SOIL SURVEY OF

Calhoun County, Texas

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

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1965-70. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1971. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Calhoun Soil and Water Conservation District.

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

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Calhoun County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the explanation of the range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the descriptions of the range sites.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife Habitat."

Ranchers and others can find, under "Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and for recreation areas in the section "Recreation."

Engineers and builders can find, under "Engineering," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Calhoun County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given under "Environmental Factors Affecting Soil Use."

Cover: Area of Livia clay loam under longtime rice rotation. The volunteer vegetation is grazed.

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SOIL SURVEY OF CALHOUN COUNTY, TEXAS

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FIELD SURVEY BY IRVIN C. MOWERY AND ROY H. L. BRUNS, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

CALHOUN COUNTY, in the southwestern part of the Gulf Coast Prairie (fig. 1), has a total area of 583,680 acres, or 912 square miles, including 246,720 acres of water. The county is irregular in shape and includes Matagorda Island and a small tract on the western side of San Antonio Bay, adjoining Aransas County. Port Lavaca, the county seat, is about 150 miles southwest of Houston and 85 miles northeast of Corpus Christi. Elevation ranges from sea level to about 55 feet above sea level. Average annual rainfall is about 39 inches.

Calhoun County is a broad, smooth, almost featureless plain broken only by a few narrow, more sloping areas adjacent to the natural drains and the inland bays. Matagorda Island and the sandy lowlands between Port O'Connor and Seadrift have undulating topography. Prolonged wetness is typical of this area. There are few natural drains and the soils are very slowly permeable.

The population of the county was 17,831 in 1970. Farming and industry are the chief enterprises. Cotton, grain sorghum, and rice are the main crops. Several large ranches raise beef cattle. Industrial plants process aluminum, starch, petrochemicals, boxes, and seafood. Mineral resources are natural gas and crude oil. The Intracoastal Waterway, the Victoria Barge Canal, and a deep water channel to Point Comfort provide water transportation within the county.

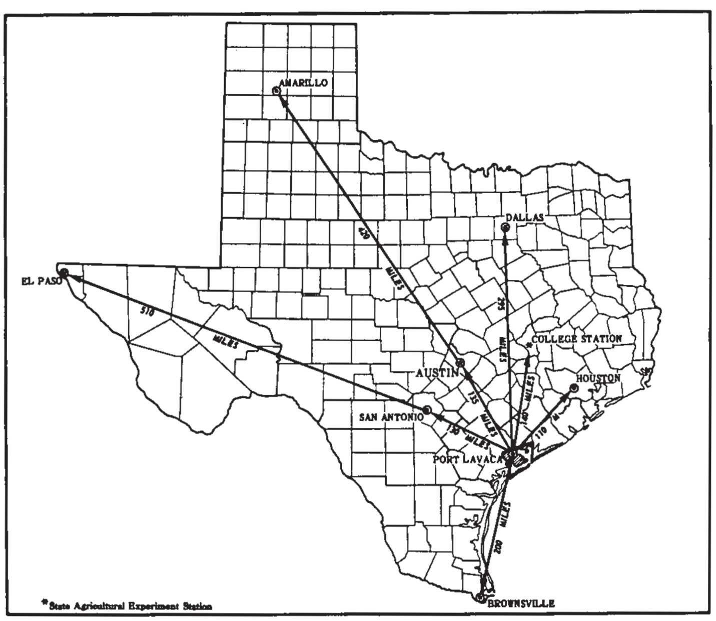

Figure 1.—**Location of Calhoun County in Texas.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Calhoun County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Lake Charles and Dacosta, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Lake Charles clay, 0 to 1 percent slopes, is one of several phases within the Lake Charles series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Calhoun County: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Dacosta-Contee complex, 0 to 1 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. Veston soils, low, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey. They are given descriptive names. Haplaquents, loamy, is an example.

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

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-well potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Calhoun County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The eight soil associations in Calhoun county are described on the following pages.

1. Lake Charles association

Nearly level to sloping, noncalcareous, somewhat poorly drained clayey soils of the uplands

This association occurs as broad expanses on almost featureless coastal prairie. The nearly level topography is interrupted only by a few narrow natural drainage courses.

This association makes up about 28 percent of the land area of the county. It is 78 percent Lake Charles soils and 22 percent Dacosta, Midland, Placedo, and Contee soils.

The surface layer of Lake Charles soils is dark gray, very firm, slightly acid clay about 28 inches thick. Below this is about 11 inches of dark gray, neutral clay; 22 inches of gray, very firm clay; and 9 inches of light gray clay mottled with brownish yellow. The underlying material to a depth of about 90 inches is light gray silty clay.

All of the less extensive soils, except Placedo soils, are on the same place on the landscape as Lake Charles soils. Placedo soils occupy natural drainage outlets at a lower elevation, near sea level, and have a water table only 12 inches below the surface.

This association is well suited to all crops commonly grown in the area. About 60 percent is in crops, about 30 percent is in native grass, and 10 percent is improved pasture. Most of the soils have a high available water capacity.

Wetness is one of the major limitations on this association. Other limitations are the high shrink-swell potential of the soils, the high corrosion potential to uncoated steel, and the very slow permeability.

2. *Livia-Francitas association*

Nearly level to gently sloping, noncalcareous, poorly drained loamy and clayey soils of the low coastal uplands

This association occurs as extensive featureless areas on uplands of the coastal prairie. It appears to occupy ancient basins between old shorelines and the upland. Occasionally it is covered with gulf water blown by stormwinds. Elevations are less than 15 feet above sea level.

This association makes up about 21 percent of the land area of the county. It is about 50 percent Livia soils, 15 percent Francitas soils, and 35 percent Matagorda, Veston, Dacosta, Harris, and Placedo soils.

Livia soils have a surface layer of light brownish gray silt loam about 6 inches thick. Below this is about 9 inches of dark gray silty clay and 41 inches of silty clay loam that is grayish brown in the upper 17 inches, light brownish gray in the next 11 inches, and light gray in the lower 15 inches. The underlying material is 16 inches of mottled light reddish brown silty clay loam over 24 inches of mottled reddish yellow silty clay.

The surface layer of Francitas soils is very dark gray clay about 16 inches thick. Below this is 43 inches of clay that is dark gray in the upper 22 inches and is gray and saline in the lower 21 inches. The next layer is about 10 inches of very pale brown, saline clay. The underlying material to a depth of 103 inches is very pale brown, saline clay.

Most of the less extensive soils are on the same place as the major soils. Placedo soils are somewhat lower, near sea level, and have a water table only 12 inches below the surface.

The soils of this association are not well suited to crops because they are saline. Plants and species tolerant of salts must be selected. About 75 percent of the association is in native grass, 20 percent is in rice and pasture rotation, and 5 percent is used for other crops.

Wetness, salinity, high and very high shrink-swell potential, very high corrosion potential to uncoated steel, and very slow permeability are the chief limitations.

3. *Portalto-Roemer association*

Nearly level to gently sloping, noncalcareous, well drained and somewhat poorly drained sandy soils of the low coastal uplands

This association is uneven flatland near the shorelines of inland bays, only slightly elevated above sea level. It marks the site of ancient coastal beaches that were formed by cyclic wave action but are now exposed to considerable wind action with the recession of sea level.

This association makes up about 16 percent of the land area of the county. It is 30 percent Portalto soils, 22 percent Roemer soils, and 48 percent Veston, Rahal, Dianola, Galveston, and Matagorda soils.

Portalto soils are on low mounds and ridges. The surface layer is gray fine sand about 8 inches thick. The upper 27 inches of the subsurface layer is white fine sand, and the lower 23 inches is light gray sand. Below this is 6 inches of grayish brown fine sandy loam, 3 inches of light brownish gray sandy clay loam, and 19 inches of fine sandy loam.

Roemer soils are in depressions between the mounds and ridges. The surface layer is grayish brown fine sand about 3 inches thick. The subsurface layer is 27 inches of white fine sand. Below this is about 9 inches of white sandy clay loam over 22 inches of white fine sandy loam.

Veston soils are in low, enclosed depressions or on meandering flats flanked by Portalto and Roemer soils. Rahal and Matagorda soils have landscape features similar to those of the major soils of the association. Galveston soils are deep sands on ridges. Dianola soils are near sea level, are adjacent to the bay, and are saline.

This association is used mostly for livestock grazing. About 90 percent is in native grass and 10 percent is improved pasture of Coastal bermudagrass.

These loose fine sands are subject to blowing. Soil blowing is the major limitation.

4. *Dacosta-Midland-Contee association*

Nearly level to gently sloping, calcareous and noncalcareous, somewhat poorly drained and poorly drained loamy soils of the uplands

This association is mostly a featureless plain except for small, narrow, more sloping borders adjacent to natural drains.

This association makes up about 9 percent of the land area of the county. It is about 32 percent Dacosta soils, 28 percent Midland soils, 17 percent Contee soils, and 23 percent Lake Charles, Edna, Ijam, and Telferner soils.

Dacosta soils are closely associated with Contee soils. In undisturbed areas they are 4 to 8 inches lower than those soils. The surface layer is very dark gray clay loam about 10 inches thick. The next 36 inches is very dark gray clay. Below this is about 16 inches of dark gray clay and 22 inches of light gray clay.

Midland soils are in about the same position on the landscape as Dacosta and Contee soils. The surface layer is clay loam about 9 inches thick. The upper part is gray, and the lower part is dark gray. The next 38 inches is clay that is gray in the upper 10 inches, light gray in the next 7 inches, and mottled light brownish gray in the lower 21 inches. Below this is 6 inches of mottled light gray silty clay loam.

Contee soils have a surface layer of gray clay loam about 8 inches thick. The next 54 inches is light gray clay. The underlying material to a depth of 80 inches is light gray clay loam.

Lake Charles, Edna, and Telferner soils are on the same plane as the major soils of the association. Ijam soils are ridges of sediments that were piled in the bay when the Intracoastal Waterway was dredged.

About 40 percent of this association is in crops, about 40 percent is range, and 20 percent is improved pasture.

The removal of excess water by effective drainage systems is one of the main requirements in management. Also to be considered are the high shrink-swell potential, the high and very high corrosion potential to uncoated steel, and the very slow permeability.

5. *Haplaquents-Bayucos association*

Nearly level, calcareous, very poorly drained sandy and loamy soils of the tidal marshes

This association occurs as coastal borders less than 4 feet above mean sea level. It is on the mainland, on Matagorda Island adjacent to Espiritu Santo Bay, and on islands in the bay. It is ordinarily inundated by high tides. The water table is at or near the surface at all times.

This association makes up about 8 percent of the land area of the county. It is about 72 percent Haplaquent soils, 15 percent Bayucos soils, and 13 percent Mustang, Veston, and Dianola soils.

Haplaquents are on the mainland and Matagorda Island. They show very little effect of plant growth and are very low in organic matter. The surface layer is about 6 inches of white loamy fine sand. Below this to a depth of more than 78 inches is stratified soil material. The upper 4 inches is light gray fine sandy loam, and the next 7 inches is mottled gray to light brownish gray loam. Below this is 24 inches of light gray fine sandy loam over 31 inches of mottled light gray sandy clay loam.

Bayucos soils are mostly on islands in the bay. They are somewhat finer textured than Haplaquents, but like those soils show very little effect of plant growth. The surface layer is gray fine sandy loam about 6 inches thick. Below this is 54 inches of loam. The upper 8 inches is gray, the next 13 inches is light brownish gray, and the lower 33 inches is gray.

Mustang soils form a low ridge of sandy sediment that was dredged from the Intracoastal Waterway.

This association is used for wildlife and recreation. The loamy Haplaquents are mostly void of vegetation. Bayucos soils have a sparse plant cover of matrimonyvine and pickelweed, both of which are salt tolerant but have little grazing value.

The main limitations on this association are flooding by tides, salinity, and the high water table. The corrosion potential to uncoated steel is very high.

6. *Galveston-Adamsville association*

Nearly level to undulating, noncalcareous, somewhat excessively drained and somewhat poorly drained sandy soils of the coastal beaches

This association is a ridge of low dunes, most of which are stabilized and are at the gulfward side of the sandy beach. These dunes are accumulations of sand blown from the beach by the prevailing southeasterly winds.

This association makes up 8 percent of the land area of the county. It is about 53 percent Galveston soils, 21 percent Adamsville soils, and 26 percent Psamments soils.

Galveston soils are on the dunes and on low ridges that parallel the long axis of the dunes. The surface layer is light gray fine sand about 5 inches thick. The underlying material to a depth of 80 inches is fine sand. It is very pale brown in the upper 27 inches and white in the lower 48 inches.

Adamsville soils are in broad flat areas between the higher lying Galveston soils and the coastal beach and in long depressions between ridges of the Galveston soils. A water table is within 20 to 40 inches of the surface in rainy seasons. These soils are subject to flooding by windblown seawater during major gulf storms. The surface layer is light brownish gray fine sand about 4 inches thick. The underlying material to a depth of 48 inches is fine sand. It is white in the upper 18 inches and dominantly light gray in the lower part.

Psamments are at the southeast side of the island, bordering the Gulf of Mexico.

This association is used as native range. Part of the range is improved pasture of Coastal bermudagrass.

The main limitations are susceptibility of the soils to flooding and soil blowing. Maintaining an adequate plant cover and stabilizing active dunes along the gulfward side of the island are the chief management needs.

7. *Austwell-Aransas-Harris association*

Nearly level, calcareous and noncalcareous, very poorly drained and poorly drained clayey soils of bottom land and coastal marshes

This association is on bottom land along rivers that drain into the Gulf. It makes up about 6 percent of the land area of the county. It is about 50 percent Austwell soils, 34 percent Aransas soils, and 16 percent Harris soils.

Austwell soils are on the lower part of the bottom land where the lowest areas are occasionally covered by windblown coastal waters. They are saline and have a water table near the surface for about 6 months each year. The surface layer is dark gray clay about 8 inches thick. The next layer is dark gray clay about 34 inches thick. The underlying material to a depth of 86 inches is a mottled gray silty clay loam.

Aransas soils are on the upper parts of the bottom land nearer the upland. The surface layer is dark gray clay about 38 inches thick. The next layer is mottled light gray clay about 20 inches thick. The underlying material to a depth of 84 inches is mottled light gray clay.

Harris soils are in old sloughs and marsh areas. They are subject to flooding during Gulf storms and high tides. The surface layer is dark gray clay about 12 inches thick. The next 46 inches is clay. The upper 9 inches of this layer is gray, and the lower 37 inches is light gray. The underlying material to a depth of 86 inches is mottled very pale brown silty clay.

Most of this association is used as range, but small areas, diversely located, are protected from flooding by levees and are used for crops.

The main limitations in the use of these soils are the lack of adequate drainage for removal of surface water, the frequent flooding, the very slow permeability, the high shrink-swell potential, and the high and very high corrosion potential to uncoated steel.

8. *Telferner-Edna association*

Nearly level, noncalcareous, somewhat poorly drained and poorly drained loamy soils of the uplands

This association is on the upland coastal plain and on some high terraces along rivers. It makes up about 4 percent of the land area of the county. It is about 46 percent Telferner soils, 41 percent Edna soils, and 13 percent Fordtran, Kenney, and Lake Charles soils.

Telferner soils are slightly higher on the landscape than Edna soils. They have a surface layer of very fine sandy loam about 11 inches thick and a white very fine sandy loam subsurface layer 4 inches thick. The next layer is 31 inches of sandy clay. The upper 9 inches is light brownish gray, the middle 13 inches is light gray, and the lower 15 inches is very pale brown. The underlying material to a depth of 84 inches is a light gray sandy clay loam.

Edna soils have a surface layer of grayish brown fine sandy loam 6 inches thick. The next 32 inches is clay that is light brownish gray in the upper 11 inches and light gray in the lower 21 inches. Below this is 12 inches of light gray sandy clay loam. The underlying material to a depth of 80 inches is white loam.

About 90 percent of this association is range, 5 percent is in crops, and 5 percent is improved pasture.

The dominant limitations in the use of these soils are wetness, very slow permeability, moderate and high shrink-swell potential, and high corrosion potential to uncoated steel.

Descriptions of the Soils

In this section the soils of Calhoun County and their use and management are described. Each soil series is described in detail, and then, briefly, the mapping units in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for dry soil unless otherwise stated. The profile described in the soil series is typical of the mapping units in that series. If a given mapping unit has a profile that differs from the one described for the series, the differences are stated in the description of the mapping unit, or they are apparent in the name of the mapping unit.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Haplaquents, loamy, for example, does not belong to a soil series, but nevertheless, is listed in alphabetic order along with the soil series.

Following the symbol of each mapping unit is the name of the mapping unit. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and range site to which the mapping unit has been assigned. The page for the description of each range site is listed in the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*8*).[1]

[1] Italic numbers in parentheses refer to Literature Cited- p. 59.

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

Soils	Area	Extent [1]
	Acres	*Percent*
Adamsville fine sand, saline	6,410	1.9
Aransas clay	6,760	2.0
Aransas clay, high bottom	500	.1
Austwell silty clay, high bottom	1,120	.3
Austwell clay	9,450	2.8
Bayucos soils	4,210	1.3
Beaumont clay	530	.2
Dacosta clay loam, saline	4,560	1.4
Dacosta-Contee complex, 0 to 1 percent slopes	18,650	5.5
Dacosta-Contee complex, 1 to 3 percent slopes	650	.2
Dianola-Portalto complex	5,510	1.6
Edna very fine sandy loam	6,300	1.9
Edna very fine sandy loam, low	1,120	.3
Fordtran loamy fine sand	860	.3
Francitas clay	11,060	3.3
Galveston fine sand, undulating	9,440	2.8
Galveston complex, undulating	9,490	2.8
Haplaquents, loamy	19,930	5.9
Haplaquents-Dianola complex	770	.2
Harris clay	2,010	.6
Harris complex	3,400	1.0
Ijam clay	1,150	.3
Kenney fine sand	480	.1
Lake Charles clay, 0 to 1 percent slopes	78,700	23.4
Lake Charles complex, 3 to 8 percent slopes	1,720	.5
Livia silt loam	15,800	4.7
Livia clay loam, 0 to 1 percent slopes	20,990	6.2
Livia clay loam, 2 to 5 percent slopes, eroded	1,200	.4
Matagorda very fine sandy loam	7,320	2.2
Midland clay loam	3,990	1.2
Midland clay loam, low	4,610	1.4
Midland-Dacosta complex	6,530	1.9
Mustang fine sand	1,860	.6
Placedo clay	6,280	1.9
Portalto-Roemer complex	29,680	8.8
Psamments, gravelly	1,160	.3
Psamments	2,780	.8
Rahal fine sand, gently undulating	7,000	2.1
Telferner very fine sandy loam	6,900	2.0
Veston soils	5,020	1.5
Veston soils, low	11,060	3.3
Land area	336,960	---
Water areas (bays, natural lakes, rivers)	246,720	---
Total	583,680	100.0

[1] Proportion based on total land area.

Adamsville Series

The Adamsville series consists of deep, nearly level to gently undulating, noncalcareous sandy soils on coastal beaches. These soils formed under sparse vegetation in sandy sediments reworked by waves and wind. They are periodically flooded by stormblown seawater and consequently are periodically affected by salinity. The native vegetation consists only of plants tolerant of salts and excess water.

In a representative profile the surface layer is light brownish gray, loose fine sand about 4 inches thick. The underlying material to a depth of 48 inches is fine sand. The upper 22 inches is white, and the lower 22 inches is mainly light gray.

Adamsville soils are in level areas and in depressions in an undulating landscape where runoff is slow. They are somewhat poorly drained and have very low available water capacity. The seasonal high water table is at a depth of 20 to 40 inches during rainy seasons, but the soil is saturated for only brief periods.

Most of the acreage is native range. Some areas are planted to Coastal bermudagrass and managed as improved pasture.

Representative profile of Adamsville fine sand, saline, on Matagorda Island; 7.08 miles northeast of the Wynn Ranch headquarters on the main island road; 0.3 mile southeast of the road and 0.3 mile east of a windmill; in native range:

A—0 to 4 inches, light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; common fine roots; medium acid; gradual, smooth boundary.

C1g—4 to 26 inches, white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; few, common, distinct, reddish yellow (7.5YR 6/6) mottles; single grained; soft; few fine roots in upper part; slightly acid; clear, smooth boundary.

C2g—26 to 38 inches, light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; single grained; soft; calcareous; moderately alkaline; abrupt, clear boundary.

C3g—38 to 41 inches, light brownish gray (10YR 6/2) fine sand, grayish brown (10YR 5/2) moist; single grained; soft; calcareous; moderately alkaline; clear, smooth boundary.

C4g—41 to 48 inches, light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; single grained; soft; calcareous; moderately alkaline.

The upper part of the soil is medium acid, and the lower part is moderately alkaline. The A horizon ranges from 4 to 14 inches in thickness and from dark gray to light brownish gray. The C horizon is white, light gray, or light brownish gray and is faintly or distinctly mottled throughout.

Ad—Adamsville fine sand, saline. This soil is mostly adjacent to the gulf coast. It is in large, gently undulating areas 3 to 8 feet above sea level and in depressional areas surrounded by Galveston soils. Slopes typically are less than 1 percent, but in places are up to 3 percent. Areas range from 15 to 800 acres in size, but are dominantly about 300 acres.

Included with this soil in mapping are small, oval-shaped dunes and low ridges of Galveston soils. These included areas make up as much as 10 percent of some mapped areas.

This soil is periodically flooded by windblown seawater. It is also saturated for several days or weeks following heavy rains. Salinity ranges from low to very high. It is high after periods of flooding in fall and winter and low during long, stormfree periods when the salt is leached out. Depth to the water table varies, depending on the season. It is 20 to 40 inches for about 4 to 6 months each year.

This soil is unsuitable for cultivation. It is limited by wetness, flooding by stormwater, and a severe hazard of blowing. Capability unit VIw-1; Low Coastal Sand range site.

Aransas Series

The Aransas series consists of deep, nearly level, calcareous, clayey soils on bottom land. These soils formed under short grasses and water-tolerant plants in calcareous, clayey alluvial sediments.

In a representative profile the surface layer is dark gray clay about 38 inches thick. The next 20 inches is mottled light gray clay. The underlying material to a depth of 84 inches is mottled light gray, massive clay.

Aransas soils are poorly drained and have a high available water capacity. They are used mostly as range. A small acreage is in crops.

Representative profile of Aransas clay, about 16 miles east of Port Lavaca; 11.6 miles southeast on Texas Highway 35 from its intersection with U.S. Highway 87; 9.6 miles north on the Victoria Barge Canal Road; 570 feet west of the barge canal; in an old field:

Ap—0 to 5 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate, fine and medium, subangular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common fine pores; calcareous; moderately alkaline; clear, smooth boundary.

A11—5 to 15 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate and strong, fine, subangular and angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common fine pores; calcareous; moderately alkaline; gradual, smooth boundary.

A12—15 to 38 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; few, fine, faint brown mottles; moderate and strong, fine, angular and subangular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; calcareous; moderately alkaline; gradual, smooth boundary.

AC—38 to 58 inches, light gray (10YR 6/1) clay, gray (10YR 5/1) moist; few, medium, faint, yellowish brown mottles; weak, fine, angular and subangular blocky structure; extremely hard, very firm, very sticky and plastic; few threads and small soft lumps of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—58 to 84 inches, light gray (10YR 6/1) clay, gray (10YR 5/1) moist; common, medium, faint, yellowish brown (10YR 5/4) mottles; massive; extremely hard, very firm, very sticky and plastic; common threads and small soft masses of calcium carbonate; calcareous; moderately alkaline.

The Ap and A11 horizons are dark gray or very dark gray and range from 10 to 20 inches in thickness. The A12 horizon ranges from 9 to 33 inches in thickness. It is dark gray or very dark gray clay loam and in places has thin strata of silty clay loam. The AC horizon ranges from 11 to 20 inches in thickness and is light gray or gray. In places it is mottled with brown, yellowish brown, or light olive brown. This horizon is clay or clay loam and is commonly stratified with silty clay loam. The C horizon is 37 to 58 inches below the surface. It is gray or light gray and in places is mottled with yellowish brown or brown.

Ar—Aransas clay. This nearly level soil is on bottom land adjacent to major rivers and their meandering channels. Unless protected by levees, it is flooded one to three times a year and remains under water for long periods after flooding. Slopes are less than 1 percent. Areas are dominantly about 1,000 acres in size, but range from 100 to 2,000 acres.

This soil has the profile described as representative of the series. Included in mapping are long, narrow areas of Austwell soils, which are old channels; narrow, low ridges or natural levees of Aransas clay, high bottom; and a few fields of Aransas clay protected by manmade levees.

This Aransas soil is not suited to crops unless it is protected from flooding by levees. Most of the acreage is in native vegetation and is used as range. Capability unit Vw-1; Clayey Bottomland range site.

As—Aransas clay, high bottom. This is a nearly level soil of the bottom land adjacent to major river channels. It is on natural levees, is 1 to 5 feet higher than adjacent bottom land, and is flooded about once every 8 to 10 years. Slopes are 0 to 1 percent and are weakly convex.

The surface layer is typically dark gray clay about 32 inches thick. The next layer, about 10 inches thick, is mottled gray clay. The underlying material to a depth of 80 inches is mottled light gray clay. The entire profile is calcareous. Some small areas have a 3-to 8-inch layer of sandy clay loam or sandy loam overwash left by floodwater.

Aransas clay, high bottom, has a high available water capacity, but is poorly suited to crops because areas are small and irregular and some are inaccessible. If this soil is used for crops, adequate drainage, proper residue management, and maintenance of fertility and good tilth are needed. Most areas are wooded or are used as range. Capability unit IIIw-2; Clayey Bottomland range site.

Austwell Series

The Austwell series consists of deep, nearly level, calcareous clayey soils on bottom land. These soils formed under a vegetative cover of salt- and water-tolerant plants in calcareous, saline alluvial sediments.

In a representative profile the surface layer is dark gray clay about 8 inches thick. The subsoil extends to a depth of 42 inches and is mottled dark gray clay. The underlying material to a depth of 86 inches is mottled gray silty clay loam.

Austwell soils are poorly drained and have a very low available water capacity. These soils are used as native grassland. They are not suited to crops.

Representative profile of Austwell clay, 15 miles southwest of Port Lavaca on Texas Highway 35, which is 1,200 feet west of Hog Bayou; 85 feet south of the right-of-way fence; in native range:

A1—0 to 8 inches, dark gray (10YR 4/1) clay, dark gray (10YR 4/1) moist; moderate, coarse, subangular blocky structure; extremely hard, very firm, very sticky and plastic; common roots; saline; calcareous; moderately alkaline; gradual, wavy boundary.

B21g—8 to 26 inches, dark gray (N 4/0) clay, dark gray (10YR 4/1) moist; moderate, medium, subangular and angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; many fine salt crystals; saline; calcareous; moderately alkaline; gradual, smooth boundary.

B22g—26 to 42 inches, dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; few, fine, faint, brown (10YR 4/3) mottles; moderate, coarse, angular blocky structure; extremely hard, very firm, very sticky and plastic; few roots; few shell fragments; common salt crystals; saline; calcareous; moderately alkaline; gradual, smooth boundary.

Cg—42 to 86 inches, gray (10YR 5/1) silty clay loam, dark gray (10YR 4/1) moist; common, fine and medium, distinct, yellowish brown (10YR 5/4) mottles; massive; hard, firm, sticky and plastic; saline; calcareous; moderately alkaline.

The A horizon is clay or silty clay. It is dark gray or gray and is 6 to 11 inches thick. Salinity ranges from low to high.

The B21g horizon is clay or silty clay and is 8 to 25 inches thick. It is dark gray or gray and in some places is mottled with olive brown, light yellowish brown, or brown.

The B22g horizon is clay or silty clay and is 10 to 25 inches thick. It is dark gray, gray, light gray, or light brownish gray. In places it is mottled with brown, yellowish brown, or light olive brown. Salinity ranges from low to very high.

The Cg horizon is silty clay loam, silty clay, clay, or clay loam and depth to it ranges from 35 to 50 inches. It has the same color range as the B22g horizon. A water table is within 24 inches of the surface during wet seasons.

At—Austwell silty clay, high bottom. This nearly level soil is on bottom land. It is on natural levees and is 1 to 5 feet higher than adjoining areas and is flooded one to three times each year. Flooded areas are 100 to 400 feet wide and 1 to 5 miles long. Slopes are 0 to 1 percent and are weakly convex.

The surface layer is gray silty clay about 11 inches thick. The next layer is dark gray silty clay about 24 inches thick. The underlying material to a depth of 66 inches is mottled light gray clay loam stratified with silty clay loam, clay loam, and clay.

This soil is used as native range along with large areas of other soils. Cattle retreat to areas of this soil when windblown seawater covers the adjoining lower lying areas. This soil is not suitable for cultivation. Capability unit Vw-2; Salty Prairie range site.

Au—Austwell clay. This nearly level soil is on bottom land along major rivers. It is less than 5 feet above mean sea level and has slopes of less than 1 percent. Areas near the bay are covered with windblown seawater one to four times annually and remain under water for 1 to 3 weeks. This soil occurs only as a few large areas 100 to 2,000 acres in size. It has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of Aransas clay; some narrow, low ridges of Austwell silty clay, high bottom, on natural levees; and shallow depressional areas of Harris soils. These included soils make up about 5 percent of some mapped areas.

This Austwell soil is used as range and wildlife habitat. It is not used for crops because of storm floodings, poor drainage, and salinity (fig. 2). Capability unit VIIw-2; Salty Prairie range site.

Bayucos Series

The Bayucos series consists of deep, nearly level, calcareous and saline loamy soils in tidal marshes. These soils formed in deep loamy sediments of recent deposits. These are sediments that have been reworked and sorted by wave action and by wind.

In a representative profile the upper 6 inches is gray fine sandy loam mottled with yellowish brown. The underlying material to a depth of 60 inches is mottled loam. The upper part is gray, the middle part is light brownish gray, and the lower part is gray.

Bayucos soils are very poorly drained and have a very low available water capacity. They are used for recreation, and they provide wetland wildlife habitat.

Representative profile of Bayucos fine sandy loam, in an area of Bayucos soils, about 2.6 miles south of Port O'Connor on Bayucos Island; 700 feet north of Saluria Bayou and 260 feet east of Mitchell Cut:

Clg—0 to 6 inches, gray (10YR 6/1) fine sandy loam; common, medium, faint, light yellowish brown (10YR 6/4) mottles; structureless; friable, slightly sticky; common medium roots; many fine and medium pores; few thin strata of loam; saline; calcareous; moderately alkaline; clear, smooth boundary.

C2g—6 to 14 inches, gray (10YR 5/1) loam; common, medium, faint, light yellowish brown mottles; structureless; friable, sticky; common fine roots; many, medium pores; few thin strata of very fine sandy loam; saline; calcareous; moderately alkaline; gradual, smooth boundary.

C3g—14 to 27 inches, light brownish gray (10YR 6/2) loam; few, medium, faint, pink mottles; structureless; friable, sticky; common fine roots: many medium pores; few small shells; saline; calcareous; moderately alkaline; gradual, smooth boundary.

Figure 2.—**Seasonal high water table in Austwell clay. The dominant plant is spiny aster.**

C4g—27 to 45 inches, gray (10YR 6/1) loam; few, fine, faint, light brownish gray mottles; structureless; friable, sticky; few fine roots; few thin strata of very fine sandy loam; saline; calcareous; moderately alkaline; gradual, smooth boundary.

C5g—45 to 60 inches, gray (10YR 6/1) loam, common, medium, distinct, yellowish brown (10YR 5/4) mottles; structureless; friable, sticky; thin strata of fine sandy loam; few shells; saline; calcareous; moderately alkaline.

The C1g horizon ranges from fine sandy loam to clay loam, silty clay loam, and loam. It is 3 to 12 inches thick and is light gray, light brownish gray, pinkish gray, or gray. The underlying material is stratified loam, clay loam, silty clay loam, silt loam, fine sandy loam, very fine sandy loam, and loamy fine sand. It is light gray, gray, dark gray, light brownish gray, pinkish gray, light olive gray, light brownish gray, pinkish gray, light olive gray, light greenish gray, or greenish gray. A water table is within 20 inches of the surface at all times.

BA—Bayucos soils. This nearly level mapping unit is dominantly Bayucos fine sandy loam. Less extensive is a similar loamy fine sand. These soils are on low-lying islands in Espiritu Santo Bay and on the chain of islands that connects the mainland with Matagorda Island adjacent to Pass Cavallo. Elevation ranges from sea level to about 4 feet above sea level. The lower lying Bayucos soils are frequently covered by cyclic tides, and the more elevated soils are occasionally covered with seawater driven by stormwinds. The landscape is spotted with many depressions that range from a few feet to more than 400 feet in diameter. The larger depressions are filled with water at all times. The water table is perennially at or near the surface.

The composition of this unit is likely to be more variable than that of other units in the survey area. Mapping has been controlled well enough, however, for the anticipated use of the areas. Included in mapping are areas of Psamments, gravelly, and slightly higher, narrow ridges of Mustang and Dianola soils. These included soils make up about 5 percent of some mapped areas.

These soils are not suitable for crops or range. They are flooded by seawater and are consequently saline, and they have a permanent high water table. They are used for recreation and provide wetland wildlife habitat. Capability unit VIIIw-1; no range site assigned.

Beaumont Series

The Beaumont series consists of deep, nearly level, noncalcareous clayey soils on uplands. These soils formed under a cover of coarse bunch grasses in calcareous clayey sediments on marine terraces.

In a representative profile the surface layer is dark gray clay in the upper 7 inches and gray mottled clay in the lower 30 inches. Below this is about 25 inches of mottled light gray clay. The underlying material to a depth of

77 inches is mottled white clay.

A microrelief of ridges and depressions is typical in areas of these soils under native vegetation, as a result of repeated shrinking and swelling with changes in moisture content.

Beaumont soils are poorly drained and have a high available water capacity. Crops and native range are the main uses.

Representative profile of Beaumont clay, about 8 miles northwest of Port Lavaca; 7.6 miles northwest on U.S. Highway 87 from its intersection with Texas Highway 35 bypass; 0.3 mile northeast on a ranch road; 50 feet north of the road in a depression area of native vegetation:

A11—0 to 7 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate to strong, medium and fine, subangular blocky structure; extremely hard, very firm, very sticky and plastic; common fine roots; shiny pressure faces on peds; medium acid; gradual, wavy boundary.

A12—7 to 25 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; common, fine, distinct brown (10YR 5/3, moist) mottles; moderate to strong, medium and coarse, subangular blocky structure; extremely hard, very firm, very sticky and plastic; common fine roots in upper part; shiny pressure faces on peds; few slickensides in lower part; few iron-manganese concretions; very strongly acid; gradual, wavy boundary.

A13—25 to 37 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; few, fine, faint brown (10YR 5/3) mottles; moderate, coarse, angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; shiny pressure faces on peds; few slickensides; few iron-manganese concretions; medium acid; gradual, wavy boundary.

AC1g—37 to 47 inches, light gray (10YR 6/1) clay, gray (10YR 5/1) moist; few, fine, faint light brownish yellow (10YR 6/4) mottles; weak, medium, angular blocky structure; extremely hard, very firm, very sticky and plastic; shiny pressure faces on peds; few intersecting slickensides; few iron-manganese concretions; matrix noncalcareous with many, fine calcium carbonate concretions; mildly alkaline; gradual, wavy boundary.

AC2g—47 to 62 inches, light gray (10YR 7/1) clay, light gray (10YR 6/1) moist; few, fine, faint light yellowish brown (10YR 6/4) mottles; weak, medium, angular blocky structure; very hard, very firm, very sticky and plastic; few intersecting slickensides; common iron-manganese concretions; many, medium and fine calcium carbonate concretions; calcareous; moderately alkaline; gradual, wavy boundary.

Cg—62 to 77 inches, white (2.5Y 8/2) clay, light gray (10YR 7/2) moist; few, medium, distinct brownish yellow (10YR 6/6) mottles; massive; very hard, very firm, very sticky and plastic; few slickensides; few and common iron-manganese concretions; many, medium and fine calcium carbonate concretions; calcareous; moderately alkaline; gradual, smooth boundary.

The A11 horizon is 7 to 9 inches thick and dark gray to gray. It is very strongly acid to medium acid. The A12 horizon ranges from 12 to 25 inches in thickness. It is gray to dark gray mottled with brown, yellowish brown, or yellowish red. Reaction ranges from very strongly acid to slightly acid. The A13 horizon ranges from 11 to 20 inches in thickness. It is gray to light gray and in places is mottled with yellowish brown or brown. Reaction is strongly acid to medium acid.

The AC horizon is 10 to 30 inches thick. It is gray to light gray mottled with light yellowish brown, yellowish brown, or light brownish yellow. Reaction is neutral to moderately alkaline.

Depth to the C horizon ranges from 48 to more than 70 inches. The C horizon ranges from mottled light gray and white to light gray and olive yellow.

The mean annual soil temperature of the Beaumont soils in Calhoun County is slightly more than is defined as the range for that series. Use and management of these soils, however, do not differ significantly.

Be—Beaumont clay. This nearly level soil is on uplands. Areas range from about 25 to 150 acres in size, but dominantly are about 40 acres. Slopes are 0 to 1 percent.

Included with this soil in mapping at a slightly higher elevation are a few small areas of Midland and Edna soils and a few spots of Lake Charles soils. These included areas make up as much as 5 percent of some mapped areas.

Nearly all the acreage is in native vegetation and is used as range. Only a small acreage is used for crops, mainly grain sorghum and cotton.

Management needs in cropped areas are adequate drainage, proper use of crop residue, and maintenance of good tilth and fertility. This clayey soil can be tilled within only a narrow range of moisture content, which insures minimum damage to the soil structure. Capability unit IIIw-1; Blackland range site.

Contee Series

The Contee series consists of nearly level to gently sloping, deep, calcareous loamy soils on uplands. These soils formed under a native plant cover of tall and mid grasses in calcareous clayey sediments.

In a representative profile the surface layer is gray firm clay loam about 8 inches thick. The next 54 inches is light gray clay that has a few light yellowish brown mottles in the lower part. The underlying material is faintly mottled light gray clay loam.

Contee soils are somewhat poorly drained and have a high available water capacity. Crops and native range are the main uses.

The Contee soils in Calhoun County are mapped only with Dacosta soils.

Representative profile of Contee clay loam, about 7 miles southwest of Port Lavaca in an area of Dacosta-Contee complex, 0 to 1 percent slopes; 5 miles southwest on Texas Highway 35 from its intersection with U.S. Highway 87 in Port Lavaca; 0.35 mile northwest on a county road; 60 feet southwest of county road right-of-way fence on a microknoll; in native range:

A1—0 to 8 inches, gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; moderate, fine, subangular blocky structure; very hard, firm, sticky; common, fine, strongly cemented calcium carbonate concretions; few, fine, strongly cemented iron-manganese concretions; calcareous; moderately alkaline; gradual, wavy boundary.

B21—8 to 27 inches, light gray (10YR 7/2) clay, light brownish gray (10YR 6/2) moist; strong, medium and fine, angular blocky structure; very hard, very firm, sticky; few fine roots; few worm holes; shiny pressure faces on peds; few, fine, strongly cemented calcium carbonate concretions; few, fine, strongly cemented iron-manganese concretions; calcareous; moderately alkaline; gradual, wavy boundary.

B22—27 to 49 inches, light gray (10YR 7/1) clay, gray (10YR 6/1) moist; moderate, fine and very fine, angular blocky structure; very hard, very firm, sticky; few fine roots; shiny pressure faces on peds; about 10 percent fine strongly cemented calcium carbonate concretions; few, fine, weakly cemented iron-manganese concretions; calcareous; moderately alkaline; gradual, wavy boundary.

B23—49 to 62 inches, light gray (10YR 7/2) clay, light brownish gray (10YR 6/2) moist; few, fine, faint, light yellowish brown (10YR 6/4) mottles; weak, fine, angular blocky structure; very hard, firm, sticky; about 10 percent fine, strongly cemented calcium carbonate concretions; few, fine, weakly cemented iron-manganese concretions; calcareous; moderately alkaline; gradual boundary.

C—62 to 80 inches, light gray (10YR 7/2) clay loam, light gray moist; common, fine, faint yellow (10YR 7/6) mottles; massive; very hard, firm, sticky; about 15 percent soft lumps and fine, weakly cemented calcium carbonate concretions; few, fine, weakly cemented iron-manganese concretions; calcareous; moderately alkaline.

The A horizon is clay loam or silty clay loam and is 4 to 9 inches thick. It is gray, dark gray, grayish brown, or dark grayish brown.

The B2 horizon is clay or silty clay that has a clay content ranging from 40 to 60 percent. It is gray, light gray, or light brownish gray. In many profiles it is mottled with yellow and brown. Parts of this horizon may not be calcareous in all profiles.

The C horizon is clay loam, silty clay loam, clay, or silty clay. It is at a depth ranging from 40 to 75 inches. It is light gray, very pale brown, pale yellow, light brownish gray, or pale brown and is mottled with yellow and brown.

Dacosta Series

The Dacosta series are deep, nearly level to gently sloping, noncalcareous loamy soils on uplands. These soils formed under mid and tall grasses in calcareous clayey sediments.

In a representative profile the surface layer is very dark gray, firm clay loam about 10 inches thick. The upper 36 inches of the next layer is very dark gray clay. The next 16 inches is dark gray clay. Below this to a depth of 84 inches is light gray clay.

Dacosta soils are somewhat poorly drained and have a high available water capacity. They are suited to cultivation and respond well to management. They are used chiefly for crops and native range.

Representative profile of Dacosta clay loam, in an area of Dacosta-Contee complex, 0 to 1 percent slopes, about 7 miles southwest of Port Lavaca in an area of Dacosta-Contee complex, 0 to 1 percent slopes; 5 miles southwest on Texas Highway 35 from its intersection with U.S. Highway 87 in Port Lavaca; 0.35 mile northwest on a county road; 70 feet southwest of county road right-of-way fence in a microbasin; in native range:

A1—0 to 10 inches, very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; massive; very hard, firm, sticky; many fine roots; slightly acid, gradual, smooth boundary.

B1tg—10 to 22 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate, medium, angular blocky structure; very hard, firm, sticky; common fine roots; common clay films on faces of peds; slightly acid; gradual, wavy boundary.

B21tg—22 to 46 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate, coarse, subangular blocky structure parting to fine and medium, angular blocky structure; very hard, very firm, very sticky; few fine roots; many clay films on faces of peds; neutral; gradual, wavy boundary.

B22tg—46 to 62 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak, medium, angular blocky structure; very hard, very firm, very sticky; common clay films on faces of peds; common fine and few medium calcium carbonate concretions; calcareous; moderately alkaline; gradual, wavy boundary.

B3tg—62 to 72 inches, light gray (10YR 7/1) clay, gray (10YR 6/1) moist; few, fine, faint yellow (10YR 7/6) mottles; weak, coarse, angular blocky structure; very hard, very firm, very sticky; common fine concretions and few medium soft masses of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C—72 to 84 inches, light gray (2.5Y 7/2) clay, light gray moist; common, medium and fine, distinct, brownish yellow (10YR 6/6) mottles; massive; very hard, very firm, very sticky; few, fine, black iron-manganese concretions; common, medium, soft masses and films of calcium carbonate; calcareous; moderately alkaline.

The A1 horizon is dark gray or very dark gray and is 6 to 16 inches thick. Salinity ranges from none to moderate.

The B1tg horizon is clay or silty clay. It ranges from very dark gray, dark gray to black. Salinity ranges from none to high. The B2tg horizon is clay, and the clay content increases with increasing depth. This horizon ranges from very dark gray and black to dark gray. It is 19 to 42 inches thick. Salinity ranges from low to high.

The C horizon is clay, silty clay, clay loam, or silty clay loam and is at a depth of 52 to 80 inches. It is light gray, very pale brown, pale yellow, or reddish yellow.

Da—Dacosta clay loam, saline. This saline soil is nearly level and is depressed in some places. It is within 5 miles of the intercoastal bays and is less than 10 feet above sea level. Slopes are 0 to 1 percent. Areas range from about 20 to 150 acres in size, but are mainly about 60 acres.

The surface layer of this soil is dark gray, firm clay loam about 10 inches thick. The next 16 inches is dark gray, moderately saline clay. Below this is 34 inches of saline clay that is dark gray in the upper part and light gray in the lower part. The underlying material to a depth of 84 inches is a moderately saline, reddish yellow silty clay.

Included with this soil in mapping are small areas of Contee soils that are slightly saline. Also included in some areas are spots of Livia and Francitas soils. These included soils make up as much as 8 percent of some areas.

This soil is suited to some crops. It is somewhat poorly drained. Salinity affects the choice of crops as well as the yields. About 60 percent of the acreage is in rice-pasture rotation. A small acreage is in other crops, mainly grain sorghum, and the rest is in native range.

Rice should be rotated with suitable grasses and legumes to improve soil productivity as well as grazing capacity. Only the crops and grasses that tolerate salinity should be selected. Adequate drainage systems are needed for all crops, including rice, to remove excess surface water. This soil responds to additional fertilization. Capability unit IIIw-6; Salty Prairie range site.

Dc—Dacosta-Contee complex, 0 to 1 percent slopes. In undisturbed areas this mapping unit has a surface microrelief of basins and knolls. It is 50 to 75 percent Dacosta soil and 25 to 50 percent Contee soil. Each of these nearly level soils occurs in an alternating pattern. The Dacosta soil is in the depressions, which are 4 to 10 inches lower than the highs. The Contee soil is on the highs. Each soil has the profile described as representative of its series. Most areas range from 15 to 600 acres in size, but are mainly about 225 acres.

Included with this unit in mapping are small areas of Lake Charles, Midland, and Edna soils. Also included are small areas of Dacosta soils that have slopes of 2 percent. These included soils make up about 8 percent of some areas.

This mapping unit is suitable for crops, but the choice of crops is limited. The main crops are grain sorghum, rice, and cotton. Smaller acreages are in corn and flax.

This mapping unit is somewhat poorly drained. Management to be considered includes adequate drainage, proper use of crop residue, and maintenance of good tilth and fertility. High residue crops, such as grain sorghum, are essential for good tilth. Capability unit IIIw-1; Blackland range site.

Dn—Dacosta-Contee complex, 1 to 3 percent slopes. This mapping unit is in gently sloping areas. It is 52 percent Dacosta clay loam and 48 percent Contee clay loam. Native areas have a microrelief of shallow swales and low ridges that are generally oriented with the slope. Dacosta clay loam is in the swales. Contee clay loam is on the ridges, which are 5 to 20 feet wide. The swales are 4 to 10 inches lower than the ridges, and are 5 to 25 feet wide.

Areas range from about 12 to 50 acres in size, but dominantly are about 25 acres.

The Dacosta soil has a surface layer of dark gray clay loam about 8 inches thick. The next 40 inches is very dark gray clay. Below this to a depth of 60 inches is light gray clay.

The Contee soil has a surface layer of dark gray clay loam about 7 inches thick. The next 50 inches is light gray clay. Below this to a depth of 72 inches is light brownish gray clay.

Included with this unit in mapping are spots of Lake Charles, Midland, or Edna soils. These included soils make up as much as 10 percent of mapped areas.

This mapping unit has a high available water capacity. It is well suited to crops commonly grown in the area, but is not suited to rice. Most of the acreage is used as native range. A small acreage is used for crops, mainly grain sorghum and cotton.

Management to be considered for crops includes control of runoff to prevent erosion, proper use of crop residue, and maintenance of good soil tilth. Runoff from large areas of nearly level, upslope tableland creates a significant erosion hazard where these soils are used for crops. Diversion terraces at the top of the slopes and terraces are needed. Crops respond to fertilization. Capability unit IIIe-1; Blackland range site.

Dianola Series

The Dianola series consists of deep, nearly level, calcareous and saline loamy soils on upland flats adjacent to the inland bays. These soils formed under a sparse cover of salt-tolerant plants in sandy coastal sediments. They are occasionally covered by stormblown seawater.

In a representative profile the surface layer is gray, very friable, saline fine sandy loam about 4 inches thick. The next 16 inches is loamy fine sand that is gray in the upper part and light gray in the lower part. Below this is fine sand. The upper 8 inches is mottled light gray, the next 14 inches is mottled white, and the lower 20 inches is very pale brown.

Dianola soils are saturated for long periods. They are poorly drained and have very low available water capacity. Depth to the seasonal high water table is 18 to 40 inches.

These soils are used chiefly as range.

Representative profile of Dianola fine sandy loam in an area of Dianola-Portalto complex 3.5 miles east of Seadrift on Texas Highway 185; 1.85 miles south and 3.17 miles southeast on a ranch road; 0.32 mile northeast on a ranch trail to a windmill, which is 470 feet west of a drainage ditch; 78 feet north of a trail, between mounds of Portalto fine sand, in native range:

A1—0 to 4 inches, gray (10YR 6/1) fine sandy loam, dark gray (10YR 4/1) moist; weak, fine, granular structure; slightly hard, very friable; common fine roots; many medium and fine pores; saline; moderately alkaline; clear, smooth boundary.

C1g—4 to 15 inches, gray (10YR 6/1) loamy fine sand, dark gray (10YR 4/1) moist; single grained; soft, very friable; common fine roots; saline; moderately alkaline; gradual, smooth boundary.

C2g—15 to 20 inches, light gray (10YR 6/1) loamy fine sand, gray (10YR 5/1) moist; few, fine, faint, brown mottles; single grained; soft, very friable; few fine roots; saline; moderately alkaline; gradual, smooth boundary.

C3g—20 to 28 inches, light gray (10YR 7/2) fine sand, light gray moist; few, fine, distinct, yellow (10YR 7/6) mottles; single grained; soft, loose; few fine roots; thin discontinuous lenses of very pale brown loamy fine sand; saline; moderately alkaline; clear, smooth boundary.

C4g—28 to 42 inches, white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; many, medium and coarse, distinct, dark brown (10YR 3/3) mottles enriched with iron and humus; common, fine and medium, yellowish brown (10YR 5/6) mottles or spheres having brittle centers; single grained; loose, soft; thin strata of brownish yellow (10YR 6/6) loamy fine sand; many fine block masses and splotches; saline; moderately alkaline; gradual, smooth boundary.

C5—42 to 62 inches, very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose; few thin strata of gray loamy fine sand; saline; moderately alkaline.

The A horizon is fine sandy loam, loamy fine sand, or fine sand and is 3 to 18 inches thick. It is gray, light gray, or light brownish gray. It is strongly saline or very strongly saline.

Above the water table the C horizon is white, light gray, gray, or light brownish gray. Below the water table, it can also be pale brown or very pale brown. It has few or common brownish or yellowish mottles. This horizon is loamy fine sand or fine sand.

Dp—Dianola-Portalto complex. This mapping unit is on the mainland on coastal lowlands. It is about 75 percent Dianola soil. This Dianola soil is nearly level, is 1 to 5 feet above sea level, and is dotted with mounts of the Portalto soil. The mounds are 50 to 90 feet in diameter, 16 to 36 inches high, and 2 to 7 feet above sea level. Slopes are 0 to 1 percent. Areas range from 30 to 2,500 acres in size, but dominantly are about 1,000 acres.

The Dianola soil has the profile described as representative of the series. The Portalto soil is fine sand to a depth of 60 inches. The surface layer is light gray and is about 10 inches thick. The next 30 inches is white, and the lower 20 inches is light gray. Below this is 10 inches of grayish brown fine sandy loam.

Included with this unit in mapping are small areas of Roemer soils, swales of Haplaquents, loamy, and small level areas of Veston soils. These included soils make up as much as 5 percent of some areas.

This mapping unit is used entirely as range. It is not suited to crops because the soils are strongly saline, are frequently flooded by seawater, have a permanent high water table, and are subject to blowing. Capability unit VIIs-1; Dianola soil in Salty Prairie range site, Portalto soil in Coastal Sand range site.

Edna Series

The Edna series consists of deep, nearly level, noncalcareous loamy soils on uplands. These soils formed under short and mid grasses in loamy and clayey sediments on marine terraces.

In a representative profile the surface layer is grayish brown very fine sandy loam about 6 inches thick. The next layer is 32 inches thick. The upper 11 inches is light brownish gray clay mottled with yellowish brown and the lower 21 inches is light gray clay mottled with brownish yellow. Below this is 12 inches of light gray sandy clay loam. The underlying material to a depth of 80 inches is white loam.

Edna soils are poorly drained and have a high available water capacity. They are used for crops and range.

Representative profile of Edna very fine sandy loam, about 6 miles southwest of Port Lavaca; 4.6 miles southwest on Texas Highway 35 from its intersection with U.S. Highway 87 in Port Lavaca; 1.0 mile southeast and southwest on Farm Road 2235; 0.9 mile southeast and south on a private road; 0.25 mile west along a drainage ditch; 100 feet south of a ditch in an old ricefield:

Ap—0 to 6 inches, grayish brown (10YR 5/2) very fine sandy loam; dark grayish brown (10YR 4/2) moist; few, fine, faint, yellowish brown (10YR 5/6, dry) mottles in root channels; massive; very hard and crusty, friable; common fine roots; medium acid; abrupt, wavy boundary.

B21tg—6 to 17 inches, light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; common, fine, distinct, yellowish brown (10YR 5/6, dry) mottles; weak, coarse, blocky structure; extremely hard, firm, sticky; few fine roots between peds; continuous thick clay films; slightly acid; gradual, wavy boundary.

B22tg—17 to 38 inches, light gray (10YR 6/1) clay, gray (10YR 5/1) moist; common, fine and medium, distinct, brownish yellow (10YR 6/6, dry) mottles; strong, medium, blocky structure; extremely hard, very firm, sticky; few fine roots; continuous thick clay films; slightly acid; gradual boundary.

B3tg—38 to 50 inches, light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; common, medium, distinct, light olive brown (2.5Y 5/6) mottles; weak, coarse, blocky structure; very hard, firm, sticky; patchy clay films; few concretions of calcium carbonate and iron-manganese; calcareous; moderately alkaline; gradual, smooth boundary.

C—50 to 80 inches, white (2.5Y 8/2) loam, light gray (2.5Y 7/2) moist; common, fine, distinct, strong brown (7.5YR 5/8) mottles; hard, friable, slightly sticky; calcareous; moderately alkaline.

The A horizon is grayish brown to light gray and is 5 to 8 inches thick.

The B21tg horizon is light gray, dark gray or light brownish gray and in some places is mottled with yellowish brown. It is 6 to 15 inches thick. The B22tg and B3tg horizons are gray or light gray and in some places are mottled with brownish yellow or yellowish brown. The B22tg and B3tg horizons are 9 to 40 inches thick.

The C horizon is loam or sandy clay loam and is at a depth of 50 to 58 inches. It is light gray, white, light brownish gray, or very pale brown mottled with brownish yellow or yellowish brown.

The mean annual soil temperature of the Edna soils is a few degrees higher than is defined as the range for that series. Behavior patterns are still within the Edna series.

Ed—Edna very fine sandy loam. This nearly level soil is in upland areas. Slopes are 0 to 1 percent. Areas range from 20 to 200 acres in size, but dominantly are about 50 acres.

This soil has the profile described as representative of the series. Included in mapping are oval-shaped, somewhat depressed spots 1 to 3 acres in size of Midland or Dacosta soils and slightly elevated spots 1 to 2 acres in size of Telferner soils. These included soils make up about 15 percent of some areas.

About 95 percent of the acreage is used as native range, and the rest is used for crops. The soil is very slowly permeable and is moderately suited to crops, mainly rice, grain sorghum, and cotton. It is well suited to rice, because little irrigation water is lost through the very slowly permeable subsoil.

Adequate drainage is needed for rice as well as for other crops. Crop residue left on the surface helps to prevent crusting and aids in maintaining good tilth. Crops respond well to fertilization. Capability unit IIIw-4; Claypan Prairie range site.

En—Edna very fine sandy loam, low. This nearly level soil is in depressions in the uplands. Slopes are less than 0.5 percent, and the surfaces are concave. Areas range from 12 to 50 acres in size, and dominantly are about 25 acres.

The surface layer of this soil is grayish brown very fine sandy loam about 8 inches thick. The next 36 inches is clay. The upper 5 inches is light gray mottled with yellowish brown, and the lower 31 inches is light gray mottled with yellow. The underlying material is sandy clay loam. The upper 20 inches is white mottled with brownish yellow, and the lower part is light gray mottled with brownish yellow.

Included with this soil in mapping are slightly elevated higher spots of Midland and Dacosta soils. These included soils make up 5 percent of some areas.

This soil is poorly drained, and adequate drainage outlets are difficult to obtain. Water ponds for long periods during wet seasons. The soil is used mostly as range in native vegetation and to a small extent for crops. The main crops are rice, grain sorghum, and cotton.

Management to be considered includes adequate drainage systems, proper use of crop residues to maintain good tilth of the surface soil, and proper fertilization. Capability unit IVw-1; Lowland range site.

Fordtran Series

The Fordtran series consists of deep, gently undulating, noncalcareous sandy soils on uplands. These soils formed under tall and mid grasses in clayey and loamy sediments.

In a representative profile the surface layer is light brownish gray loamy fine sand about 18 inches thick. The subsurface layer is light gray loamy fine sand about 10 inches thick. The next 14 inches is slightly acid sandy clay. The upper 8 inches is light brownish gray mottled with dark red and brownish yellow and the lower 6 inches is light gray mottled with red. Below this is 8 inches of reddish yellow sandy clay loam. The underlying material to a depth of 88 inches is yellow fine sandy loam.

Fordtran soils are somewhat poorly drained and have a medium available water capacity. They are used mostly for range.

Representative profile of Fordtran loamy fine sand, 12 miles southwest of Port Lavaca; 3.5 miles northwest on Texas Highway 185 from its intersection with Texas Highway 35; 0.3 mile southwest on shell road and 0.3 mile south and southwest on a ranch road; 200 feet east of a road; in range:

A1—0 to 18 inches, light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; weak, fine, granular structure; slightly hard, very friable; few fine roots; medium acid; gradual, smooth boundary.

A2g—18 to 28 inches, light gray (10YR 7/2) loamy fine sand, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; few fine roots; medium acid; abrupt, wavy boundary.

B21tg—28 to 36 inches, light brownish gray (10YR 6/2) sandy clay, grayish brown (10YR 5/2) moist; common, coarse, prominent, dark red (10YR 3/6) and common, medium, distinct, brownish yellow (10YR 6/6) mottles; moderate, medium, blocky structure; very hard, very firm, sticky; few fine roots, mainly between peds; continuous clay films; slightly acid; gradual, wavy boundary.

B22tg—36 to 42 inches, light gray (10YR 7/2) sandy clay, light brownish gray (10YR 6/2) moist; common, medium, prominent, red (10YR 4/8) mottles; weak, coarse, blocky structure; very hard, firm, sticky; patchy clay films; slightly acid; gradual, wavy boundary.

B3t—42 to 50 inches, reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak, coarse, blocky structure; hard, slightly firm, slightly sticky; neutral; gradual, smooth boundary.

C—50 to 88 inches, yellow (10YR 8/6) fine sandy loam, yellow (10YR 8/6) moist; massive; slightly hard, friable, nonsticky; mildly alkaline.

Depth of the surface horizon above a clayey horizon ranges from

20 to 38 inches. The A1 horizon is grayish brown to light brownish gray and is 10 to 18 inches thick. The A2g horizon is light gray or gray and is 10 to 20 inches thick.

The Bt horizon is light gray, light brownish gray, dark grayish brown or reddish yellow and is 14 to 24 inches thick. It is mottled with dark red, red, yellowish red, brownish yellow, or yellowish brown in the upper part and red, yellowish red, or yellow in the lower part.

The C horizon is fine sandy loam to clay loam and is at a depth of 50 to 64 inches. It ranges from yellow and pale yellow to pink.

A temporary water table is at a depth of 14 to 40 inches during the rainy season.

Fo—Fordtran loamy fine sand. This is a gently undulating soil. Slopes range from about 1 to 4 percent. Included in mapping are small, slightly higher areas of Kenney soils, which make up about 5 percent of some mapping units.

Fordtran soils are chiefly used for range. They are not well suited to crops because of poor drainage, low fertility, and the serious hazard of soil blowing.

Management to be considered for crops includes high residue crops, cover crops, and proper use of residue for control of soil blowing. Adequate drainage as well as fertilization must be provided according to the needs of the crop. Capability unit IIIw-3; Sandy Prairie range site.

Francitas Series

The Francitas series consists of deep, nearly level, noncalcareous and saline clayey soils on low coastal uplands. These soils formed under salt-tolerant grasses in calcareous clayey sediments that accumulated in slightly concave basins.

In a representative profile the surface layer is very dark gray clay about 16 inches thick. The next 43 inches is clay. The upper 22 inches is dark gray and the lower 21 inches is gray and saline. Below this is 10 inches of very pale brown, saline clay. The underlying material to a depth of 108 inches is very pale brown, saline clay.

The surface of Francitas soils in native vegetation has a microrelief of microbasins and microknolls. Such relief is caused by repeated shrinking and cracking of the soil when dry, and swelling and heaving when wet.

Francitas soils are poorly drained and have medium available water capacity. Surface drainage and permeability are very slow. The soils are used for crops and native range.

Representative profile of Francitas clay, 3.0 miles southwest of Port Lavaca; 0.95 mile southeast on Texas Highway 316 from its intersection with Texas Highway 238; 1.1 miles northeast on a field road; 80 feet northwest of road in a depression; in native range:

A1—0 to 16 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate, fine, angular and subangular blocky structure when moist, massive when dry; very sticky and plastic; many fine roots; common fine pores; mildly alkaline; gradual, wavy boundary.

B21tg—16 to 38 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong, fine and medium, angular blocky structure; extremely hard, very firm, very sticky and plastic; common fine roots; few fine pores; shiny pressure faces on peds; saline; calcareous; moderately alkaline; gradual, wavy boundary.

B22tg—38 to 59 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate, fine and medium, angular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; shiny pressure faces on peds; intersecting slickensides; few, fine calcium carbonate concretions; saline; calcareous; moderately alkaline; gradual, wavy boundary.

B3—59 to 69 inches, very pale brown (10YR 7/3) clay, pale brown (10YR 6/3) moist; weak, medium, angular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; intersecting slickensides; common, fine calcium carbonate concretions and few thin seams of calcium carbonate; few, fine iron-manganese concretions; saline; calcareous; moderately alkaline; gradual, wavy boundary.

C—69 to 108 inches, very pale brown (10YR 7/4) clay, light yellowish brown (10YR 6/4) moist; few, medium, distinct, gray (10YR 6/1) and brownish yellow (10YR 6/6) mottles; massive; very hard, very firm, very sticky and plastic; few intersecting slickensides in upper part; few, fine calcium carbonate concretions; saline; calcareous; moderately alkaline.

The A1 horizon is dark gray and very dark gray and is 6 to 20 inches thick.

The B21tg horizon is dark gray or very dark gray and is 10 to 24 inches thick. The B22tg horizon is gray to light gray and is 10 to 30 inches thick. The B3 horizon is very pale brown or light brown and is 10 to 20 inches thick.

The C horizon ranges from clay to silty clay loam and in some profiles is stratified with very fine sandy loam. It is light brown or very pale brown to light reddish brown and is at a depth of 40 to 90 inches.

Salinity is low in the A horizon and ranges from moderate to very high in the B horizon.

Fr—Francitas clay. This nearly level soil is within 5 miles of the intercoastal bays and is less than 15 feet above sea level. Slopes are 0.3 to 1 percent. Some areas are covered occasionally by windblown seawater. Most areas range from 30 to 1,000 acres in size, but dominantly are about 250 acres.

Included with this soil in mapping are spots 2 to 5 acres in size of Livia soils and Dacosta soils, saline. These included soils make up to 8 percent of some mapped areas.

Francitas clay is not well suited to crops. Salinity reduces the water availability for plants and restricts the choice of crops. About 70 percent of the acreage is in crops, consisting mostly of a rotation of rice with unimproved pasture and to a lesser extent, in grain sorghum. The rest is native range.

Management to be considered for crops includes selection of crops that are saline tolerant, adequate drainage systems, and proper use of crop residue. These clay soils can be tilled within only a narrow range of moisture content. Such tillage is most effective and causes minimum damage to soil tilth and structure. Abundance of crop residue on the surface or partly incorporated into the surface layer aids in maintaining good soil tilth. This soil is fertile, but crops respond to fertilization. Favorable seedbeds are difficult to prepare because of the high content of clay in the surface layer. Selected salt-tolerant grasses, planted after rice harvest, increase the amount of forage available for grazing. Pastures need to be adequately drained. Capability unit IVw-2; Salty Prairie range site.

Galveston Series

The Galveston series consists of deep, undulating, noncalcareous sandy soils on coastal beaches and adjacent terraces. These soils formed under coarse bunchgrasses in sandy sediments that had been reworked by wind and wave action.

In a representative profile the surface layer is light gray fine sand about 5 inches thick. It contains only small amounts of organic matter. Below this is 75 inches of fine sand that is very pale brown in the upper 27 inches and white in the lower 48 inches.

Galveston soils are somewhat excessively drained and have a low available water capacity. They are subject to flooding during major gulf storms. They are used mainly as native range. A small acreage is Coastal bermudagrass pasture.

Representative profile of Galveston fine sand, undulating, 11 miles east of Seadrift; 1.35 miles north on Farm Road 1289 from its intersection with Texas Highway 185; 20 feet east of right-of-way fence; in native range:

A—0 to 5 inches, light gray (10YR 7/1) fine sand, gray (10YR 6/1) moist; single grained; loose; common fine and few coarse roots; medium acid; gradual, smooth boundary.

C1—5 to 32 inches, very pale brown (10YR 8/3) fine sand, very pale brown (10YR 7/3) moist; single grained; loose; few fine and coarse roots; medium acid; gradual, smooth boundary.

C2—32 to 80 inches, white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; single grained; loose; slightly acid.

The A horizon is light gray to light brownish gray and is 2 to 8 inches thick.

The C horizon is very pale brown, white, or light brownish gray. Reaction ranges from medium acid to mildly alkaline. Salinity ranges from none to high, depending on the action of stormblown seawater or salt water spray. Depth to the seasonal high water table ranges from 40 to 72 inches.

Ga—Galveston fine sand, undulating. This soil is in large areas on the mainland adjacent to Espiritu Santo Bay and west of San Antonio Bay. It is also on the central ridge of Matagorda Island and in the dune areas inland from the gulfward shoreline. Slopes are 1 to 8 percent. Most areas range from about 300 acres to more than 2,000 acres in size.

This soil has the profile described as representative of the series. Included in mapping are small areas of Adamsville soils in slightly lower positions and small areas of Portalto and Roemer soils. These included soils make up as much as 15 percent of some areas.

This soil is not suited to cultivation because soil blowing is a severe hazard. It is used mostly as native range and for wildlife. A small acreage is in Coastal bermudagrass pasture. Capability unit VIe-1; Coastal Sand range site.

Gc—Galveston complex, undulating. This mapping unit is about 51 percent alternating parallel ridges of Galveston soils and 49 percent parallel swales of sandy soils that are poorly drained and in places are saline. The ridges and swales are parallel to the long axis of Matagorda Island and make up landforms that are too narrow to warrant separation in mapping. This mapping unit is generally on both sides of the central ridge of Galveston fine sand. It extends for the entire length of the island except for a few places where the island is narrow. Slopes are 1 to 8 percent.

The ridges of Galveston soils are 36 to 670 feet wide, and the swales of wetter soils 18 to 400 feet wide. The ridges are 2 to 5 feet higher than the swales. The ridges and swales are 1,000 feet to more than 5 miles long.

Galveston soils of this complex have a surface layer of light gray fine sand 5 inches thick. Next is about 30 inches of white fine sand. Below this to a depth of 60 inches is pale brown fine sand.

This mapping unit is used as native range, improved pasture of Coastal bermudagrass, and wildlife habitat. It is not suited to crops because soil blowing is a severe hazard on the ridges and drainage is poor in the swales. Water ponds in the swales for extended periods during the wet season. Capability unit VIw-1; Coastal Sand range site.

Haplaquents

Haplaquents are deep, nearly level, calcareous sandy soils in tidal marshes. They are saturated with saline water for long periods. They are essentially barren of vegetation and lack distinct characteristics that result from plant relationships.

In a representative profile the surface layer is white, saline loamy fine sand about 6 inches thick. Below this, to a depth of more than 72 inches, is stratified soil material. In sequence downward, this material is 4 inches of light-gray fine sandy loam, 7 inches of mottled gray to light brownish-gray loam, 24 inches of light-gray fine sandy loam, and 31 inches of mottled light-gray sandy clay loam.

Haplaquents are used only as wetland wildlife habitat. They are very poorly drained and have a water table within 18 inches of the surface at all times. They are strongly saline above the water table. The available water capacity is very low.

Representative profile of Haplaquents, loamy, about 12 miles southeast of Seadrift; 9.3 miles east of Seadrift on Texas Highway 185; 3.0 miles south past ranch headquarters and along a fence to the Intracoastal Waterway; 300 feet east of the fence and 300 feet north of the waterway:

C1g—0 to 6 inches, white (10YR 8/2) loamy fine sand, light gray (10YR 7/2) moist; single grained; very friable; many medium pores; saline; calcareous; moderately alkaline; clear, smooth boundary.

IIC2g—6 to 10 inches, light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; many fine, faint, brown (10YR 7.5YR 5/2) mottles; massive; friable; saline; calcareous; moderately alkaline; abrupt, smooth boundary.

IIIC3g—10 to 13 inches, gray (10YR 6/1) loam, gray (10YR 5/1) moist; massive; friable, slightly sticky; saline; calcareous; moderately alkaline; clear, smooth boundary.

IVC4g—13 to 17 inches, light brownish gray (10YR 6/2) loam; grayish brown (10YR 5/2) moist; many, medium and fine, faint, brown (7.5YR 5/2) mottles; massive; friable, slightly sticky; saline; calcareous; moderately alkaline; gradual, smooth boundary.

VC5g—17 to 41 inches, light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist with common threads of grayish brown (10YR 5/2); massive; friable, slightly sticky; thin strata of loamy fine sand; few soft masses of calcium carbonate at a depth of 28 to 34 inches; few soft very dark gray spots; saline; calcareous; moderately alkaline; clear, smooth boundary.

VIC6g—41 to 72 inches, light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; thin strata of loam; common, medium, distinct, brownish yellow (10YR 6/6) mottles; massive; friable, slightly sticky; few soft black iron-manganese masses; saline; calcareous; moderately alkaline.

The C1g horizon is loamy fine sand or fine sandy loam and is 4 to 10 inches thick. Color variations throughout the soil are white, light gray, light brownish gray, gray, light olive gray, light greenish gray, greenish gray, and pinkish gray. Brownish, yellowish, or pinkish mottles are common. Strata of fine sandy loam, loam, sandy clay loam, and loamy fine sand are common.

HA—Haplaquents, loamy. These nearly level soils are on the mainland, adjacent to the Espiritu Santo Bay, and on the landward side of Matagorda Island. They are less than 2 feet above mean sea level and are frequently covered by tides. There are many circular, shallow depressions that trap and hold tidewaters continuously. Most areas on the mainland range from about 25 to 300 acres in size, but dominantly are about 100 acres. On Matagorda Island areas range from about 200 to more than 2,000 acres in size.

The composition of these mapped areas is more variable than that of other units in the survey area, but mapping has been controlled well enough for the anticipated use of the areas.

Included with these soils in mapping are a few small low areas of Placedo soils, small areas of Bayucos soils, and a few higher lying oval-shaped areas of Dianola soils. These included soils make up no more than 5 percent of any one area.

Haplaquents, loamy, is void of vegetation except for matrimonyvine growing on the small, slightly higher spots. All areas are accessible to cattle because they are not fenced from adjacent range, but are suitable only as wildlife habitat. Capability unit VIIIw-1; no range site assigned.

Hd—Haplaquents-Dianola complex. This nearly level mapping unit is mostly near the bay along the southern mainland shore of the county. It is characterized by flats and mounds. It is 64 percent Haplaquents and 36 percent Dianola soils. Dianola soils are on the mounds. Haplaquents are on flats between the mounds. The mounds are oval shaped, are 30 to 100 feet in diameter, and are 12 to 24 inches high. Slopes are 0 to 1 percent. Areas range from about 20 to 200 acres in size.

Haplaquents have a surface layer of light brownish gray loamy fine sand 8 inches thick. The underlying material is about 17 inches of light gray fine sandy loam, 16 inches of gray loam, and 24 inches of light olive gray sandy clay loam.

Dianola soils have a surface layer of light brownish gray loamy fine sand about 10 inches thick. The next layer is 34 inches of fine sand that is white in the upper part and light gray in the lower part. Below a depth of about 44 inches is stratified clay loam, fine sandy loam, and loamy fine sand that is light brownish gray mottled with light brown.

Haplaquents are void of vegetation, are frequently covered by tides, and have a water table within 18 inches of the surface at all times. Dianola soils are vegetated and provide a limited amount of grazing. Both are too saline for crops. Capability unit VIIw-2; Salty Prairie range site.

Harris Series

The Harris series consists of deep, nearly level, noncalcareous, saline soils of coastal marshlands. These soils formed under coarse salt-tolerant grasses and sedges in clayey coastal sediments.

In a representative profile the surface layer is dark gray clay about 12 inches thick. The subsoil is clay that extends to a depth of 58 inches. The upper 9 inches is gray, and the lower 37 inches is light gray. The underlying material to a depth of 86 inches is very pale brown silty clay that is mottled.

Harris soils are very poorly drained and have a very low available water capacity. A permanent water table fluctuates within a depth of about 50 inches, and water ponds in places (fig. 3). The soils are subject to flooding during

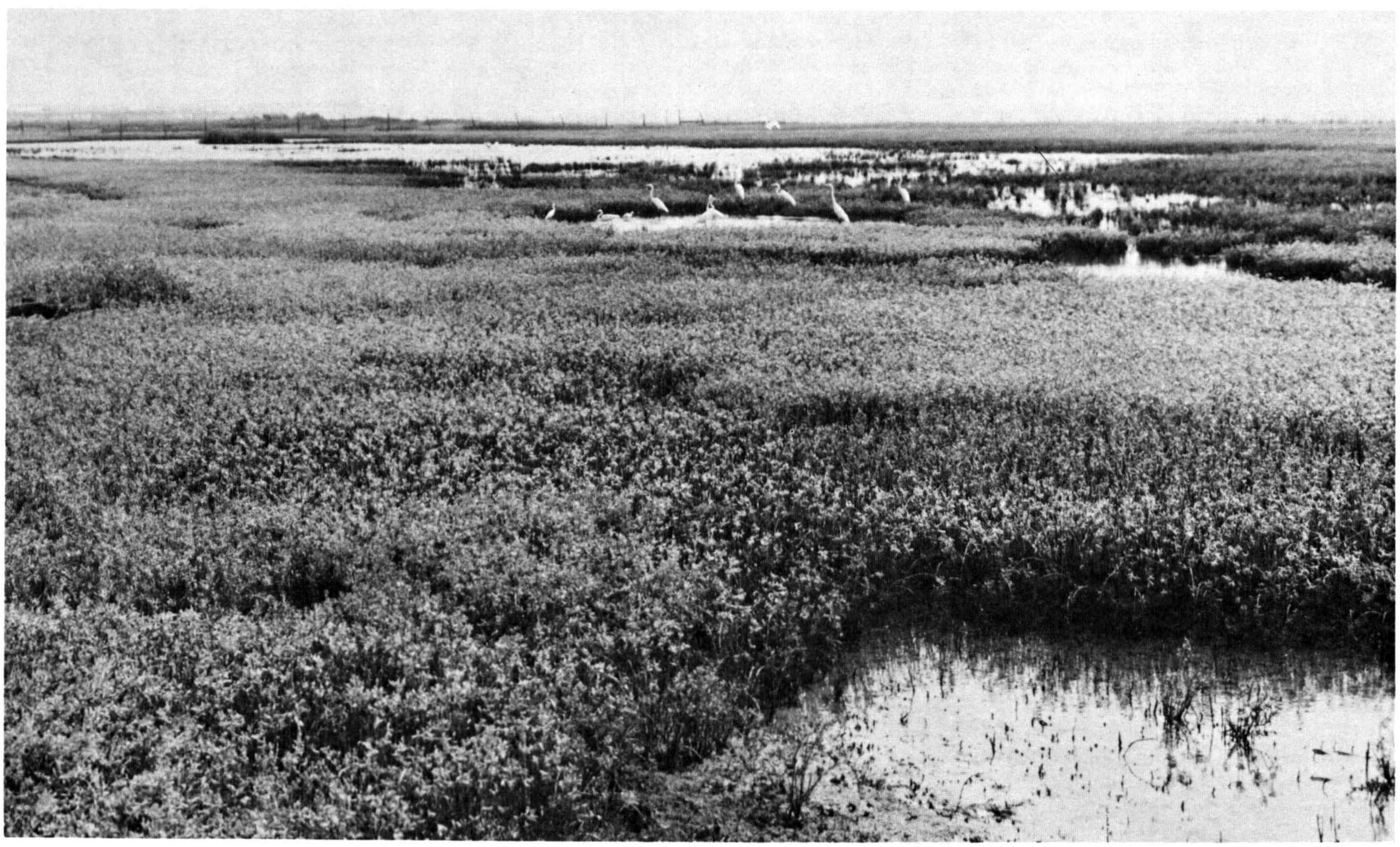

***Figure 3.*—Soils of the Harris series. The dominant plant in this overgrazed site is salt-tolerant bushy sea oxeye.**

gulf storms and high tides.

These soils are used mostly as range for beef cattle and as wildlife habitat.

Representative profile of Harris clay, located 3.4 miles east on Texas Highway 185 from Seadrift; 1.8 miles south on a paved ranch road; 1.9 miles south-southwest on a shell road; 2.05 miles west-southwest and 0.4 mile south on unimproved roads; 15 feet east of road; in native range:

A1g—0 to 12 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong, fine, subangular blocky structure; very hard, very firm, very sticky and plastic; common fine roots; common very fine pores; saline; moderately alkaline; gradual, wavy boundary.

B21g—12 to 21 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate and strong, fine, angular blocky structure; very hard, very firm, very sticky and plastic; common fine roots; shiny pressure faces on ped surfaces; saline; moderately alkaline; diffuse, wavy boundary.

B22g—21 to 40 inches, light gray (10YR 6/1) clay, gray (10YR 5/1) moist; moderate, medium and coarse, angular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; intersecting slickensides; saline; moderately alkaline; diffuse, wavy boundary.

B23g—40 to 58 inches, light gray (10YR 6/1) clay, gray (10YR 5/1) moist; common, medium, distinct, light yellowish brown (2.5Y 6/4) mottles; moderate, medium, angular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; intersecting slickensides; common, small calcium carbonate concretions; saline; moderately alkaline; gradual wavy boundary.

C—58 to 86 inches, very pale brown (10YR 7/3) silty clay, pale brown (10YR 6/3) moist; common, coarse, faint, yellow (10YR 7/6) and greenish gray (5G 6/1) mottles; massive; hard, firm, sticky and plastic; few, small calcium carbonate concretions; saline; moderately alkaline.

The A1 horizon is dark gray or very dark gray and is 10 to 19 inches thick. Salinity is low to moderate.

The B21g horizon is dark gray or light brownish gray and is 9 to 8 inches thick. Salinity is moderate or high. Some profiles have a B22g horizon that is light gray or gray and is as much as 20 inches thick. The B23g horizon is light gray or gray and is mottled with dark brown, light yellowish brown, or light olive brown in some profiles. It is 9 to 29 inches thick.

Depth to the C horizon ranges from 45 to 58 inches. This horizon is very pale brown, light brownish gray, light gray, gray, or brownish yellow mottled with yellowish brown, dark brown, brownish yellow, or greenish gray, or very pale brown. It is silty clay or clay. Salinity is high or very high.

The mean annual soil temperature of the Harris soils in Calhoun County is slightly higher than is defined as the range for that series. Use and management of these soils, however, do not differ significantly.

Hr—Harris clay. This nearly level soil is on coastal lowlands. Slopes are 0 to 1 percent. Most areas range from 10 to 300 acres in size, but dominantly are about 50 acres.

This soil has the profile described as representative of the series. Included in mapping are slightly higher bands of Veston soils, which make up less than 3 percent of any one area.

This soil is used for grazing. It is not suited to crops because it is very poorly drained and saline. Capability unit VIIw-1; Salt Marsh range site.

Hs—Harris complex. This nearly level mapping unit is in concave marshy areas on coastal shorelines along the inland bays. It is 70 to 80 percent Harris clay. Slopes are 0 to 1 percent. Areas range from 20 to 900 acres in size. Most of the smaller areas, however, are about 40 acres, and the larger areas about 600 acres.

Other soils in the unit are similar to Harris clay. Some have a 1- to 6-inch layer of organic matter below a depth of 12 inches, some have a gray or light surface layer, and some are underlain by silty clay loam.

Harris clay has a surface layer of dark gray clay about 12 inches thick. The lower part has yellowish brown mottles. The next 13 inches is mottled gray clay. The underlying material to a depth of 62 inches is gray silty clay. In many areas this soil has a thin surface layer of organic matter, consisting of stems and leaves of marsh plants.

Included with this unit in mapping are narrow, slightly higher ridges of Austwell soils and a few small intermittent lakes. These included spots make up as much as 5 percent of some areas.

This unit is used as range and is nearly all in native vegetation. It is not suited to crops. Capability unit VIIw-1; Salt Marsh range site.

Ijam Series

The Ijam series consists of deep, gently sloping to strongly sloping, calcareous and saline clayey soils bordering canals and waterways. These soils formed in clayey material accumulated during dredging and construction. They have not been in place long enough for the formation of distinct soil horizons.

In a representative profile the surface layer is mottled pinkish gray clay about 24 inches thick. Below this to a depth of 72 inches is mottled yellowish red clay.

Ijam soils have more potential for use as range, but are presently used mostly for recreation. They are very poorly drained and have a very low available water capacity. The water table is within 24 inches of the soil surface.

Representative profile of Ijam clay, about 5.0 miles east of Port Lavaca; 3.6 miles south on Farm Road 1593 from its intersection with Texas Highway 35 to Lavaca Bay; on a ridge of sediments dredged from the bay floor:

C1—0 to 24 inches, pinkish gray (7.YR 6/2) clay, brown (7.5YR 5/2) moist; common, coarse, light brownish gray (10YR 6/2) mottles; massive; extremely hard, very firm, very sticky and plastic; few fine roots; lenses of sand in cracks; few calcium carbonate concretions; saline; calcareous; moderately alkaline; diffuse, wavy boundary.

C2—24 to 72 inches, yellowish red (5YR 5/6) clay, yellowish red moist; common, coarse, prominent, light gray (5Y 7/2) mottles; massive; very hard, very firm, very sticky and plastic; few calcium carbonate concretions; few thread-like forms of iron-manganese; saline; calcareous; moderately alkaline.

The C horizon is pinkish gray, yellowish red, dark gray, gray, or light brownish gray mottled with shades of gray, brown, red, or olive. Salinity is moderate to high.

The mean annual soil temperature of the Ijam series in Calhoun County is slightly higher than is defined as the range for that series. Also, the C2 layer has higher chroma than is allowed for the series. Behavior patterns are similar.

Ic—Ijam clay. This gently sloping to strongly sloping clayey soil formed in sediments dredged from the floor of Lavaca Bay to provide a shipping channel to Point Comfort and from the floor of Green Lake to form the Victoria Barge Canal. These sediments were piled along the borders of channels, forming ridges or levees. Slopes are 2 to 10 percent and are generally convex.

This soil is not suitable for cultivation because of salinity and the size, the shape, and the topography of the deposits. It supports a very thin cover of salt-tolerant plants. It is commonly used for recreational purposes, mainly by fishermen as a means of access to parts of the bay. Capability unit VIIw-1; Salty Prairie range site.

Kenney Series

The Kenney series consists of deep, gently undulating, noncalcareous sandy soils on uplands. These soils formed under a cover of tall and mid bunch grasses in loamy and sandy unconsolidated sediments.

In a representative profile the surface layer is pale brown fine sand about 18 inches thick. The next 50 inches is light gray fine sand. Below this to a depth of 98 inches is very pale brown, mottled, friable, slightly acid sandy clay loam.

Kenney soils are well drained and have a low available water capacity. They are used mostly as range. Improved pastures of Coastal bermudagrass have a moderate potential.

Representative profile of Kenney fine sand, 12 miles southwest of Port Lavaca on State Highway 35; 7.5 miles northwest on Texas Highway 185; 0.3 mile southwest on a shell road; 0.15 mile northwest; in native range:

A1—0 to 18 inches, pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grained; loose; common fine roots; medium acid; gradual, smooth boundary.

A2—18 to 68 inches, light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; single grained; loose; few fine roots; medium acid; clear, smooth boundary.

B2t—68 to 88 inches, very pale brown (10YR 8/3) sandy clay loam, very pale brown (10YR 7/3) moist; common, fine, distinct, red (2.5YR 5/8) mottles; weak, coarse, blocky structure; hard, friable; patchy clay films; slightly acid; gradual, smooth boundary.

B3t—88 to 98 inches, very pale brown (10YR 8/3) sandy clay loam, very pale brown (10YR 7/3) moist; common, medium, prominent, red (2.5YR 5/6) mottles; weak, coarse, blocky structure; hard, friable; few patchy clay films; slightly acid.

Total thickness of the A horizon ranges from 40 to 70 inches. Reaction is slightly acid to medium acid. The A1 horizon is brown to pale brown and is 14 to 20 inches thick. The A2 horizon is light gray to very pale brown and is 30 to 50 inches thick.

The B2t horizon ranges from light gray to very pale brown and is commonly mottled with red, dark red, or brownish yellow. It is 20 to 40 inches thick. The B3t horizon is very pale brown, white, or reddish yellow mottled with red.

The mean annual soil temperature of the Kenney soils in Calhoun County is slightly higher than is defined as the range for that series. Management of these soils is similar.

Ke—Kenney fine sand. This gently undulating soil commonly forms hill crests. Slopes are 1 to 5 percent. Areas range from about 24 to 100 acres in size, but most areas are about 40 acres. Included in mapping are small, slightly lower areas of Fordtran soils. These included soils may make up about 2 percent of some areas.

This soil is mostly in native range. It is not well suited to crops because soil blowing is a severe hazard.

Management to be considered for crops includes growing crops that leave large quantities of residue to reduce soil blowing and maintain fertility. This deep soil is low in fertility. Small, frequent applications of fertilizer are beneficial. Capability unit IIIs-1; Sandy Prairie range site.

Lake Charles Series

The Lake Charles series consists of deep, nearly level to sloping, noncalcareous clayey soils on uplands. These soils formed under a cover of tall bunch grasses in alkaline marine clays.

In a representative profile the surface layer is dark gray, very firm, slightly acid to neutral clay about 39 inches thick. The next 22 inches is gray, very firm clay. Below this is 9 inches of light gray clay mottled with brownish yellow. The underlying material to a depth of 90 inches is light gray silty clay.

Lake Charles soils are somewhat poorly drained and have a high available water capacity. Permeability is very slow. Water enters the soil rapidly when it is cracked, but very slowly when it is wet and cracks are sealed.

Most of the acreage is used for crops. Some areas are in native vegetation and are used for range.

Representative profile of Lake Charles clay, 0 to 1 percent slopes, about 8.0 miles northwest of Port Lavaca; 7.6 miles northwest on U.S. Highway 87 from its intersection with Texas Highway 35; 0.62 mile northeast on a ranch road, 60 feet northwest of the road in a small depression; in range:

A11—0 to 17 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong, medium and fine, subangular blocky structure; extremely hard, very firm, very sticky and plastic; common fine roots; few worm holes; shiny pressure faces on peds in lower part; slightly acid; gradual, wavy boundary.

A12—17 to 28 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate, medium, angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; shiny pressure faces on peds; few intersecting slickensides in lower part; slightly acid; gradual, wavy boundary.

A13—28 to 39 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate, medium and coarse, angular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; shiny pressure faces on peds; many intersecting slickensides; few fine iron-manganese concretions; neutral; gradual, wavy boundary.

AC1g—39 to 61 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak, medium, angular blocky structure; very hard, very firm, very sticky and plastic; shiny pressure faces on peds; slickensides not as numerous as above; few, fine calcium carbonate concretions; few, fine iron-manganese concretions; calcareous; moderately alkaline; gradual, wavy boundary.

AC2g—61 to 70 inches, light gray (10YR 6/1) clay, gray (10YR 5/1) moist; common, coarse, faint, light brownish gray (10YR 6/2) and few, fine, faint brownish yellow (10YR 6/6) mottles; weak, medium, angular blocky structure; very hard, very firm, very sticky; common, fine, calcium carbonate concretions; few fine, iron-manganese concretions; calcareous; moderately alkaline; gradual, wavy boundary.

C—70 to 90 inches, light gray (2.5Y 7/2) silty clay, light brownish gray (2.5Y 6/2) moist; many, medium, distinct, brownish yellow (10YR 6/6) mottles; massive; very hard, very firm, very sticky and plastic; about 10 percent soft lumps and concretions of calcium carbonate; few iron-manganese concretions; calcareous; moderately alkaline.

The A horizon ranges from 16 to 50 inches in thickness and is dark gray to very dark gray. Reaction ranges from slightly acid to mildly alkaline. The ACg horizon is gray or light gray, and is mottled with pale brown, light brownish gray, or light yellowish brown in some profiles.

Depth to the C horizon ranges from 52 to 74 inches. It is light gray to light brownish gray silty clay and clay mottled with olive yellow, light olive brown, or olive.

Calhoun County represents the southern edge of the distribution of the Lake Charles soils. The mean annual soil temperature of the Lake Charles soils in Calhoun County therefore is a few degrees warmer than is defined as the range for the series. Use and management, however, are not altered appreciably.

La—Lake Charles clay, 0 to 1 percent slopes. This nearly level soil is in broad expansive areas. Where cultivation has not disturbed the natural land surface, microrelief is evident. Small, oval-shaped knolls are surrounded by elliptical basins that are 4 to 12 inches lower in elevation (fig. 4). Slopes are mostly 0.3 to 0.8 percent. Most areas range from about 15 to 2,000 acres or more in size, but dominantly are more than 1,000 acres.

This soil has the profile described as representative

Figure 4.—**Hay meadow on Lake Charles clay after rain shower. Uncultivated areas have microrelief.**

of the series. Included in mapping are areas of Lake Charles clay that has slopes as much as 3 percent in some places. These areas range from about 12 to 50 acres in size. Also included are slightly depressed areas of Beaumont soils 5 to 8 acres in size, and complex areas of Dacosta and Contee or Midland soils 3 to 5 acres in size. These included soils make up less than 10 percent of any one area.

This soil is suited to cultivation. Grain sorghum, cotton, and rice are the main crops. Small acreages of corn and flax are grown. About 70 percent of the acreage is crops. The rest is in native vegetation and used for range. If the soil is tilled too wet, a dense plowpan forms, and tilth and soil structure are damaged.

In managing this soil, the cropping sequence should include crops that produce high residue. This crop residue, left on the surface or partially incorporated into the surface soil, aids in maintaining good tilth. Crops respond to fertilization. Drainage is needed. Capability unit IIw-1; Blackland range site.

Lc—Lake Charles complex, 3 to 8 percent slopes. This mapping unit is about 70 percent Lake Charles clay, 3 to 8 percent slopes; 15 percent Midland clay loam; and 15 percent Dacosta clay loam. Slopes are dominantly 3 to 6 percent. Areas are long and narrow, averaging about 260 feet in width and about 150 acres in size.

Lake Charles clay has a dark gray surface layer about 21 inches thick. The next 20 inches is gray clay. The underlying material to a depth of 62 inches is light gray clay.

Included with this unit in mapping are small areas of Edna, Telferner, and Contee soils. These included soils make up less than 5 percent of any area.

The hazard of water erosion is severe. About 85 percent of the acreage is in native vegetation and is used for range, and 15 percent is used for crops. Crop acreages are small and have slopes of less than 5 percent. A few areas under cultivation or previously cultivated are eroded.

Management to be considered includes adequate erosion control, proper use of crop residue, and maintenance of soil tilth. Crop residue managed on or near the soil surface helps to control erosion and maintain soil tilth. Diversion terraces for control of outside water and contour farming help control water erosion. Capability unit IVe-1; Blackland range site.

Livia Series

The Livia series consists of deep, nearly level to gently sloping, noncalcareous and saline loamy soils on low coastal uplands. These soils formed under salt-tolerant grasses in saline clayey sediments of marine terraces. They are within 5 miles of the inland bays and less than 15 feet above sea level.

In a representative profile the surface layer is light brownish gray silt loam about 6 inches thick. The subsoil extends to a depth of 56 inches. In sequence downward, it is about 9 inches of dark gray silty clay, 17 inches of grayish brown silty clay loam, 11 inches of light brownish gray silty clay loam, and 13 inches of light gray silty clay loam. The underlying material to a depth of 96 inches is distinctly mottled. The upper 16 inches is light reddish brown silty clay loam, and the lower 24 inches is reddish yellow silty clay.

Livia soils are poorly drained and have a medium available water capacity. They are used mainly for crops and range.

Representative profile of Livia silt loam, about 10 miles east of Port Lavaca; 14 miles east-northeast on State Highway 35; 6.0 miles south on State Highway 172; 1.0 mile east on State Highway 159; 0.5 mile south on a county road; 400 feet east on a field road, and 80 feet south in a cultivated field:

Ap—0 to 6 inches, light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable; many fine roots; saline; slightly acid; abrupt, smooth boundary.

B21tg—6 to 15 inches, dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; few, fine, prominent, reddish brown (2.5YR 4/4) mottles; moderate, coarse, prismatic structure parting to moderate, fine, angular blocky; very hard, very firm, and very sticky; common fine roots; common fine pores; many clay films; thin silty coatings on faces of prisms in upper part; saline; moderately alkaline; gradual, smooth boundary.

B22tg—15 to 32 inches, grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate, medium and fine, angular blocky structure; very hard, very firm, and very sticky; few fine roots; many clay films; few pressure faces; saline; moderately alkaline; gradual, smooth boundary.

B23tg—32 to 43 inches, light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak, medium, blocky structure; very hard, very firm; and very sticky; few fine roots; common fine pores; few clay films; about 5 percent fine calcium carbonate concretions; few fine iron-manganese concretions; saline; moderately alkaline; gradual, smooth boundary.

B3tg—43 to 56 inches, light gray (10YR 7/2) silty clay loam, light brownish gray (10YR 6/2) moist; weak, medium, blocky structure; very hard, very firm, and very sticky; few fine roots; few clay films; about 8 percent concretions and soft lumps of calcium carbonate; few fine iron-manganese concretions; saline; moderately alkaline; gradual, smooth boundary.

C1—56 to 72 inches, light reddish brown (5YR 6/4) silty clay loam, reddish brown (5YR 5/4) moist; few, fine, distinct, light gray

(10YR 7/2) streaks; massive; very hard, very firm, and very sticky; few fine roots; few calcium carbonate concretions; few fine iron-manganese concretions; saline; moderately alkaline; gradual, smooth boundary.

C2—72 to 96 inches, reddish yellow (5YR 6/6) silty clay, yellowish red (5YR 5/6) moist; few, medium, distinct, light gray (5Y. 7/1) mottles; massive; very hard, very firm, and very sticky; few fine roots; few calcium carbonate concretions; few fine iron-manganese concretions; saline; moderately alkaline.

The A horizon is dominantly silt loam, but is clay loam in some places. It is light gray to dark gray and is 4 to 10 inches thick. It is slightly acid to mildly alkaline. Salinity is low.

The B21tg horizon is silty clay loam, silty clay, or clay. It is dark gray, grayish brown, or light gray and is 6 to 21 inches thick. In some places it has a few reddish brown, red, dark brown, or olive brown mottles. It is neutral to moderately alkaline. Salinity ranges from low to very high.

The B22tg and B23tg horizons are silty clay, silty clay loam, or clay loam. Combined, they are 21 to 46 inches thick. They range from gray, grayish brown, light brownish gray, and light gray to pale olive and are commonly mottled with light yellowish brown or brownish yellow. Salinity ranges from low to very high.

The B3tg horizon is silty clay or silty clay loam. It is light gray, very pale brown, or pale yellow.

Depth to the C horizon ranges from 40 to 75 inches. This horizon is clay, clay loam, silty clay, or silty clay loam. It is reddish brown, reddish yellow, light reddish brown, very pale brown, yellow, or light gray and has light brown or yellowish red mottles.

Lo—Livia silt loam. This nearly level soil is on smooth, low coastal uplands. Slopes are 0 to 1 percent. Areas range from 20 to 1,000 acres in size, but dominantly are about 150 acres.

This soil has the profile described as representative of the series. Included in mapping are small sandy areas of Matagorda soils and small, slightly lower, oval-shaped areas of Livia clay loam. These included areas make up as much as 8 percent of the mapping unit.

This soil is suited to rice, but is not well suited to other crops. About 60 percent of the acreage is in rice-pasture rotation. A small acreage is in grain sorghum. The rest is in native vegetation and is used for range.

The effect of soil salinity on the availability of water for plant growth limits the choice of crops. Crops respond well to fertilization. Selected salt-tolerant grasses planted after rice harvest increase the amount of forage available for grazing. Such pasture plantings need to be adequately drained. Capability unit IVw-3; Salty Prairie range site.

Lv—Livia clay loam, 0 to 1 percent slopes. This nearly level soil is on smooth, low coastal uplands. Occasionally it is covered with gulf water blown by stormwinds. Areas range from 30 to 1,500 acres in size, but are dominantly about 200 acres.

Included with this soil in mapping are slightly higher, oval-shaped, 1- to 3-acre areas of Livia silt loam and Matagorda soils. Also included are slightly lower, 2- to 4-acre areas of Francitas soils and small areas of Dacosta soils. These included areas make up as much as 11 percent of the mapping unit.

The surface layer is typically dark gray clay loam about 6 inches thick. Below this is 20 inches of dark gray clay and 36 inches of light gray clay loam mottled with brownish yellow. The underlying material to a depth of 90 inches is very pale brown clay loam mottled with light brown.

This soil is suited to rice, but is not well suited to other crops grown in the county. About half the acreage is in rice-pasture rotation, and the rest is range.

The main concerns of management are drainage, fertilization, and the management of crop residue on or near the surface to keep the soil in good tilth. Capability unit IVw-3; Salty Prairie range site.

Lx—Livia clay loam, 2 to 5 percent slopes, eroded. This gently sloping soil is in areas adjacent to streams and the inland bays. Slopes range from 1 to 5 percent, but are dominantly 2 to 5 percent. Areas are long and are about 250 feet wide. They range from 10 to 260 acres in size, but are dominantly about 40 acres. Water flowing over this soil from large, flat areas at slightly higher elevations has cut gullies 100 to 300 feet wide and 6 inches to 3 feet deep.

The surface layer is typically dark gray clay loam about 4 inches thick. The next layer, to a depth of 54 inches, is silty clay. It is grayish brown in the upper part and light gray in the lower part. The underlying material to a depth of about 84 inches is light gray clay mottled with light brown.

Included with this soil in mapping are small areas of Livia silt loam, Matagorda soils, and Dacosta soils. These included areas make up as much as 12 percent of the mapping unit.

This soil is not suitable for crops. The hazard of water erosion is severe. Most of the acreage is used for range. Capability unit VIe-2; Salty Prairie range site.

Matagorda Series

The Matagorda series consists of deep, nearly level, noncalcareous loamy soils on low coastal uplands. These soils formed under salt-tolerant grasses in saline, moderately alkaline loamy and clayey sediments.

In a representative profile the surface layer is light brownish gray very fine sandy loam about 5 inches thick. The subsoil extends to a depth of 47 inches. In sequence downward, it is 8 inches of light yellowish brown clay loam, 9 inches of faintly mottled yellow clay, and 16 inches of mottled pale yellow sandy clay loam. The underlying material to a depth of 76 inches is white sandy clay loam.

Matagorda soils are somewhat poorly drained and have a medium available water capacity. These soils are subject to flooding by storm tides. A water table is within 24 inches of the soil surface during rainy seasons.

Most areas are used as range. Some are cultivated.

Representative profile of Matagorda very fine sandy loam, about 13 miles southeast of Port Lavaca near Indianola; 7.3 miles southeast on Texas Highway 316 from its intersection with Texas Highway 238; 1.3 miles southeast on a paved road; 0.75 mile south on a road to a cemetery; 0.67 mile west on a ranch road; 100 feet north of the road:

A1—0 to 5 inches, light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable; few fine roots; neutral; abrupt, wavy boundary.

A2g—5 to 14 inches, light gray (10YR 7/2) very fine sandy loam, light brownish gray (10YR 6/2) moist; massive; hard, friable; few fine roots; neutral; abrupt, smooth boundary.

B21tg—14 to 22 inches, light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; ped exteriors are black (10YR 2/1), very dark gray (10YR 3/1), or dark gray (10YR 4/1); moderate, coarse, columnar structure parting to moderate medium, angular blocky structure; 1/4-inch cap of grayish-brown (10YR 5/2) loam on columns; very hard, firm; roots are flattened along ped faces; common clay films; saline; mildly alkaline; gradual, wavy boundary.

B22tg—22 to 31 inches, yellow (2.5Y 7/6) clay, olive yellow (2.5Y 6/6) moist; few, faint, light olive brown (2.5Y 5/6) mottles; moderate, coarse, angular blocky structure; very hard, firm; few fine roots; peds have gray (10YR 5/1) coatings; common clay films; few, fine iron-manganese concretions; noncalcareous; moderately alkaline; gradual, smooth boundary.

B3t—31 to 47 inches, pale yellow (2.5Y 7/4) sandy clay loam, light yellowish brown (2.5Y 6/4) moist; few, fine, distinct, reddish yellow (7.5YR 6/6) mottles; weak, coarse, blocky structure; very hard, firm; few fine roots; few clay films; common, fine iron-manganese concretions; few thin vertical streaks of light gray fine sand; noncalcareous; moderately alkaline; gradual, wavy boundary.

C—47 to 76 inches, white (2.5Y 8/2) sandy clay loam, light gray (2.5Y 7/2) moist; few, fine and medium, prominent, reddish yellow (7.5YR 6/6) mottles; massive; very hard, firm; few thin vertical streaks of fine sand; calcareous; moderately alkaline.

The total thickness of the A horizon ranges from 8 to 16 inches. Reaction of the A horizon is slightly acid or neutral. The A1 horizon ranges from dark grayish brown to light brownish gray. The A2g horizon ranges from gray to light gray.

The Btg horizon is clay, sandy clay loam, or clay loam and is 14 to 39 inches thick. It is yellowish brown and olive yellow to grayish brown and has fine and medium mottles in shades of gray, brown, yellow, and red. The peds have black, very dark gray, or dark gray coatings in the upper part and dark gray, gray, or light gray in the lower part. Reaction ranges from slightly acid to moderately alkaline.

Depth to the C horizon ranges from 35 to 60 inches. The C horizon ranges from light gray to strong brown. Reaction is mildly alkaline or moderately alkaline. There are small calcium carbonate concretions in some places.

Salinity ranges from none to moderate in the A horizon and from none to very high in lower horizons.

Ma—Matagorda very fine sandy loam. This nearly level soil is on low coastal uplands. Areas are within about 5 miles of the inland bays and are less than 10 feet above sea level. Windblown seawater occasionally covers this landscape. Surfaces are weakly convex and slopes are generally less than 1 percent. Most areas range from 15 to 500 acres in size, but dominantly are about 40 acres.

Included with this soil in mapping are 2- to 5-acre spots of Livia loam; small, slightly lower, oval-shaped areas of Livia clay loam; and 2- to 4-acre spots of Rahal fine sand. Also included are areas of Matagorda soils where slopes are as much as 2 percent. These included soils make up to 8 percent of some areas.

This soil is well suited to rice, but is poorly suited to the other crops commonly grown in the area. About 60 percent of the acreage is in native vegetation and is used for range, and 40 percent is used for crops. Rice is the main cultivated crop. Cropping systems generally follow a rice-pasture rotation.

Adequate drainage is needed if this soil is used for crops. Salt-tolerant crops and grasses should be selected. Crop residue managed on the soil surface helps maintain tilth in the surface layer. Crops respond to fertilization. Capability unit IIIw-5; Salty Prairie range site.

Midland Series

The Midland series consists of deep, nearly level, noncalcareous, loamy soils on slightly depressed uplands. These soils formed under tall and mid grasses in clayey marine sediments.

In a representative profile the surface layer is clay loam about 9 inches thick. The upper part is gray, and the lower part is dark gray. The subsoil extends to a depth of 53 inches. It is clay to a depth of 47 inches. The upper 10 inches is gray, the next 7 inches is light gray, and the lower 21 inches is mottled light brownish gray. The lower 6 inches of the subsoil is mottled light gray silty clay loam. The underlying material to a depth of 80 inches is white mottled silty clay loam.

Midland soils are poorly drained and have a high available water capacity. They are used mainly for crops and range.

Representative profile of Midland clay loam, about 3 miles northeast of Port Lavaca; 2.77 miles east on Texas Highway 35 from its intersection with U.S. Highway 87 in the northwestern part of Port Lavaca; 0.25 mile northeast on a shell road; 60 feet west of a road in a cultivated field:

Ap—0 to 4 inches, gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; massive; very hard, slightly firm, and slightly sticky; few fine roots; slightly acid; clear, smooth boundary.

A1—4 to 9 inches, dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; massive; very hard, slightly firm, and sticky; few roots; slightly acid; gradual, smooth boundary.

B21tg—9 to 19 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak, coarse, angular blocky structure; extremely hard, very firm, and sticky; few fine roots; continuous clay films; few, small, rounded iron-manganese concretions; slightly acid; gradual, smooth boundary.

B22tg—19 to 26 inches, light gray (10YR 6/1) clay, gray (10YR 5/1) moist; weak, fine, subangular blocky structure; very hard, very firm, and sticky; few fine roots; continuous clay films; few small iron-manganese concretions; noncalcareous; moderately alkaline; gradual, smooth boundary.

B23tg—26 to 47 inches, light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; common, fine, faint, brownish yellow (10YR 6/6) mottles; weak, coarse, subangular blocky structure; very hard, very firm, and sticky; patchy clay films; few small iron-manganese concretions; noncalcareous; moderately alkaline; gradual, smooth boundary.

B3tg—47 to 53 inches, light gray (10YR 7/1) silty clay loam, gray (10YR 6/1) moist; common, fine, faint, pale yellow (5Y 7/3) mottles; weak, coarse, subangular blocky structure; very hard, firm, and sticky; from 10 to 15 percent concretions and soft lumps of calcium carbonate; calcareous; strongly alkaline; gradual, smooth boundary.

C—53 to 80 inches, white (2.5Y 8/2) silty clay loam, light gray (2.5Y 7/2) moist; few, fine, faint, light olive brown (2.5Y 5/6) mottles; massive; hard, slightly firm, and slightly sticky; calcareous; strongly alkaline.

The A horizon is 5 to 12 inches thick. It is gray or dark gray.

The B2tg horizons are clay or sandy clay 32 to 40 inches thick. They are dark gray, gray, or light brownish gray mottled with brownish yellow, yellow, or brown. The B3tg horizon is clay or silty clay loam 6 to 14 inches thick. It is gray, light gray, or light brownish gray.

The C horizon, at a depth of 46 to 53 inches, is clay or silty clay loam. It is white, light gray, pale brown, or light brown mottled with light olive brown, pale yellow, or olive yellow.

The Midland soils in Calhoun County have an average annual soil temperature a few degrees more than 72° F, which is slightly higher than is defined as the range for the series. No significant differences in use and management are noted.

Mb—Midland clay loam. This nearly level soil is on weakly dissected uplands. Generally slopes are no more than 1 percent. Areas range from 12 to 300 acres in size, but are dominantly about 35 acres.

Included with this soil in mapping are concave, oval-shaped areas of Midland clay loam, low, that are 1 to 3 acres in size; small areas of Beaumont, Lake Charles, Dacosta, and Contee soils; and at slightly higher elevations, oval-shaped areas of Edna soils. Also included are small areas of Midland clay loam where slopes are as much as 3 percent. These included soils make up as much as 15 percent of the mapping unit.

This soil is suited to row crops and is well suited to rice. About 75 percent of the acreage is in native vegetation, 15 percent is in grain sorghum and cotton, and 10 percent is in rice. The major concern in management is the control of excess water.

A designed drainage system is needed if this soil is cropped. Crops, such as grain sorghum, that produce large quantities of residue should be included in the cropping system. Managing crop residue helps maintain soil tilth. Crops respond to applications of fertilizer. Capability unit IIIw-4; Blackland range site.

Mc—Midland clay loam, low. This nearly level soil is in concave areas. Many areas are oval shaped. Others are long and narrow and occur in a meandering pattern across the landscape. Water ponds for several weeks during and after the rainy season and after heavy rains. Slopes are less than 0.5 percent. Areas range from 12 to 340 acres in size, but are dominantly about 100 acres.

Included with this soil in mapping are small areas of Beaumont, Lake Charles, and Dacosta soils. Also included at slightly higher elevations are oval-shaped areas of Edna soils. These included soils make up as much as 15 percent of the mapping unit.

The surface layer of this Midland soil is gray clay loam about 9 inches thick. The subsoil is clay about 48 inches thick. The upper part is dark gray mottled with brown, the next layer is gray, and the lower part is light gray mottled with brown. The underlying material to a depth of 80 inches is pale brown silty clay mottled with pale yellow.

This soil is not suited to crops unless it can be adequately drained. About 85 percent of the acreage is range. The rest is used for crops. Rice, grain sorghum, and cotton are the most commonly grown crops. Other management to be considered is the proper use of crop residue to help maintain soil tilth and fertilization to maintain the level of fertility. Crops respond well to fertilization. Capability unit IVw-1; Lowland range site.

Md—Midland-Dacosta complex. This nearly level mapping unit is on uplands that are slightly affected by microrelief. It is 15 to 80 percent, but dominantly 48 percent, Midland soil and 20 to 61 percent, but dominantly 44 percent, Dacosta soil. Slopes are 0 to 1 percent. Areas range from 15 to 300 acres in size, but are dominantly about 100 acres.

Midland soils are on slightly elevated, oval-shaped knolls or ridges. Dacosta soils are slightly depressed, concave, irregularly shaped areas enclosing the Midland soils.

Included with this unit in mapping are small areas of Telferner, Contee, and Edna soils. Also included are small areas of Midland and Dacosta soils where slopes are as much as 3 percent. These included soils make up as much as 12 percent of the mapping area.

Midland soils have a surface layer of dark gray clay loam about 9 inches thick. The next layer extends to a depth of 39 inches. The upper 10 inches is dark gray clay, and the lower 20 inches is mottled gray clay. The underlying material to a depth of 70 inches is mottled light gray silty clay loam.

Dacosta soils have a surface layer of very dark gray clay loam about 10 inches thick. Next is about 55 inches of dark gray clay. Between depths of 65 and 72 inches is light gray clay.

About 60 percent of the acreage is in native vegetation and is used as range. About 40 percent is used for crops. Grain sorghum, rice, and cotton are the main crops.

An adequate drainage system is needed if this mapping unit is used for crops. Other management to be considered is the proper use of crop residue to help maintain soil tilth and reduce crusting. Crops respond to fertilization. Capability unit IIIw-4; Blackland range site.

Mustang Series

The Mustang series consists of deep, gently undulating, calcareous sandy soils on low coastal flats. These soils formed under tall grasses in sandy sediments reworked by wind.

In a representative profile the surface layer is white fine sand about 8 inches thick. In sequence downward, the underlying material is 6 inches of pale brown loamy fine sand, 19 inches of pale brown fine sand, 9 inches of mottled white fine sand, and 12 inches of light gray fine sand.

Mustang soils are poorly drained and have a very low available moisture capacity. They are periodically flooded with salt water. Salinity may be low or very high, depending upon the length of time between flooding. A water table is within 40 inches of the surface.

These soils are in native vegetation and are used for recreation and range.

Representative profile of Mustang fine sand, 440 feet south of the southern edge of the Intracoastal Waterway, at a point 0.6 mile west of the U.S. Coast Guard Station at Port O'Connor; in range:

A—0 to 8 inches, white (10YR 8/2) fine sand, white moist; few, fine, faint, light brownish gray (10YR 6/2) mottles; single grained; loose; common fine roots; calcareous; moderately alkaline; clear, smooth boundary.

C1—8 to 14 inches, pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; common, medium, faint, light brownish gray (10YR 6/2) and a few, medium and fine, light yellowish brown (10YR 6/4) mottles; single grained; weak bedding planes; very friable; few fine roots; about 5 percent fine shell fragments; calcareous; moderately alkaline; gradual, smooth boundary.

C2—14 to 33 inches, pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grained; weak bedding planes; loose; few fine roots; few fine shells; calcareous; moderately alkaline; gradual, smooth boundary.

C3g—33 to 42 inches, white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; common, coarse, distinct, reddish yellow (7.5YR 6/6) mottles; single grained; loose; few very fine shell fragments; calcareous; moderately alkaline; water table at a depth of 33 inches; clear, smooth boundary.

C4g—42 to 54 inches, light gray (5Y 7/1) fine sand, gray (5Y 6/1) moist; single grained; loose; calcareous; moderately alkaline.

The A horizon is white, light brownish gray, or very pale brown and is 5 to 15 inches thick.

The C horizon is stratified in texture, color, and salinity. It is fine sand or loamy fine sand. It is typically white, pale brown, or gray mottled with pale brown, light brownish gray, brownish gray, and reddish yellow. Strata of dark gray and greenish gray fine sandy loam are in the lower part of some profiles.

Mu—Mustang fine sand. This gently undulating soil is on ridges that were formed by sandy sediments dredged from the Intracoastal Waterway. These deposits are adjacent to the waterway on both the landward and gulfward borders. Wind action and wave action have smoothed the ridges of sediments. Very little soil formation has taken place. Slopes are 1 to 5 percent.

This soil is used for grazing. Soil blowing is a severe hazard in areas where native vegetation has been removed. Capability unit VIw-1; Low Coastal Sand range site.

Placedo Series

The Placedo series consists of deep, nearly level, noncalcareous clayey soils on flood plains along streams. These soils are near sea level. They formed under a cover of salt-tolerant grasses in saline clayey alluvial sediments.

In a representative profile the surface layer is gray clay about 36 inches thick. It is mottled with olive brown in the lower 9 inches. The underlying material to a depth of 50 inches is light gray clay loam having thin strata of fine sandy loam. Below this to a depth of 62 inches is light gray loam.

Placedo soils are very poorly drained and have a very low available water capacity. They are not suitable for cultivation or improved pasture. They are in native vegetation and are used as range.

Representative profile of Placedo clay, 3.6 miles southwest of Texas Highway 238 from its intersection with U.S. Hghway 87 in downtown Port Lavaca; 100 feet west of State Highway 238 between two channels of Big Chocolate Bayou; in range:

A11g—0 to 8 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak, medium, angular blocky structure; firm, sticky and plastic; many grass roots; saline; mildly alkaline; gradual, smooth boundary.

A12g—8 to 25 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak, medium, angular blocky structure; very firm, extremely sticky and plastic; common grass roots; saline; mildly alkaline; gradual, smooth boundary.

A13g—25 to 36 inches, gray (10YR 6/1) clay, dark gray (10YR 4/1) moist; few, fine, faint olive brown mottles; weak, coarse, angular blocky structure; very firm; very sticky and plastic; few fine roots; saline; mildly alkaline; clear, smooth boundary.

C1g—36 to 50 inches, light gray (10YR 6/1) clay loam, dark gray (10YR 4/1) moist; massive; very hard, firm, sticky and plastic; few fine roots; few thin strata of fine sandy loam; saline; mildly alkaline; clear, smooth boundary.

C2g—50 to 62 inches, light gray (10YR 6/1) loam, gray (10YR 5/1) moist; massive; slightly hard, friable; few thin strata of fine sandy loam and clay; saline; mildly alkaline.

The A11g horizon is gray or dark gray and is 4 to 10 inches thick. The A12g and A13g horizons range from dark gray, gray, or light gray, and some profiles have distinct mottles of brown or yellow.

Depth to the C horizon ranges from 30 to 50 inches. It is loam to clay loam and is stratified with sandy and clayey layers. It is gray, light gray, or greenish gray. The C1g horizon does not occur in all soils.

Salinity of the A11g horizon ranges from low to very high, but is very high in the underlying horizons. The seasonal high water table fluctuates between the surface and a depth of 12 inches.

Pc—Placedo clay. This nearly level soil is in areas where the flood plains are near sea level. It is frequently covered during high tides. It is very poorly drained, and has little or no runoff. Permeability is very slow. The water table fluctuates between the surface and a depth of 12 inches. Slopes are 0 to 1 percent. Areas range from about 20 to 200 acres in size, but dominantly are about 80 acres.

Included with this soil in mapping are small areas of Haplaquents, loamy, and spots of Veston soils. These included soils make up about 5 percent of some areas.

This soil is not suitable for crops because of high salinity and cyclic inundation by tides. It is used as range and wildlife habitat. Capability unit VIIw-1; Salt Marsh range site.

Portalto Series

The Portalto series consists of deep, nearly level to gently sloping, noncalcareous sandy soils on low coastal uplands. These soils formed under tall and mid grasses in sandy to loamy sediments.

In a representative profile the surface layer is gray fine sand about 8 inches thick. The subsurface layer is about 50 inches of fine sand. The upper 27 inches is white. The lower 23 inches is light gray. Below this is 6 inches of grayish brown fine sandy loam, 3 inches of light brownish gray sandy clay loam, and 19 inches of light gray fine sandy loam. The underlying material to a depth of 96 inches is greenish gray fine sandy loam.

Portalto soils are well drained and have a low available water capacity. They are used for grazing, both native vegetation on range and introduced grasses in improved pasture. The water table is at a depth of 40 to 60 inches.

Representative profile of Portalto fine sand, in an area of Portalto-Roemer complex, 11.2 miles east of Seadrift; 0.3 mile east of the intersection of Texas Highway 185 and Farm Road 1289; 110 feet south of road right-of-way on a mound:

A1—0 to 8 inches, gray (10YR 6/1) fine sand, dark gray (10YR 4/1) moist; single grained; loose; many roots; medium acid; clear, smooth boundary.

A21—8 to 35 inches, white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; single grained; loose; common roots; medium acid; gradual, smooth boundary.

A22g—35 to 58 inches, light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; single grained; loose; few roots; medium acid; clear, smooth boundary.

B1g—58 to 64 inches, grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard and very friable; few roots; medium acid; clear, smooth boundary.

B21tg—64 to 67 inches, light brownish gray (10YR 6/2) sandy clay loam, grayish brown (10YR 5/2) moist; common, coarse and medium, distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) mottles, and a few medium faint very pale brown (10YR 7/4) mottles; weak, coarse, blocky structure; slightly hard and friable; few roots; few clay bridges and films; medium acid; gradual, smooth boundary.

B22tg—67 to 86 inches, light gray (10YR 7/1) fine sandy loam, gray (10YR 6/1) moist; many coarse and medium distinct brownish yellow (10YR 6/6), yellow (10YR 7/6), and strong brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure; slightly hard and very friable; few roots; slightly acid; gradual, smooth boundary.

Cg—86 to 96 inches, greenish gray (5G 6/1) fine sandy loam, greenish gray moist; common coarse distinct yellow (10YR 7/8) mottles; massive; slightly hard and friable; calcareous; moderately alkaline.

The fine sand A horizon is 40 to 65 inches thick. Is it slightly acid or medium acid. The A1 horizon is 4 to 16 inches thick and is light gray or grayish brown. The A2 horizon is white, light gray, or light brownish gray.

The B horizon is sandy clay loam, fine sandy loam, or loamy fine sand. It is gray, light gray, light brownish gray, dark gray, grayish brown or dark grayish brown. It is slightly acid or medium acid. In places it has distinct yellow or brown mottles.

Depth to the C horizon ranges from 60 to 100 inches. This horizon is fine sandy loam, sandy clay loam, or loamy fine sand and is gray, light gray, or greenish gray. It ranges from neutral to moderately alkaline.

Pr—Portalto-Roemer complex. This nearly level to gently sloping mapping unit is in areas that appear to have been ancient coastal beaches. It is about 56 percent Portalto soil and about 42 percent Roemer soil. Typically, the gradient is less than 1 percent. Mounds or ridges and associated basins are gently undulating. Their gradient is 1 to 3 percent. The mounds and ridges of the Portalto soils are 2 to 4 feet higher than the Roemer soil, which is concave and is in depressions between the mounds and ridges (fig. 5).

This mapping unit is mainly in native vegetation and is used as range. A small acreage is in improved pasture of Coastal bermudagrass. Capability unit IIIs-2; Coastal Sand range site.

Psamments

These are deep, nearly level, noncalcareous soil materials that are mostly saline. They are a mixture of shell fragments of various sizes and sand. Psamments are on the barrier islands and along the mainland coastal beaches. They are covered by cyclic tides and windblown water several times a year.

A water table is within 20 inches of the soil surface. Salinity ranges from low to high. Vegetation is sparse, and little or no farming or ranching use is foreseen.

PS—Psamments, gravelly. This mapping unit consists of beds of sea shells, fine and very fine shell fragments, and varying amounts of sand (fig. 6). Most areas are nearly level or slightly uneven. This mapping unit forms the beach along Lavaca and Matagorda Bays between Magnolia Beach and Indianola where it provides good access roads to the beach and supports some building construction. It also is on some of the islands in Espiritu Santo Bay, and some places form shell reefs in the bay. Most of these areas are without vegetation or have only a thin covering of short annual grasses and weeds. Some older, more sloping areas between Magnolia Beach and Indianola extend back about one-fourth mile from the bay. These areas have a better cover of vegetation.

The composition of this unit is more variable than that of other units in the survey area, but mapping has been controlled well enough for the anticipated use of the areas.

This mapping unit is used extensively for road material. It is not suitable for cultivation and is very poor range. It is used mainly for recreation. Capability unit VIIs-1; no range site assigned.

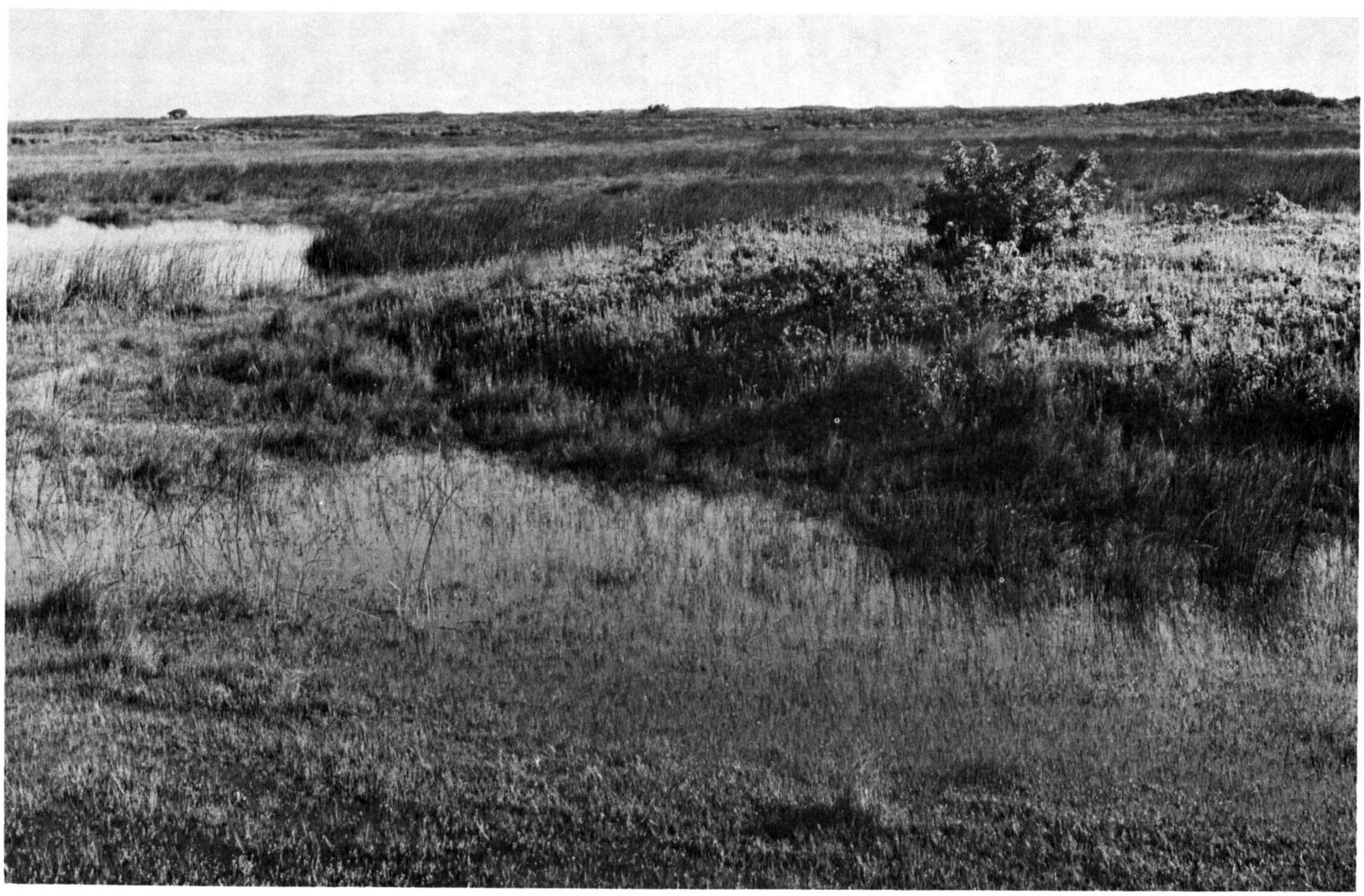

***Figure 5.*—Portalto-Roemer complex after a heavy rain. Roemer soils are ponded for several days.**

Pt—Psamments. This nearly level, white sand lacks distinct soil horizons. It is almost void of vegetation. A water table is at the surface or within a depth of 20 inches. Prevailing southeasterly winds continuously move sand inland from the gulf shore, forming rows of dunes on the landward beaches. Strong windblown waves cover the beach several times annually. Slopes are 0 to 1 percent.

Soil drainage is variable, but Psamments are not permanently saturated with water. Recreation is the main use for this mapping unit. Capability unit VIIIs-1; no range site assigned.

Rahal Series

The Rahal series consists of deep, gently undulating, noncalcareous sandy soils on uplands. These soils formed under a cover of coarse bunch grasses in clayey to loamy sediments.

In a representative profile the surface layer is light brownish gray fine sand about 10 inches thick. The subsurface layer is white fine sand about 25 inches thick. The next 27 inches is sandy clay. The upper 13 inches is light gray and distinctly mottled, and the lower 14 inches is white and prominently mottled. Below this is 18 inches of white sandy clay loam prominently mottled with light yellowish brown and dark red. The underlying material to a depth of 96 inches is mottled white fine sandy loam.

Rahal soils are somewhat poorly drained and have a low available water capacity. They are used for livestock grazing where native vegetation is utilized.

Representative profile of Rahal fine sand, gently undulating, about 10 miles south of Port Lavaca; 8.2 miles south on Farm Road 1289 from its intersection with Texas Highway 238; 30 feet east; in range:

A1—0 to 10 inches, light brownish gray (10YR 6/2) fine sand, grayish brown (10YR 5/2) moist; single grained; loose; few coarse roots and common fine roots; neutral; clear, smooth boundary.

A2g—10 to 35 inches, white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; single grained; loose; few coarse roots; neutral; abrupt, smooth boundary.

B21tg—35 to 48 inches, light gray (10YR 7/2) sandy clay, light brownish gray (10YR 6/2) moist; common, coarse, distinct, yellowish brown (10YR 5/6) mottles; moderate, coarse, blocky structure; very hard, firm, sticky; few fine roots mostly between peds; many clay films; some clean sand grains on vertical ped surfaces; mildly alkaline; gradual, smooth boundary.

Figure 6.—**Shoreline site of Psamments, gravelly. Erosion by wind and water is evident.**

B22tg—48 to 62 inches, white (10YR 8/2) sandy clay, light gray (10YR 7/2) moist; few, coarse, prominent, red (2.5YR 4/8) and fine, distinct brownish yellow (10YR 6/6) mottles; moderate, coarse, blocky structure; very hard, firm, sticky; many clay films; some clean sand grains on vertical ped surfaces; mildly alkaline; gradual, smooth boundary.

B3tg—62 to 80 inches, white (10YR 8/1) sandy clay loam, light gray (10YR 7/1) moist; common, medium, faint, light yellowish brown (2.5YR 6/4) and prominent, dark red (2.5YR 3/6) mottles; weak, coarse, blocky structure; hard, firm, slightly sticky; few fine roots; mildly alkaline; gradual, smooth boundary.

Cg—80 to 96 inches, white (10YR 8/1) fine sandy loam, light gray (10YR 7/1) moist; common, medium, prominent, red (2.5YR 4/6) and common, fine distinct, light olive brown (2.5Y 5/6) mottles; slightly hard, friable; noncalcareous; moderately alkaline.

Total thickness of the A horizon ranges from 20 to 40 inches. Reaction ranges from medium acid to neutral. The A1 horizon is light gray to grayish brown and is 5 to 16 inches thick. The A2g horizon is white to light gray and is 12 to 35 inches thick.

The B2tg horizon is light gray to light brownish gray and has distinct mottles of yellow, brown, or red. It is 12 to 30 inches thick. Reaction is neutral or mildly alkaline. The B3tg horizon is gray to white and is mottled with yellow, brown, or red.

Depth to the C horizon ranges from 50 to 90 inches. The C horizon is sandy clay loam to fine sandy loam and is white to pale brown. Reaction is mildly alkaline or moderately alkaline. In some places are hard concretions and soft masses of calcium carbonate.

A water table is perched 10 to 35 inches below the surface during winter and spring.

Ra—Rahal fine sand, gently undulating. This gently undulating soil is in moundy areas, near the mainland coastline, that are significantly shaped by wind action. Slopes range from about 0.5 to 2 percent, but generally are less than 1 percent. Most areas range from 20 to 600 acres in size, but dominantly are about 200 acres.

Included with this soil in mapping are small, slightly higher mounds and ridges of Galveston or Portalto soils; small, less sandy areas of Matagorda soils; small concave areas of Roemer soils; and concave, oval-shaped areas of Veston soils. Also included are oval-shaped depressions 1 to 5 acres in size in which water is ponded for 6 months or more during the year. Included soils make up as much as 10 percent of some areas.

Water runs off this Rahal soil very slowly because it readily enters the sandy surface layer. A water table is perched on the very slowly permeable clayey layers during winter and spring and after heavy rains. The sandy surface layer has a low available water capacity.

This soil is used as range. It is not well suited to crops. Soil blowing is a severe hazard. Management to be considered when this soil is used for crops includes careful selection of crops that produce large quantities of crop residue, use of cover crops, adequate drainage, and maintenance of fertility. Crop residue should be managed on the soil surface to reduce soil blowing. Capability unit IIIw-3; Coastal Sand range site.

Roemer Series

The Roemer series consists of deep, nearly level to gently sloping, noncalcareous sandy soils on low coastal uplands. These soils formed under a cover of tall and mid bunch grasses in sandy and loamy sediments.

In a representative profile the surface layer is grayish brown fine sand about 3 inches thick. The subsurface layer is white fine sand mottled with yellow and is 27 inches thick. The subsoil extends to a depth of 61 inches. The upper 9 inches is distinctly mottled white sandy clay loam, and the lower 22 inches is fine sandy loam. The underlying material to a depth of 84 inches is light gray loamy fine sand mottled with yellowish brown and red.

Roemer soils are somewhat poorly drained and have a medium available water capacity. They have a perched water table within 30 inches of the soil surface for a few days following heavy rainfall.

These soils are used for livestock grazing. Most of the acreage is in native vegetation and used as range. A few areas are in an introduced grass species and are used as improved pastures.

The Roemer soils in Calhoun County are mapped only with Portalto soils.

Representative profile of Roemer fine sand, in an area of Portalto-Roemer complex, 11.2 miles east of Seadrift; 0.3 mile east of the intersection of Texas Highway 185 and Farm Road 1289; 160 feet south of the right-of-way fence; in a depressed area:

A1—0 to 3 inches, grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; many fine roots; strongly acid; clear, smooth boundary.

A2g—3 to 30 inches, white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; common, fine, distinct, yellow (10YR 7/2) mottles; single grained; loose; few fine roots; strongly acid; clear, irregular boundary.

B21tg—30 to 39 inches, white (10YR 8/2) sandy clay loam, light gray (10YR 7/2) moist; many, medium, distinct, strong brown (7.5YR 5/6) mottles; weak, coarse, blocky structure; friable, hard; few fine roots; few clay films with clay bridging sand grains; strongly acid; gradual, wavy boundary.

B22tg—39 to 61 inches, white (10YR 8/2) fine sandy loam, light gray (10YR 7/2) moist; many, coarse, distinct, strong brown (7.5YR 5/6) mottles; weak, coarse, blocky structure; friable, hard; few fine roots; clay bridging of sand grains; strongly acid; gradual, wavy boundary.

C—61 to 84 inches, light gray (10YR 7/1) loamy fine sand, light gray (10YR 6/1) moist; many, coarse, distinct, yellowish brown (10YR 5/6) and common, fine, prominent, red (2.5YR 4/6) mottles; single grained; very friable, slightly hard; medium acid.

The A horizon is fine sand or loamy fine sand and is 20 to 40 inches thick. The A1 horizon is dark grayish brown to light brownish gray and is 2 to 10 inches thick. Reaction ranges from strongly acid to neutral. The A2 horizon is white or light brownish gray and distinct yellowish or brownish mottles are common. It is 13 to 37 inches thick. Reaction ranges from strongly acid to neutral.

The B2tg horizon is light gray, light brownish gray, or grayish brown and includes few to many, fine to coarse, brownish, yellowish, and reddish mottles. Reaction is medium acid or strongly acid.

Depth to the C horizon ranges from 48 to 72 inches. The C horizon is light gray, light brownish gray, or grayish brown.

Telferner Series

The Telferner series consists of deep, nearly level, noncalcareous loamy soils on uplands. These soils formed under mid and tall bunch grasses in unconsolidated calcareous clayey and loamy materials.

In a representative profile the surface layer is grayish brown very fine sandy loam about 11 inches thick. The subsurface layer is white very fine sandy loam about 4 inches thick. The subsoil to a depth of about 52 inches is sandy clay. The upper 9 inches is light brownish gray, the next 13 inches is light gray, and the lower 15 inches is very pale brown. The underlying material to a depth of 84 inches is light gray sandy clay loam.

These soils are somewhat poorly drained and have a medium available water capacity. They have a perched water table at a depth of 10 to 24 inches following periods of heavy rainfall.

Telferner soils are mostly in native vegetation and are used as range. They are suitable for cultivation, however, and a small acreage is in crops.

Representative profile of Telferner very fine sandy loam, about 11 miles northeast of Port Lavaca; 11.75 miles northeast on Texas Highway 35 from its intersection with U.S. Highway 87; 65 feet north of right-of-way, at a point 700 feet west of the Calhoun-Jackson county line:

A1—0 to 11 inches, grayish brown (10YR 5/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; common, fine, faint, brown mottles; weak, fine, granular structure; slightly hard, friable; many fine roots; common, fine and medium pores; slightly acid; clear, smooth boundary.

A2g—11 to 15 inches, white (10YR 8/2) very fine sandy loam, light brownish gray (10YR 6/2) moist; structureless; soft, friable; common fine roots; slightly acid; abrupt, wavy boundary.

B21tg—15 to 24 inches, light brownish gray (10YR 6/2) sandy clay, grayish brown (10YR 5/2) moist; common, coarse, distinct, brown (7.5YR 5/4) and few, medium, distinct, yellowish brown (10YR 5/4) mottles; moderate, medium and coarse, blocky structure; very hard, very firm, very sticky; few fine roots; many clay films; slightly acid; gradual, wavy boundary.

B22tg—24 to 37 inches, light gray (10YR 7/2) sandy clay, light brownish gray (10YR 6/2) moist; common, coarse, distinct, yellowish brown (10YR 5/4) mottles; moderate, coarse, blocky structure; very hard, very firm, very sticky; few fine roots; many clay films; slightly acid; gradual, wavy boundary.

B3t—37 to 52 inches, very pale brown (10YR 8/2) sandy clay, very pale brown (10YR 7/3) moist; common, fine, faint, light brown (7.5YR 6/4) and light gray (10YR 7/2) mottles; weak, coarse, blocky structure; very hard, firm, slightly sticky; few clay films; mildly alkaline; gradual, smooth boundary.

C—52 to 84 inches, light gray (10YR 7/2) sandy clay loam, grading in lower part to very pale brown (10YR 7/3); few, medium, faint, brown and brownish yellow mottles; structureless; hard, slightly firm, slightly sticky; few iron-manganese concretions; noncalcareous; moderately alkaline.

The A horizon ranges from 8 to 20 inches in thickness. Reaction is medium acid or slightly acid. The A1 horizon is grayish brown, dark grayish brown to light brownish gray and is 6 to 16 inches thick. The A2g horizon is not in all profiles but is in some parts of all delineations. It ranges up to 6 inches thick and is white to light brownish gray.

The B2tg horizon is clay or sandy clay. It is dark gray, light gray, gray, or light brownish gray. Distinct mottles of yellow, brown, and red are common. Reaction ranges from medium acid to neutral. The B3t horizon is very pale brown, white, or pale brown and is 8 to 20 inches thick. Reaction is mildly alkaline or moderately alkaline.

Depth to the C horizon ranges from 48 to 68 inches. It is sandy clay loam or clay loam. It is pale brown, light yellowish brown, or light gray and is faintly mottled yellow and brown. Reaction is mildly alkaline or moderately alkaline.

Te—Telferner very fine sandy loam. This nearly level soil is in areas that appear undulating. The surface in most areas is weakly convex. Slopes are 0.2 to 1 percent. Most areas range from 15 to 550 acres in size, but dominantly are about 50 acres.

Included with this soil in mapping are small, oval-shaped areas of Edan and Midland soils at slightly lower elevations. Also included are small areas of Telferner soils where slopes are 1 percent. These included soils make up about 5 percent of some areas.

About 5 percent of the acreage is used for crops. The soil is suited to row crops and well suited to rice. It is easily tilled, and seedbeds are generally easy to prepare.

Management to be considered when this soil is used for crops includes adequate drainage, proper use of crop residue, and maintenance of good tilth and fertility. Capability unit IIIw-3; Loamy Prairie range site.

Veston Series

The Veston series consists of deep, nearly level, noncalcareous loamy soils on coastal lowlands. These soils formed under salt-tolerant grasses in saline loamy sediments deposited by tidal water and reworked by wind action.

In a representative profile the surface layer is gray, friable fine sandy loam about 12 inches thick. The next 12 inches is gray loam that is mottled and stratified. Below this to a depth of 60 inches is gray silty clay loam that is mottled and stratified.

Veston soils have a low available water capacity and are poorly drained. Their water table is within a depth of 24 inches. They are used for range and wildlife habitat.

Representative profile of Veston fine sandy loam, in an area of Veston soils, about 6 miles south of Seadrift; 3.4 miles east on Texas Highway 185; 1.85 miles south on paved ranch road; 4.75 miles south-southwest on shell road; 50 feet west of road:

A1g—0 to 12 inches, gray (10YR 6/1) 2 inches of sandy clay loam over fine sandy loam, dark gray (10YR 4/1) moist; few, fine, faint and distinct, strong brown (7.5YR 5/6), yellowish brown (10YR 5/6), and light gray (10YR 7/1) mottles; weak, fine, angular blocky structure; hard, friable, nonsticky and nonplastic; common very fine grass roots; noncalcareous; moderately alkaline; abrupt, wavy boundary.

B21g—12 to 24 inches, gray (10YR 6/1) loam and thin strata of fine sandy loam, silt loam, or clay loam, gray (10YR 5/1) moist; few, fine, faint and distinct; brownish yellow (10YR 6/6), light gray (10YR 7/1), and olive yellow (2.5Y 6/6) mottles; moderate, fine and medium, angular blocky structure; hard, friable, nonsticky and nonplastic; few fine roots; few fine pores; few, fine, strong brown concretions; saline; noncalcareous; moderately alkaline; clear, wavy boundary.

B22g—24 to 60 inches, gray (10YR 6/1) silty clay loam and thin strata of loam, silt loam, and fine sandy loam, gray (10YR 5/1) moist; few, fine, faint, light gray (10YR 7/1) mottles; weak, medium, angular blocky structure; hard, firm, sticky and plastic; few fine roots and pores; few, fine, strong brown concretions; few very fine gypsum crystals and calcium-carbonate concretions in lower part; saline; moderately alkaline.

Salinity in the A horizon ranges from low to high. The A1g horizon is fine sandy loam or loam and 8 to 14 inches thick. It ranges from gray and dark gray to light brownish gray. In places it has faint very pale brown, yellowish brown, strong brown, light gray, or brown mottles.

Salinity in the B horizon ranges from moderate to very high. The B2g horizon ranges from loam to silty clay loam. It ranges from gray, light gray and dark gray to light brownish gray. In places it has faint yellowish brown, brownish yellow, light gray, or olive yellow mottles. Reaction is moderately alkaline or strongly alkaline.

Ve—Veston soils. This nearly level mapping unit occupies flatland adjacent to Espiritu Santo and San Antonio Bays. It is on both the mainland and the landward shores of coastal islands. The elevation is generally less than about 3 feet above mean sea level. Slopes are 0 to 1 percent. Areas range from 30 to 200 acres in size, but are dominantly about 100 acres.

This unit is dominantly Veston loamy soils. These soils have the profile described as representative of the series. They are associated with other saline soils having a surface layer that ranges from fine sandy loam to loam and a subsoil that ranges from loam to silty clay.

Included with this unit in mapping are a few areas where clay layers are within 22 inches of the surface. Also included are other soils that have a clay surface layer 8 to 12 inches thick.

This mapping unit is too saline to be suitable for crops. In most areas it is inundated by seawater during storms. It is used mostly as range or wildlife habitat. Capability unit VIIw-2; Salty Prairie range site.

Vs—Veston soils, low. This nearly level mapping unit occupies large, flat basins near bays and oval-shaped or meandering depressions. Slopes are 0 to 1 percent. Many areas are inundated for long periods during and after excessive rains.

Mapped areas are dominantly Veston soils. The surface layer is gray, saline loam about 8 inches thick. The next 32 inches is light brownish gray, saline clay loam. The underlying material to a depth of 84 inches is light gray, saline clay loam that is faintly mottled with yellowish brown.

Some associated soils have a clayey surface layer. Others have thin clayey strata within the profile. Included in mapping and making up about 10 percent of the mapped acreage are sand mounds 40 to 70 feet in diameter.

This mapping unit is too saline and too poorly drained to be suitable for crops. It is used as range and wildlife habitat. The natural vegetation is salt-tolerant grasses and herbs. Capability unit VIIw-2; Salty Prairie range site.

Use and Management of the Soils

The soils in Calhoun County are used for crops, pasture, range, wildlife, recreation, and engineering. This section tells how the soils are used for these purposes and suggests general management. In addition, it explains the system of capability classification used by the Soil Conservation Service and in table 2 lists predicted yields of the principal crops grown in the county.

General Management of Crops

Rice and grain sorghum are the two most important cultivated crops grown in Calhoun County. The climate and the soils, however, are well suited to cotton, soybeans, flax, and improved pasture. Fruits, such as citrus and figs, are moderately suited, but acreages are small.

The management needed for crops is chiefly (1) adequate drainage to remove excess surface water; (2) crop residue on the soil surface or partially incorporated into the surface layer; (3) timely tillage; (4) maintenance of fertility; (5) crop rotation; and (6) terraces, grassed waterways, and contour farming on the more sloping acreage.

Drainage.—The removal of excess surface water is a special consideration in Calhoun County, because the landscape is mostly a broad, nearly level plain with few natural drains that are well defined. Acreages in crops and pasture cannot be adequately drained unless effective outlets are available. Where outlets are adequate, a system of lateral drains and field ditches properly installed and maintained can be used to remove excess surface water (fig. 7).

Subsurface drainage is not effective because nearly all of the soils have very slow internal drainage. Completion of the PL-566 drainage project on Chocolate, Little Chocolate, and Lynn Bayous will provide drainage outlets for a large part of the acreage in crops and pasture in the county.

Fieldwork must often be delayed on poorly drained soils. Poor drainage equally affects seedbed preparation, planting in spring, tillage during the growing season, and harvest in fall. Wet conditions commonly cause poor seed germination or loss of stand, and often replanting is needed.

Crop residue management.—Crop residue, properly used, is beneficial to the soil and is an economical means of restoring fertility. Organic matter in the plant residue is used by soil organisms as a source of nutrients and energy. An abundance of organic matter in the soil generally means higher fertility and better tilth.

A good litter of crop residue left on the surface of the soil or worked into the upper few inches of the surface layer protects the soil from the damaging effects of intense rains. It reduces the crusting and sealing of the surface and increases the intake of water. The shading effect of the residue and a corresponding reduction of soil temperature, in turn, reduce the amount of soil moisture lost through evaporation. Residue also adds organic matter to the soil, which improves the tilth of the surface layer, and reduces the packing effect of farm machinery. The residue decays more quickly if nitrogen fertilizer is applied at the time of initial tillage.

Tillage.—Proper tillage is important in managing soils and crops. Tillage is needed to prepare a seedbed, kill weeds, and improve tilth of the surface layer. If the soil is too wet when tilled, soil structure is broken down and a plowpan is likely to form. Any plowpan restricts the growth and penetration of plant roots and slows the downward movement of water.

Rice culture.—The climate of Calhoun County is well suited to rice (*7*). Also, many of the soils are well suited, for example, Lake Charles, Midland, Dacosta, and Edna soils.

The culture of rice differs from the culture of other local crops. To be suitable for rice, an area should have a dependable supply of fresh water, very slowly permeable soils, and level or nearly level topography. Land leveling can be done with a minimum of mechanical shaping (fig. 8). The need for restricted water percolation in the subsoil insures a minimum loss of irrigation water when soils are flooded.

A common, but damaging, rotation is 1 or 2 years of rice followed by 2 to 4 years of beef cattle grazing the volunteer grasses. Generally, the amount of organic matter is lowered, the structure of the surface soil is destroyed, and the soil becomes hard and massive.

Although rice culture causes a general deterioration of soils during growth years, good management when the soil is not in rice can improve and partly restore desirable tilth. Rice can be rotated with other cultivated crops, such as soybeans and flax, and with grasses or legumes, including common bermudagrass, gulf ryegrass, small grain, and Hubam clover. A drainage system maintained at optimum capacity for crops between rice seasons is essential to insure successful production.

Other crops and cropping systems.—Of the adapted crops, grain sorghum and cotton are next in importance to

Figure 7.—**Lake Charles clay, 0 to 1 percent slopes, showing field drain and improper provision for erosion control.**

rice in the county. The acreages of corn and flax are small.

Although rice does not fit well in a cropping sequence with cotton and grain sorghum, a 2-year rotation with those crops and good residue management help to maintain good tilth on acreages used for rice. Grain sorghum produces about twice as much residue as cotton. Cotton residue, except for the leaves and stems, is more woody. Because grain sorghum is a more shallow-rooted crop than cotton, alternating use of these two crops distributes the feeding zone through a greater depth.

Other suggestions for use and management of acreages in crops are given in the mapping unit descriptions of the respective soils.

Capability Grouping

Some readers, particularly those who farm on a large scale, may find it practical to use and manage alike some of the different kinds of soil on their farm. These readers can make good use of the capability classification system, a grouping that shows, in a general way, the suitability of soils for most kinds of farming.

The grouping is based on permanent limitations of soils when used for field crops, the risk of damage when they are farmed, and the way the soils respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations for range, for forest trees, or for engineering.

In the capability system, all kinds of soil are grouped at three levels: the class, the subclass, and the unit. The broadest grouping, the capability class, is designated by Roman numerals I to VIII. In class I are the soils that have

Figure 8.—**Smoothing with a land plane in preparation for irrigation border layout on riceland. The soil is Midland clay loam.**

the fewest limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products. The subclass indicates major kinds of limitations within the classes. Within most of the classes there can be up to four subclasses. The subclasses are indicated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter "e" shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; "w" means that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); "s" shows that the soil is limited mainly because it is shallow, droughty, or stony; and "c" indicates that the chief limitation is climate that is too cold, or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w, s,* and *c,* because the soils are subject to little or no erosion but have other limitations that confine their use largely to pasture, range, or wildlife.

Subclasses are further divided into groups called capability units. These are groups of soils that are so much alike that they are suited to the same crops and pasture plants, they require about the same management, and have generally similar productivity and other response to management. Capability units are generally identified by numbers assigned locally, for example, IIw-1 or IIIs-1.

The eight classes in the capability system and the subclasses and units in Calhoun County are described in the list that follows. The unit designation for each soil is shown in the Guide to Mapping Units.

Class I. Soils have few limitations that restrict their use. (No subclasses). No Class I soils in the county.

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

Subclass IIw. Soils moderately limited by excess water.

Unit IIw-1. Nearly level, somewhat poorly drained, very slowly permeable clayey soils on uplands.

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

Subclass IIIe. Soils subject to severe erosion if they are cultivated and not protected.

Unit IIIe-1. Gently sloping, somewhat poorly drained, very slowly permeable loamy soils on uplands.

Subclass IIIw. Soils severely limited for cultivation by excess water.

Unit IIIw-1. Nearly level, somewhat poorly drained to poorly drained, very slowly permeable clayey to loamy soils on uplands.

Unit IIIw-2. Nearly level, poorly drained, very slowly permeable clayey soils on bottom land.

Unit IIIw-3. Nearly level to gently undulating, somewhat poorly drained, very slowly permeable loamy to sandy soils on uplands.

Unit IIIw-4. Nearly level, poorly drained, very slowly permeable loamy soils on uplands.

Unit IIIw-5. Nearly level, somewhat poorly drained, very slowly permeable loamy soils on low coastal uplands.

Unit IIIw-6. Nearly level, saline, somewhat poorly drained, very slowly permeable loamy soils on uplands.

Subclass IIIs. Soils severely limited for cultivation by low available water capacity.

Unit IIIs-1. Gently undulating, well-drained, moderately rapidly permeable sandy soils on uplands.

Unit IIIs-2. Nearly level to gently sloping, well-drained to somewhat poorly drained, moderately rapidly permeable sandy soils on uplands.

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

Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.

Unit IVe-1. Gently sloping to sloping, somewhat poorly drained, very slowly permeable clayey soils on uplands.

Subclass IVw. Soils very severely limited for cultivation by excess water.

Unit IVw-1. Nearly level to depressional, poorly drained, very slowly permeable loamy soils on uplands.

Unit IVw-2. Nearly level, saline, poorly drained, very slowly permeable clayey soils on low coastal uplands.

Unit IVw-3. Nearly level, saline, poorly drained, very slowly permeable loamy soils on low coastal uplands.

Class V. Soils are subject to little or no erosion, but have other limitations, impractical to remove, that limit their use largely to pasture, range, or wildlife habitat.

Subclass Vw. Soils frequently flooded and too wet for cultivation.

Unit Vw-1. Nearly level, poorly drained, very slowly permeable clayey soils on bottom land.

Unit Vw-2. Nearly level, saline, poorly drained, very slowly permeable clayey soils on bottom land.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, range, or wildlife habitat.

Subclass VIe. Soils severely limited by the hazard of erosion from wind or water unless protective cover is maintained.

Unit VIe-1. Undulating, somewhat excessively drained, rapidly permeable sandy soils on coastal beaches and adjacent terraces.

Unit VIe-2. Gently sloping, saline, poorly drained, very slowly permeable loamy soils on low coastal uplands.

Subclass VIw. Soils severely limited by excess water.

Unit VIw-1. Nearly level to gently undulating, poorly drained to somewhat excessively drained, rapidly permeable sandy soils on low coastal beaches and flats near sea level.

Class VII. Soils have very severe limitations that make them unsuitable for cultivation and restrict their use largely to range or wildlife habitat.

Subclass VIIw. Soils very severely limited by excess water and salinity.

Unit VIIw-1. Nearly level to strongly sloping, saline, very poorly drained, very slowly permeable clayey soils on flood plains, coastal marshes, and border deposits.

Unit VIIw-2. Nearly level, saline, poorly drained to very poorly drained, moderately to very slowly permeable sandy to clayey soils on bottom land and coastal uplands.

Subclass VIIs. Soils very severely limited by salinity.

Unit VIIs-1. Nearly level, well drained to poorly drained, moderately to rapidly permeable loamy to sandy and gravelly soils on low coastal uplands and upland flats.

Class VIII. Soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife habitat, or esthetic purposes.

Subclass VIIIw. Soil material frequently covered by seawater.

Unit VIIIw-1. Nearly level, saline, very poorly drained, moderately permeable loamy to sandy soils on coastal uplands and near sea level.

Subclass VIIIs. Soil material has very low available water capacity and very severe erosion hazard.

Unit VIIIs-1. Nearly level, saline sandy material on coastal beaches and islands, subject to shifting by wind and wave action.

Predicted Yields

Table 2 lists predicted yields of the principal crops grown in the county. The predictions are based on estimates by farmers, soil scientists, and others who have knowledge of yields in the county and on information taken from research data. The predicted yields are average yields per acre that can be expected at the level of management that tends to produce the highest economic returns. Not included in this table are soils that are used only for range or recreation.

The predicted yields listed in table 2 can be expected if—

1. Rainfall is effectively used and conserved.
2. Surface and/or subsurface drainage systems are

TABLE 2.—*Predicted average yields per acre of the principal crops grown under improved management*

[Absence of figure indicates that the crop is not suited to the soil or is not commonly grown.]

Soil	Cotton	Grain sorghum	Rice	Tame pasture
	Lb of lint	*Lb*	*Lb*	*AUM*[1]
Adamsville fine sand, saline				5
Aransas clay				6
Aransas clay, high bottom	400	3,000		10
Beaumont clay	400	4,200	5,000	10
Dacosta clay loam, saline	250	4,000	4,600	7
Dacosta-Contee complex, 0 to 1 percent slopes	480	4,500	5,100	10
Dacosta-Contee complex, 1 to 3 percent slopes	475	4,500		9
Edna very fine sandy loam	375	3,500	5,000	8
Edna very fine sandy loam, low	275	2,800	4,800	7
Fordtran loamy fine sand		2,200		8
Francitas clay	250	2,500	4,000	8
Galveston fine sand, undulating				6
Galveston complex, undulating				6
Kenney fine sand				6
Lake Charles clay, 0 to 1 percent slopes	480	5,000	5,600	10
Lake Charles complex, 3 to 8 percent slopes	300	2,800		6
Livia silt loam	200	3,000	4,600	5
Livia clay loam, 0 to 1 percent slopes	200	3,000	4,600	5
Matagorda very fine sandy loam			4,700	5
Midland clay loam	320	3,500	4,900	6
Midland clay loam, low		2,500	4,800	6
Midland-Dacosta complex	400	4,000	5,000	8
Mustang fine sand				6
Portalto-Roemer complex				8
Rahal fine sand, gently undulating		2,200		8
Telferner very fine sandy loam		2,000	5,000	8

[1] Animal-unit-month is used to express the amount of forage or feed required to maintain one animal unit for a period of 30 days.

installed where needed.

3. Crop residue is managed to provide good soil tilth.
4. Tillage is minimum, but timely.
5. Insects, diseases, and weeds are consistently controlled.
6. Fertilizer is applied according to soil test and crop needs.
7. Adapted crop varieties are used at recommended seeding rates.
8. In addition, for rice, the only irrigated crop, terraces are installed where needed.
9. Irrigation water is of suitable quality.
10. Irrigation is timed to meet the needs of the soil and crop.
11. Irrigation systems are properly designed and efficiently used.

Pasture and Hay

On approximately 17,000 acres in Calhoun County, tame pasture is managed for forage production. The choice of species depends on the drainage of the soil and on the salinity level. The introduced bluestems are widely used. Gordo bluestem and Angleton bluestem have a high production potential and are tolerant of wetness. Gordo bluestem and Kleberg bluestem are especially tolerant of salts. The Kleberg variety, however, is somewhat less productive. Medio bluestem is intermediate in adaptation. Kleingrass 75 is broadly adapted and produces somewhat earlier than bluestems. Coastal bermudagrass, the most versatile introduced grass, has a high production potential except in poorly drained areas. Other important species are gulf ryegrass and Pensacola bahiagrass.

Controlled grazing, weed control, and fertilization are needed on pasture. A complete cover of a one-base grass is desirable. Weeds should be systematically controlled by mechanical means, such as mowing or shredding, or by the use of herbicides. Fertilizer should be applied according to plant needs, the level of production desired, and the results of soil tests.

For hay, management is generally the same as that for pasture. Hay should be cut at a height that has been proven best for the grass used. Cutting too close to the ground, or cutting too often damages hay in the same way that overgrazing damages pasture.

Range[2]

About 59 percent, or 197,700 acres, of Calhoun County is in native vegetation and is used as range. Some livestock farms also utilize small areas of native vegetation as sources of forage. On these farms, the stock receives supplemental forage from feed grown on cropped acreages and from grazing tame pasture. The stock is almost exclusively cattle, predominantly cow-calf enterprises. A few horses are raised. In favorable years, a few stocker-type animals are grazed.

On the larger ranches, an important use of range is to provide forage and cover for livestock, deer, quail, waterfowl, and other birds.

The original plant cover in Calhoun County was chiefly

[2] By STANLEY T. REINKE, range conservationist, Soil Conservation Service.

mid and tall grasses and associated forbs. Many years of continuous heavy grazing has resulted in deterioration of the climax plant community and lower total forage production. A large part of the better forage plants has declined and has been replaced by less palatable grasses, weeds, and brush.

Forage production is highest in April, May, and June. In most years this is the period when rainfall is heaviest and temperature most favorable. Another growing season occurs in fall, usually during September, October, and early in November. Rainfall is plentiful during this period, but production is lower as a result of cooler temperatures.

Three different types of range occur in this county. The sandy soils near the coast line and on Matagorda Island produce tall grasses, sedges, and salt-tolerant plants. The saline soils of coastal lowlands generally grow cordgrasses and are most useful for winter grazing. The slightly elevated soils farther inland produce a prairie of tall and mid grasses, mainly little bluestem and indiangrass. This vegetation, however, has been modified by past grazing and cultural uses.

Range sites and condition classes

Different kinds of soil differ in their capacity to produce grass and other plants for grazing. Soils that produce about the same kinds and amounts of forage, if the range is in similar condition, make up a range site.

Range sites are kinds of range that differ in their ability to produce vegetation. The soils on any one site produce about the same kind of climax vegetation. Climax vegetation is the stabilized plant community; it reproduces itself and does not change as long as the environment remains unchanged. Throughout the prairie and the plains, the climax vegetation consists of the plants that were growing there when the region was first settled. If cultivated crops are not grown, the most productive combination of forage plants on a range site is generally the climax vegetation.

Decreasers are plants in the climax vegetation that tend to decrease in relative amount under close grazing. They generally are the tallest and most productive perennial grasses and forbs and the most palatable to livestock.

Increasers are plants in the climax vegetation that increase in relative amount as the more desirable decreaser plants are reduced by close grazing. They are commonly shorter than decreasers and are generally less palatable to livestock.

Invaders are plants that cannot compete with plants in the climax plant community for moisture, nutrients, and light. Hence, invaders come in and grow along with increasers after the climax vegetation has been reduced by grazing. Many are annual weeds. Some are shrubs that have some grazing value, but others have little value for grazing.

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

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

Range condition is judged according to standards that apply to the particular range site. It expresses the present kind and amount of vegetation as related to the climax plant community for that site.

Potential forage production depends on the range site. Current forage production depends on the range condition and the moisture available to plants during their growing season.

A primary objective of good range management is to keep range in excellent or good condition. If this is done, water is conserved, yields are improved, and the soils are protected. The problem is recognizing important changes in the kind of cover on a range site. These changes take place gradually and can be misinterpreted or overlooked. Growth encouraged by heavy rainfall may lead to the conclusion that the range is in good condition, when actually the cover is weedy and the long-term trend is toward lower production. On the other hand, some range that has been closely grazed for short periods, under the supervision of a careful manager, may have a degraded appearance that temporarily conceals its quality and ability to recover.

Descriptions of range sites

On the following pages, the range sites of Calhoun County are described and the climax plants and principal invaders on the sites are named. Also given is an estimate of the potential annual yield of air-dry herbage for each site when it is in excellent condition. The soils in each site can be determined by referring to the "Guide to Mapping Units" at the back of this soil survey.

BLACKLAND RANGE SITE

The soils of this site are nearly level to sloping and clayey to loamy. They are very slowly permeable and have a high available water capacity.

The climax plant community, a true prairie type plant cover, is a mixture of tall and mid grasses and associated forbs. By weight, it is 60 percent little bluestem; 15 percent indiangrass; 15 percent big bluestem, eastern gamagrass, and switchgrass; 5 percent brownseed paspalum, sedges, Texas wintergrass, knotroot bristlegrass, and Scribner panicum; and 5 percent annual forbs.

This site in excellent condition produces approximately 7,000 pounds of air-dry herbage per acre in favorable years and 4,500 pounds per acre in unfavorable years. Approximately 95 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing by cattle, little bluestem, indiangrass, big bluestem, eastern gamagrass, and switchgrass decrease and such plants as brownseed paspalum and knotroot bristlegrass increase. If overgrazing is prolonged, annual production and total production are greatly reduced.

CLAYEY BOTTOMLAND RANGE SITE

The soils of this site are nearly level clays. They are very slowly permeable and have a high available water capacity.

The climax plant community is a mixture of tall and mid grasses and hardwood trees. By weight, it is 15 percent oak, elm, and pecan; 15 percent big bluestem and pecan; 20 percent big bluestem, indiangrass, switchgrass, and eastern gamagrass; 15 percent little bluestem; 20 percent Virginia wildrye, southwestern bristlegrass, and vine-mesquite; 5 percent rustyseed paspalum, 5 percent perennial forbs; and 5 percent annual forbs and weeds. Also included are spiny aster and some cordgrass in low wet and slightly saline areas.

This site produces approximately 6,000 pounds of total annual yield per acre in favorable years and 4,000 pounds per acre in unfavorable years. Approximately 80 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing by cattle, big bluestem, indiangrass, eastern gamagrass, switchgrass, and little bluestem decrease and such plants as Virginia wildrye and paspalums increase. If overgrazing is prolonged, annual weeds and woody vegetation make up a substantial part of the annual production, and total production is greatly reduced.

CLAYPAN PRAIRIE RANGE SITE

The one soil of this site, Edna very fine sandy loam, is nearly level, is moderately permeable, and has a high available water capacity.

The climax plant community, a true prairie type plant cover, is a mixture of mid and short grasses and associated forbs. By weight, it is 40 percent little bluestem; 15 percent switchgrass; 5 percent indiangrass; 10 percent eastern gamagrass, big bluestem, and Florida paspalum; 10 percent brownseed paspalum; 5 percent sedges; 10 percent other grasses; and 5 percent bundleflower, sensitivebrier, yellow neptunia, herbaceous mimosa, and other forbs.

This site in excellent condition produces approximately 8,000 pounds of air dry herbage per acre in favorable years and 5,000 pounds per acre in unfavorable years. Approximately 95 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing by cattle, little bluestem, indiangrass, big bluestem, eastern gamagrass, and switchgrass decrease and such plants such as brownseed paspalum, knotroot bristlegrass, and longspike tridens increase. If overgrazing is prolonged, annual and total production are greatly reduced.

COASTAL SAND RANGE SITE

The soils of this site are nearly level to gently sloping and undulating sands. In many places dunes are interspersed with flat wet depressions (fig. 9). The soils are rapidly permeable to moderately slowly permeable and have a low to medium available water capacity.

***Figure 9.*—Coastal Sand range site. Galveston fine sand is on the ridges. The depressions are Adamsville fine sand, saline, which is part of the Low Coastal Sand site.**

The climax plant community varies from one type of community on the knolls to a different variety of grass in the depressions. By weight, it is 50 percent little bluestem and seacoast bluestem; 10 percent switchgrass; 5 percent eastern gamagrass and big bluestem; 15 percent gulfdune and brownseed paspalum; 10 percent Florida paspalum, sea oats, marshhay cordgrass, low panicums; 5 percent perennial forbs; and 5 percent woody plants such as live oak.

This site produces approximately 4,500 pounds of air-dry herbage per acre in favorable years and 2,800 pounds per acre in unfavorable years. Approximately 90 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing by cattle, little bluestem, seacoast bluestem, big bluestem, switchgrass, and eastern gamagrass decrease and such plants as brownseed paspalum and gulfdune paspalum, sea oats, and low panicums increase. If overgrazing is prolonged, annual weeds and poor quality grasses are dominant parts of the annual production, and total production is greatly reduced.

LOAMY PRAIRIE RANGE SITE

Telferner very fine sandy loam is the only soil on this site. This soil is nearly level, very slowly permeable, and has a medium available water capacity.

The climax plant community, a true prairie type, is a mixture of mid and tall grasses and forbs. By weight, it is 60 percent little bluestem; 15 percent indiangrass; 5 percent switchgrass; 10 percent eastern gamagrass, big bluestem, and Florida paspalum; and 10 percent brownseed paspalum, low panicums, longtom, Scribner panicum, knotroot bristlegrass, balsamscale, and perennial forbs.

This site produces approximately 6,500 pounds of air-dry herbage per acre in favorable years and 3,500 pounds per acre in unfavorable years. Approximately 95 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing, eastern gamagrass, big and little bluestem, indiangrass, and switchgrass decrease and such plants as brownseed paspalum, knotroot bristlegrass, longspike tridens, and low panicums increase. If overgrazing is prolonged, annual weeds and lower producing grasses make up a substantial part of the annual production, and total production is greatly reduced.

LOW COASTAL SAND RANGE SITE

The soils of this site are nearly level to gently undulating sands. They are rapidly permeable and have a very low available water capacity.

The climax plant community is a mixture of wet tolerant and nontolerant grass species. By weight, it is 5 percent seacoast bluestem; 20 percent marshhay cordgrass; 15 percent seashore saltgrass; 10 percent gulf cordgrass; 5 percent seashore dropseed; 10 percent gulfdune paspalum; 10 percent sedges and rushes; 15 percent switchgrass; 5 percent other grasses; and 5 percent forbs.

This site produces approximately 6,500 pounds of air-dry herbage per acre in favorable years and 3,000 pounds per acre in unfavorable years. Approximately 95 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing by cattle, seacoast bluestem, marshhay cordgrass, and switchgrass decrease and such plants as gulf cordgrass, seashore saltgrass, and gulfdune paspalum increase. If overgrazing is prolonged, gulf cordgrass becomes dominant, after which glasswort and bushy sea-oxeye encroach, and total production is greatly reduced.

LOWLAND RANGE SITE

The soils of this site are nearly level loamy soils. They are very slowly permeable and have a high available water capacity.

The climax plant community, a wet prairie type, is dominated by tall grasses. By weight, it is 55 percent switchgrass, eastern gamagrass, and maidencane; 30 percent indiangrass, little bluestem, big bluestem, and Florida paspalum; 10 percent brownseed paspalum, longspike tridens, knotroot bristlegrass, sedges, low panicum, and longtom; and 5 percent perennial forbs.

This site produces approximately 8,000 pounds of air-dry herbage per acre in favorable years and 5,500 pounds per acre in unfavorable years. Approximately 90 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing by cattle, switchgrass, big bluestem, eastern gamagrass, and maidencane decrease and such plants as longtom, brownseed paspalum, broomsedge, bushy bluestem, and longspike tridens increase. If overgrazing is prolonged, needlegrass rush, smutgrass, and sesbania make up a substantial part of the annual production, and total production is greatly reduced.

SALT MARSH RANGE SITE

The soils of this site (fig. 10) are nearly level saline clays. They are very slowly permeable and have a very low available water capacity. The water table is near the surface for long periods.

The climax plant community is dominated by marsh plants. By weight, it is 75 percent marshhay cordgrass; 10 percent common reed, big cordgrass, smooth cordgrass, seashore saltgrass, seashore paspalum, and sedges; 10 percent Olney and saltmarsh bulrush; and 5 percent perennial forbs.

This site produces approximately 12,000 pounds of air-dry herbage per acre in favorable years and 9,000 pounds per acre in unfavorable years. Approximately 85 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing by cattle, marshhay cordgrass, big cordgrass, and smooth cordgrass decrease and such plants as seashore paspalum and seashore saltgrass increase. If overgrazing is prolonged, needlegrass rush, sesbania, spiny aster, and alligatorweed make up a substantial part of the annual production, and total production is greatly reduced.

SALTY PRAIRIE RANGE SITE

The soils of this site are nearly level to strongly sloping and sandy to clayey. They are saline and occasionally are covered by tides or storm-blown water. Salinity affects the type of vegetation grown on this site (fig. 11). These soils are rapidly to very slowly permeable and have a very low to medium available water capacity.

The climax plant community is a mixture of tall and mid grasses dominated by gulf cordgrass. By weight, it is 70 percent gulf cordgrass; 15 percent little bluestem and

Figure 10.—**Salt Marsh range site. The soil is Placedo clay.**

switchgrass; 10 percent common reed, marshhay cordgrass, knotroot bristlegrass, seashore saltgrass, and shoregrass; and 5 percent bushy sea-oxeye and slim aster.

This site produces from 8,000 pounds of air-dry herbage per acre in favorable years to 4,000 pounds per acre in unfavorable years. Approximately 95 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing by cattle, bluestem, switchgrass, and common reed decrease. When these species are eliminated, gulf cordgrass is dominant. If overgrazing is prolonged, bushy sea-oxeye, slim aster, whorled dropseed, red lovegrass, and annual forbs are dominant, and total production is greatly reduced.

SANDY PRAIRIE RANGE SITE

The soils of this site are gently undulating and sandy. They are rapidly to very slowly permeable and have a low to medium available water capacity.

The climax plant community, a true prairie type, is a mixture of mid and tall grasses and forbs. By weight, it is 55 percent little bluestem; 20 percent indiangrass, crinkleawn, and big bluestem; 10 percent eastern gamagrass, Florida paspalum, and switchgrass; 10 percent brownseed paspalum, knotroot bristlegrass, low panicums, balsamscale, and sedges; and 5 percent perennial forbs.

This site produces approximately 5,000 pounds of air-dry herbage per acre in favorable years and 3,000 pounds per acre in unfavorable years. Approximately 95 percent of this yield is from plants that furnish forage for cattle.

Under continued heavy grazing by cattle, eastern gamagrass, big bluestem, little bluestem, indiangrass, crinkleawn, and Florida paspalum decrease and such plants as brownseed paspalum, knotroot bristlegrass, sedges, and low panicums increase. If overgrazing is prolonged, annual weeds and poor quality grasses, such as smutgrass and balsamscale, make up a substantial part of the annual production, and total production is greatly reduced.

Wildlife Habitat

Most of Calhoun County is a nearly level, treeless plain and a few well-defined stream valleys. This expansive topography is marked by a few narrow, gently sloping and sloping areas adjacent to the few natural drains, the bottom land along the Guadalupe River, and the inland bays. Trees form a narrow band along the channels of the Guadalupe River, Hog Bayou, and some of the smaller drains.

Originally the vegetation was tall-growing native grasses and low plants on all but the wooded, freshwater bottom land.

White-tail deer, bobwhite quail, and wild turkey are numerous on Matagorda Island and in the Aransas Wildlife Refuge in Calhoun County. In other parts of the county, white-tail deer are scarce, but bobwhite quail are moder-

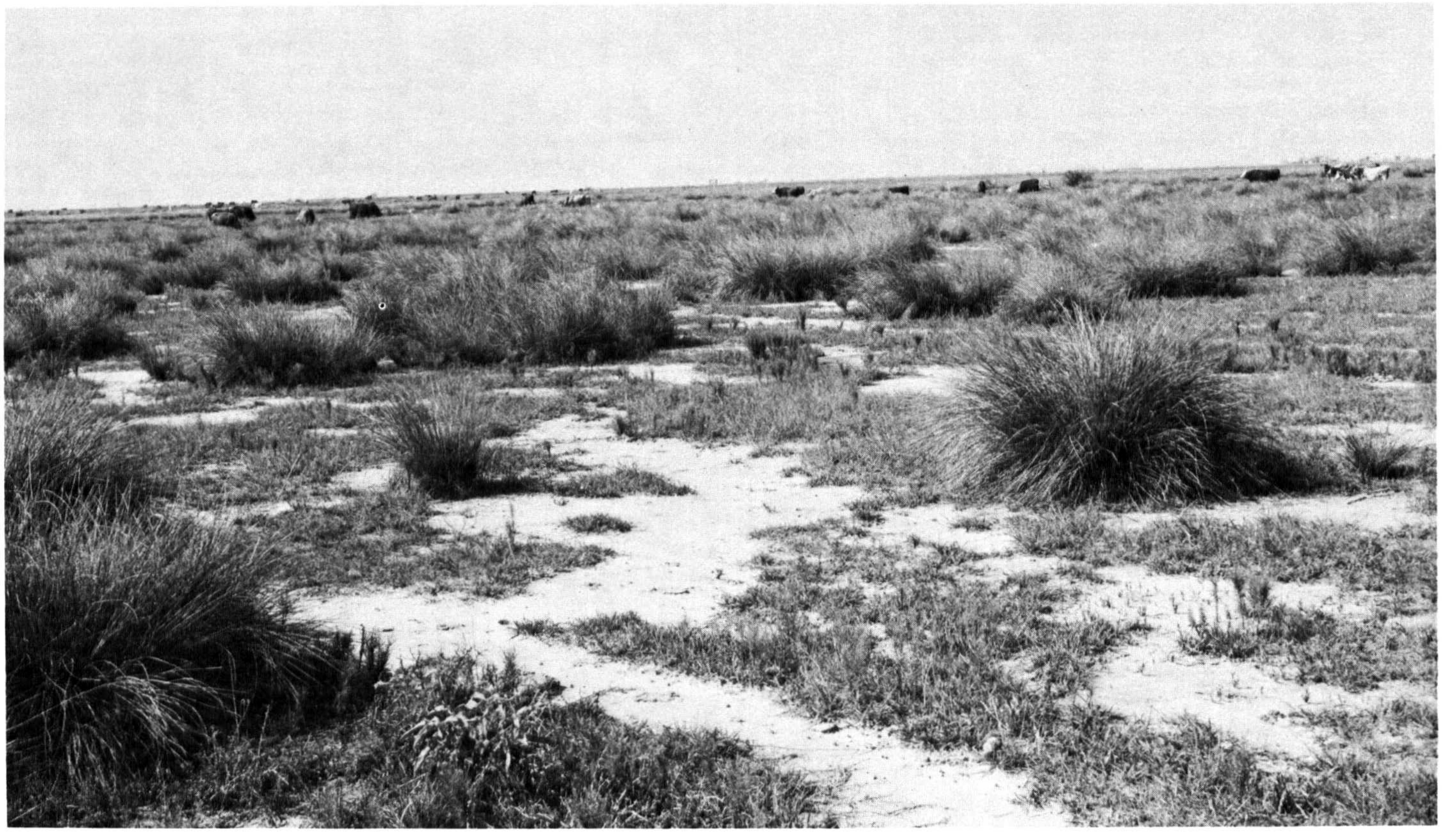

Figure 11.—**Salty Prairie range site, showing gulf cordgrass as the dominant species. The soil is Livia silt loam.**

ately numerous. Deer and quail are most numerous on a few large ranches where they are protected. Axis deer have been imported and are prevalent in private reserves.

Other plentiful species are mourning dove, cottontail rabbit, jackrabbit, armadillo, skunk, opossum, raccoon, and other fur-bearing animals, and many kinds of song birds. There are a few coyotes on the mainland and on Matagorda Island.

Alligators and javelinas are on bottom land along the Guadalupe River, especially south of State Highway 35. Javelinas are also on the Powder Horn Ranch.

Rare and endangered wildlife species in the county are the American alligator, the red wolf, the whooping crane, and the bald eagle.

Calhoun County is the wintering ground for thousands of geese and ducks, which are numerous from about the first of November through March. Many geese linger until May. Geese are attracted to the ricefields after harvest and cause considerable damage to some of the late crops. Geese that linger late in the spring feed on early planted rice and sometimes destroy the crop.

The Guadalupe River, the bayous in the river bottoms, and the inland bays provide good fishing. In the river and bayous are channel catfish, yellow catfish, blue catfish, and largemouthed bass. In the bays are mainly red fish, speckled trout, and flounder and some sand trout, drum, croaker, and sheephead. Shrimp, oyster, and crab are harvested from the bays by fleets of commercial fishing boats.

Soil directly influences the kind and amount of vegetation and the amount of water available and in this way indirectly influences the kinds of wildlife that can live in an area. Properties of the soil that affect the growth of habitat plantings are (1) thickness of the soil, (2) texture of the surface layer, (3) available water capacity to a depth of 40 inches, (4) wetness, (5) stones or rocks on the surface, (6) flood hazard, (7) slope, and (8) permeability of the soil to air and water.

In table 3 the soils of this survey area are rated according to their potential for producing habitat elements for three groups, or kinds, of wildlife.

A rating of *good* means that the element of wildlife habitat and the habitat generally are easily created, improved, and maintained. Few or no limitations affect management, and satisfactory results are expected.

A rating of *fair* means that the element of wildlife habitat, and the habitat can be created, improved, or maintained in most places. Moderate intensity of management and fairly frequent attention, however, may be required for satisfactory results.

A rating of *poor* means that the element of wildlife and limitations for the designated use are severe. Habitat can be created, improved, or maintained in most places, but management is difficult and requires intensive effort.

A rating of *very poor* means that the elements of wildlife habitat are very severe and that unsatisfactory results are to be expected. It is either impossible or impractical to

TABLE 3.—*Elements of wildlife habitat and kinds of wildlife*

Soils series and map symbols	Elements of wildlife habitat						Kinds of wildlife		
	Grain and seed crops	Grass and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland	Rangeland	Wetland
Adamsville: Ad	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Poor.
Aransas:									
Ar	Very poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair.
As	Fair	Fair	Poor	Poor	Poor	Good	Fair	Poor	Fair.
Austwell: At, Au	Very poor	Very poor	Poor	Poor	Poor	Good	Very poor	Poor	Fair.
Bayucos: BA	Very poor	Very poor	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Poor.
Beaumont: Be	Poor	Fair	Fair	Poor	Poor	Good	Fair	Poor	Fair.
Contee. Mapped only with Dacosta soils.	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Poor	Fair.
Dacosta:									
Da	Poor	Fair	Poor	Poor	Fair	Fair	Poor	Poor	Fair.
Dc	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Poor	Fair.
Dn. For Contee part of Dc and Dn, see Contee soils.	Fair	Good	Fair	Poor	Fair	Poor	Fair	Poor	Poor.
Dianola: Dp. For Portalto part of Dp, see Portalto soils.	Very poor	Very poor	Very poor	Very poor	Good	Very poor	Very poor	Very poor	Poor.
Edna: Ed, En	Poor	Fair	Poor	Poor	Good	Good	Poor	Poor	Good.
Fordtran: Fo	Poor	Fair	Poor	Poor	Fair	Fair	Poor	Poor	Fair.
Francitas: Fr	Poor	Fair	Poor	Poor	Poor	Good	Poor	Poor	Fair.
Galveston: Ga, Gc	Poor	Poor	Fair	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Haplaquents: HA, Hd. For Dianola part of Hd, see Dianola soils.	Very poor	Very poor	Very poor	Very poor	Poor	Good	Very poor	Very poor	Fair.
Harris: Hr, Hs	Very poor	Very poor	Poor	Poor	Poor	Good	Very poor	Poor	Fair.
Ijam: Ic	Very poor	Very poor	Poor	Poor	Poor	Good	Very poor	Poor	Fair.
Kenney: Ke	Poor	Fair	Fair	Good	Poor	Very poor	Fair	Fair	Very poor.
Lake Charles:									
La	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor	Poor.
Lc	Fair	Fair	Fair	Poor	Poor	Very poor	Fair	Poor	Very poor.
Livia:									
Lo, Lv	Poor	Fair	Poor	Poor	Good	Good	Poor	Poor	Good.
Lx	Poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor.
Matagorda: Ma	Fair	Fair	Poor	Poor	Fair	Fair	Fair	Poor	Poor.
Midland: Mb, Mc, Md. For Dacosta part of Md, see Dacosta soils.	Poor	Fair	Poor	Poor	Good	Good	Poor	Poor	Good.
Mustang: Mu	Very poor	Poor	Poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor.
Placedo: Pc	Very poor	Very poor	Very poor	Very poor	Poor	Good	Very poor	Very poor	Fair.
Portalto: Pr. For Roemer part of Pr, see Roemer soils.	Poor	Poor	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor.
Psamments: PS, Pt	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Rahal: Ra	Poor	Poor	Fair	Poor	Poor	Fair	Poor	Poor	Poor.
Roemer. Mapped only in complex with Portalto soils.	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor.
Telferner: Te	Fair	Fair	Fair	Poor	Fair	Poor	Fair	Poor	Poor.
Veston: Ve, Vs	Very poor	Very poor	Very poor	Very poor	Good	Good	Very poor	Very poor	Good.

create, improve, or maintain habitat on soils in this category.

The significance of each subheading in table 3 under "Elements of Wildlife Habitat" and "Kinds of Wildlife" is explained in the following paragraphs.

Each soil is rated according to its suitability for producing various kinds of plants and other elements that provide habitat. The ratings take into account mainly the characteristics of the soils and closely related natural factors of the environment. They do not take into account the climate, the present use of the soils, or the present distribution of wildlife and people. For this reason, selection of a site for development as a habitat for wildlife requires inspection at the site.

Grain and seed crops are annual grain-producing plants, such as corn, sorghum, millet, and soybeans.

Grasses and legumes are domestic grasses and legumes that are established by planting. They provide food and cover for wildlife. Grasses are bahiagrass, ryegrass, and panicgrass; legumes are annual lespedeza, shrub lespedeza, and other clovers.

Wild herbaceous plants are native or introduced perennial grasses, forbs, and weeds that provide food and cover for upland wildlife. Beggarweed, perennial lespedeza, wild bean, pokeweed, and cheatgrass are typical examples. On range, typical plants are bluestem, grama, perennial forbs, and legumes.

Shrubs produce wildlife food in the form of fruits, buds, or browse. Such plants commonly grow in their natural environment, but they can be planted and developed through wildlife management programs. Typical species in this category are oak, cherry, viburnum, grape, honeysuckle, greenbrier, and silverberry.

Wetland plants are annual and perennial herbaceous plants that grow wild on moist and wet sites. They furnish food and cover mostly for wetland wildlife. Typical examples are smartweed, wild millet, spikerush and other rushes, sedges, burreed, tearthumb, and aneilema. Submerged and floating aquatics are not in this category.

Shallow water areas are impoundments or excavations for controlling water, generally no more than 5 feet deep, to create habitat suitable for waterfowl. Some are designed to be drained, planted, and then flooded; others are permanent impoundments that grow submersed aquatics.

Table 3 also rates the soils according to their suitability as habitat for three kinds of wildlife—openland, rangeland, and wetland wildlife.

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

Rangeland wildlife are birds and mammals that normally live in natural range. Prairie chicken, wild turkey, deer, squirrel, and raccoon are typical examples.

Wetland wildlife are birds and mammals that normally live in wet areas, marshes, and swamps. Ducks, geese, shore birds, herons, and alligators are typical examples.

Recreation

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

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

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, a surface free of rocks and coarse fragments, no flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Picnic areas are attractive natural or landscaped tracts used primarily for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic is confined to access roads. The best soils are firm when wet but not dusty when dry; are free from flooding during the season of use; and do not have slopes or stoniness that greatly increases cost of leveling sites or of building access roads.

Playgrounds are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops, good drainage, no flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Paths and trails are used for local and cross country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded no more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Engineering [3]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

[3] TERRY E. SMITH, area engineer, Soil Conservation Service helped prepare this section.

TABLE 4.—*Recreation*

[Some terms in this table are explained in the glossary, where they are identified by an asterisk]

Soil series and map symbols	Camp areas	Picnic areas	Playgrounds	Paths and trails
Adamsville: Ad	Severe: floods, wet	Severe: floods	Severe: floods, too sandy, wet.	Severe: floods.
Aransas: Ar, As	Severe: floods, too clayey, wet.	Severe: floods, too clayey, wet.	Severe: floods, too clayey, wet.	Severe: floods, too clayey, wet.
Austwell: At, Au	Severe: floods, too clayey, wet.	Severe: floods, too clayey, wet.	Severe: floods, too clayey, wet.	Severe: floods, too clayey, wet.
Bayucos: BA	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet.
Beaumont: Be	Severe: percs slowly, too clayey, wet.	Severe: too clayey, wet	Severe: percs slowly, too clayey, wet.	Severe: too clayey, wet.
Contee Mapped only with Dacosta soils.	Severe: percs slowly, wet	Moderate: too clayey, wet	Severe: percs slowly, wet	Moderate: too clayey, wet.
Dacosta: Da, Dc, Dn For Contee part of Dc and Dn, see Contee soils.	Severe: percs slowly, wet	Moderate: too clayey, wet	Severe: percs slowly, wet	Moderate: too clayey, wet.
Dianola: Dp For Portalto part of Dp, see Portalto soils.	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet.
Edna: Ed, En	Severe: percs slowly, wet	Severe: wet	Severe: percs slowly, wet	Severe: wet.
Fordtran: Fo	Severe: percs slowly, wet	Moderate: too sandy, wet	Severe: percs slowly, wet	Moderate: too sandy, wet.
Francitas: Fr	Severe: percs slowly, too clayey, wet.	Severe: too clayey, wet	Severe: percs slowly, too clayey, wet.	Severe: too clayey, wet.
Galveston: Ga, Gc	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy.
Haplaquents: HA, Hd For Dianola part of Hd, see Dianola soils.	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet.
Harris: Hr, Hs	Severe: floods, percs slowly, too clayey, wet.	Severe: floods, too clayey, wet.	Severe: floods, percs slowly, too clayey, wet.	Severe: floods, too clayey, wet.
Ijam: Ic	Severe: percs slowly, too clayey, wet.	Severe: too clayey, wet	Severe: percs slowly, too clayey, wet.	Severe: too clayey, wet.
Kenney: Ke	Moderate: too sandy	Moderate: too sandy	Moderate: too sandy, slope.	Moderate: too sandy.
Lake Charles: La, Lc	Severe: percs slowly, too clayey.	Severe: too clayey	Severe: percs slowly, too clayey.	Severe: too clayey.
Livia: Lo, Lv, Lx	Severe: percs slowly, wet	Severe: wet	Severe: percs slowly, wet	Severe: wet.
Matagorda: Ma	Severe: percs slowly	Moderate: wet	Severe: percs slowly, wet	Moderate: wet.
Midland: Mb, Mc, Md For Dacosta part of Md, see Dacosta soils.	Severe: percs slowly, wet	Severe: wet	Severe: percs slowly, wet	Severe: wet.
Mustang: Mu	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet.
Placedo: Pc	Severe: floods, too clayey, wet.	Severe: floods, too clayey, wet.	Severe: floods, too clayey, wet.	Severe: floods, too clayey, wet.
Portalto: Pr For Roemer part of Pr, see Roemer soils.	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy.
Psamments: PS, Pt	Severe: floods, too sandy	Severe: floods, too sandy	Severe: floods, too sandy	Severe: floods, too sandy.
Rahal: Ra	Severe: percs slowly, too sandy.	Severe: too sandy	Severe: percs slowly, too sandy.	Severe: too sandy.
Roemer Mapped only with Portalto soils.	Severe: percs slowly, too sandy, wet.	Severe: too sandy	Severe: percs slowly, too sandy, wet.	Severe: too sandy.
Telferner: Te	Severe: percs slowly, wet	Moderate: wet	Severe: percs slowly	Moderate: wet.
Veston: Ve, Vs	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet	Severe: floods, wet.

Among properties of soils highly important in engineering are permeability, shear strength, compressibility, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 5, 6, and 7, which show, respectively, several estimated soil properties significant in engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 5 and 6, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning in soil science that may not be familiar to engineers. The Glossary defines many of these terms.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified Soil Classification System (*10*) used by the SCS engineers, Department of Defense, and others, and the AASHTO system adopted by the American Association of State Highway and Transportation Officials (*1*).

In the Unified system soils are classified according to particle size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL-ML.

The AASHTO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is assigned to one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils, which have high bearing strength and are the best soils for subgrade (foundation). At the other extreme, in group A-7, are clay soils, which have low strength when wet and are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 7; the estimated classification, without group index numbers, is shown in table 5 for all soils mapped in the survey area.

Estimated properties of soils

Estimates of soil properties significant in engineering are listed in table 5. These estimates are made for typical soil profiles, by layers sufficiently different to differ significantly in soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 5.

Hydrologic soil groups indicate the runoff potential after rainfall. Four major soil groups are used. The soils are classified on the basis of intake of water at the end of long duration storms occurring after prior wetting and opportunity for swelling and without the protective effects of vegetation.

The major soil groups are:

A. (Low runoff potential). Soils have high infiltration rates even thoroughly wetted. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission. Water readily passes through the soil.

B. Soils have moderate infiltration rates when thoroughly wetted. These consist chiefly of moderately deep to deep, moderately well drained to well drained soils that have a moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission.

C. Soils have slow infiltration rates when thoroughly wetted. These consist chiefly of soils having a layer that impedes downward movement of water or soils that have a moderately fine to fine texture. These soils have a slow rate of water transmission.

D. (High runoff potential). Soils have very slow infiltration rates when thoroughly wetted. These consist chiefly of clays of high swelling potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to bedrock, or distance from the surface of the soil to the upper surface of the rock layer, is not listed in table 5. Bedrock is many feet below the surface for all the soils of Calhoun County.

Depth to the seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in table 5 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state; and the liquid limit, from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 5. Data on liquid limit and plasticity index in table 7 are based on tests of soil samples.

Permeability is a quality that enables a soil to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 5 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed as a pH value. The pH value and terms describing soil reaction are explained in the Glossary.

Salinity refers to the amount of soluble salts in the soil. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25° C. Salinity affects the suitability of a soil for crop production, its stability when used as construction material, and its corrosive potential to metal and concrete.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks when dry or swells when wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Corrosion, as used in table 5, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil properties, such as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosion of concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A rating of *low* indicates a low probability of soil-induced corrosion damage. A rating of *high* indicates a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations

The interpretations in table 6 are based on the engineering properties of soils shown in table 5, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Calhoun County. In table 6, ratings summarize the limitation or suitability of the soils for all listed purposes but irrigation and drainage of crops and pasture. For those particular uses, table 6 lists those soil features not to be overlooked in planning and in installation and maintenance.

Soil limitations are expressed as *slight, moderate,* and *severe. Slight* indicates soil properties generally favorable for the rated use, or in other words, limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* indicates soil properties so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance is needed.

Soil suitability is expressed as *good, fair,* and *poor,* which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Following are explanations of the columns in table 6.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope affects difficulty of layout and construction and also determines the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor, and sides, or embankments, of compacted soil material. The assumption is made that the embankment is com-

TABLE 5.—*Estimates of soil*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. These soils may have the first column. The symbol > means

Soil series and map symbols	Hydrologic soil group	Depth to seasonal high water table	Depth from surface	USDA texture	Classification		Percentage less than 3 inches passing sieve—	
					Unified	AASHTO	No. 4 4.7 mm	No. 10 2.0 mm
		In	*In*					
Adamsville: Ad	C	20-40	0-48	Fine sand	SP, SP-SM	A-3	100	100
Aransas: Ar, As	D	>80	0-84	Clay	CH	A-7-6	100	100
Austwell: At, Au	D	0-24	0-42	Clay, silty clay	CH	A-7-6	100	98-100
			42-86	Silty clay loam, silty clay, clay.	CL, CH	A-7-6	100	98-100
Bayucos: BA	D	0-20	0-60	Loam, clay loam, silty clay loam, fine sandy loam.	CL	A-6	95-100	95-100
Beaumont: Be	D	>80	0-25	Clay	CH	A-7-6	100	85-100
			25-47	Clay	CH	A-7-6	100	90-100
			47-77	Clay	CH	A-7-6	100	90-100
Contee. Mapped only with Dacosta soils.	D	>80	0-8	Clay loam, silty clay loam	CL, CH	A-7-6	95-100	90-100
			8-62	Clay, silty clay	CH	A-7-6	95-100	90-100
			62-80	Clay loam, clay, silty clay, silty clay loam.	CL, CH	A-7-6	95-100	90-100
*Dacosta: Da, Dc, Dn. For Contee part of Dc and Dn, see Contee soils.	D	>80	0-10	Clay loam	CL	A-6, A-7	95-100	90-100
			10-46	Clay, silty clay	CL, CH	A-7	95-100	90-100
			46-84	Clay, silty clay, silty clay loam, clay loam.	CH, CL	A-7	95-100	90-100
*Dianola: Dp. For Portalto part of Dp, see Portalto soils.	D	18-40	0-4	Fine sandy loam, loamy fine sand, fine sand.	SM	A-2-4, A-4	100	100
			4-62	Loamy fine sand, fine sand.	SM, SP-SM	A-2-4	100	100
Edna: Ed, En	D	>80	0-6	Very fine sandy loam	SM-SC, SC, CL-ML, CL	A-4, A-6	100	100
			6-38	Clay	CH	A-7-6	100	100
			38-50	Sandy clay loam	CL, CH	A-7-6	100	100
			50-80	Loam	CL	A-6, A-7-6	100	100
Fordtran: Fo	C	14-40	0-28	Loamy fine sand	SM, SM-SC	A-2-4	80-100	80-100
			28-42	Sandy clay	CL, CH	A-7-6	95-100	90-100
			42-88	Clay loam, sandy clay loam, fine sandy loam.	CL	A-6, A-7-6	95-100	95-100
Francitas: Fr	D	>80	0-16	Clay	CH	A-7-6	100	100
			16-108	Clay	CH	A-7-6	98-100	95-100
Galveston: Ga, Gc	A	40-72	0-80	Fine sand	SW-SM	A-3	100	95-100
*Haplaquents: HA, Hd. For Dianola part of Hd, see Dianola soils.	D	0-18	0-6	Loamy fine sand	SM, SM-SC	A-2-4	100	100
			6-72	Fine sandy loam, loam, sandy clay loam.	SM-SC, SC, CL-ML, CL	A-4	100	100
Harris: Hr, Hs	D	0-50	0-12	Clay	CH	A-7-6	100	80-95
			12-40	Clay	CH	A-7-6	100	95-100
			40-86	Clay, silty clay	CH	A-7-6	100	100
Ijam: Ic	D	0-24	0-72	Clay	CH	A-7-6	100	90-95
Kenney: Ke	A	>80	0-68	Fine sand	SM	A-2-4	100	100
			68-98	Sandy clay loam	SC, CL	A-6, A-4	100	100
Lake Charles: La, Lc	D	>80	0-28	Clay	CH	A-7-6	100	100
			28-70	Clay	CH	A-7-6	100	100
			70-90	Silty clay	CH	A-7-6	95-100	95-100
Livia: Lo, Lv, Lx	D	>80	0-6	Silt loam, clay loam	CL, CL-ML	A-4	100	100
			6-15	Silty clay	CH	A-7-6	100	100
			15-72	Silty clay loam	CH	A-7-6	100	98-100
			72-96	Silty clay	CH	A-7-6	100	98-100
Matagorda: Ma	D	0-24	0-14	Very fine sandy loam	ML, CL-ML	A-4	100	98-100
			14-22	Clay loam	CL, CH	A-7-6	100	98-100
			22-31	Clay	CL, CH	A-7-6	100	98-100
			31-76	Sandy clay loam	CL	A-7-6	100	98-100
*Midland: Mb, Mc, Md. For Dacosta part of Md, see Dacosta soils.	D	>80	0-9	Clay loam	CL	A-6	100	100
			9-47	Clay, sandy clay	CH, CL	A-7-6	100	100
			47-80	Silty clay loam, clay	CL	A-6	100	100

properties significant in engineering

different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series that appear in greater than; < means less than]

Percentage less than 3 inches passing sieve—*Continued*		Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion to—	
No. 40 0.42 mm	No. 200 0.074 mm								Uncoated steel	Concrete
				In/hr	*In/in of soil*	*pH*	*Mmhos/cm at 25° C*			
80-95	4-10	----------	NP [1]	6.0 -20.0	0.02-0.05	5.6-8.4	2-20	Low	High	Moderate.
95-100	70-90	51-65	30-40	<0.06	0.15-0.18	7.9-8.4	([2])	High	High	Low.
85-100	80-95	51-65	30-40	<0.06	0.05-0.15	7.9-8.4	2-18	High	Very high	Low.
85-100	80-95	45-60	25-40	<0.06	0.01-0.10	7.9-8.4	18-25	High	Very high	Moderate.
85-95	65-85	20-40	11-20	0.60- 2.0	0.0 -0.10	7.9-8.4	20-50	Low	Very high	High.
65-75	60-70	55-65	35-45	0.06- 0.2	0.15-0.20	4.5-6.5	([2])	High	High	Moderate.
70-80	65-75	60-80	35-60	<0.06	0.15-0.20	5.6-8.4	([2])	High	High	Moderate.
75-90	80-90	75-90	55-65	<0.06	0.15-0.20	6.6-8.4	([2])	High	High	Moderate.
85-100	75-95	45-55	25-35	<0.06	0.14-0.18	7.9-8.4	([2])	High	Very high	Low.
85-100	75-95	51-65	30-40	<0.06	0.15-0.18	7.9-8.4	([2])	High	Very high	Low.
85-100	75-95	45-60	25-35	<0.06	0.13-0.17	7.9-8.4	([2])	High	Very high	Low.
90-100	70-80	35-45	20-25	0.20- 0.60	0.15-0.20	6.1-6.5	0-8	Moderate	Very high	Low.
90-100	75-95	45-60	30-40	<0.06	0.15-0.18	6.1-7.3	2-16	High	Very high	Low.
85-95	70-80	45-60	30-40	<0.06	0.13-0.15	7.4-8.4	2-16	High	Very high	Low.
80-95	20-50	<26	NP-3	6.0 -20.0	0.0 -0.01	7.9-8.4	8-40	Very low	Very high	High.
80-95	10-25	<24	NP-3	6.0 -20.0	0.0 -0.01	7.9-8.4	18-50	Very low	Very high	High.
90-100	45-60	18-25	4-13	0.60- 2.0	0.10-0.15	5.6-6.0	([2])	Low	High	Low.
90-100	60-80	51-60	30-40	<0.06	0.15-0.20	6.1-6.5	([2])	High	High	Low.
80-100	70-80	41-55	20-36	<0.06	0.15-0.20	7.9-8.4	([2])	High	High	Low.
80-100	60-70	35-45	20-30	<0.06	0.15-0.20	7.9-8.4	([2])	Moderate	High	Low.
80-100	15-30	18-25	2-6	2.0 - 6.0	0.07-0.11	5.6-6.5	([2])	Very low	Very high	Moderate.
80-95	65-90	41-60	20-40	<0.06	0.15-0.18	6.1-6.5	([2])	Moderate	Very high	Moderate.
90-100	70-80	30-50	20-30	<0.06	0.15-0.20	6.6-7.8	([2])	Moderate	Very high	Moderate.
95-100	80-95	51-65	30-40	<0.06	0.10-0.18	7.4-7.8	1-4	High	Very high	Low.
95-100	80-95	63-90	40-65	<0.06	0.06-0.12	7.9-8.4	4-20	Very high	Very high	Low.
65-80	5-10	----------	NP	6.0 -20.0	0.05-0.10	5.6-7.8	0-16	Low	High	Moderate.
80-95	20-35	10-20	2-4	2.0 - 6.0	0.0 -0.10	7.9-8.4	20-50	Very low	Very high	High.
80-95	36-60	10-20	4-10	2.0 - 6.0	0.0 -0.10	7.9-8.4	20-50	Very low	Very high	High.
70-95	70-95	65-75	45-50	0.06- 0.20	0.02-0.20	7.9-8.4	2-8	High	High	High.
90-100	80-90	60-70	35-45	<0.06	0.01-0.10	7.9-8.4	4-16	High	High	High.
90-100	85-95	60-70	35-55	<0.06	0.01-0.10	7.9-8.4	8-25	High	High	High.
90-95	80-95	60-75	35-55	<0.06	0.15-0.20	7.9-8.4	4-16	High	High	High.
50-75	10-20	<22	NP-3	6.0 -20.0	0.05-0.10	5.1-6.0	([2])	Low	Low	Moderate.
80-90	45-55	25-35	9-20	2.0 - 6.0	0.10-0.15	6.1-6.5	([2])	Low	Low	Moderate.
100	90-100	65-80	40-55	0.06- 0.2	0.15-0.20	6.1-7.8	([2])	High	High	Low.
100	90-100	75-90	45-60	<0.06	0.15-0.20	6.1-8.4	([2])	High	High	Low.
80-95	75-95	75-90	40-60	<0.06	0.15-0.20	7.9-8.4	([2])	High	High	Low.
100	70-80	20-30	5-10	0.60- 2.0	0.10-0.15	6.1-7.8	1-4	Low	Very high	Low.
100	75-90	51-60	30-40	<0.06	0.05-0.16	6.6-8.4	2-18	High	Very high	Low.
95-100	80-90	55-70	35-50	<0.06	0.05-0.15	7.9-8.4	2-25	High	Very high	Low.
95-100	80-97	60-80	45-60	<0.06	0.05-0.10	7.9-8.4	2-18	High	Very high	Low.
95-100	51-70	20-30	2-7	0.60- 2.0	0.13-0.17	6.1-7.3	0-8	Low	Very high	Moderate.
95-100	55-76	45-60	30-40	<0.06	0.15-0.18	6.1-8.4	0-18	High	Very high	Moderate.
95-100	55-75	45-60	30-40	<0.06	0.12-0.16	6.1-8.4	0-18	High	Very high	Moderate.
95-100	51-75	41-49	25-35	<0.06	0.10-0.15	7.4-8.4	0-18	Moderate	Very high	Moderate.
100	95-100	30-40	14-25	0.06- 0.2	0.20-0.22	6.1-6.5	([2])	High	High	Moderate.
100	95-100	45-65	20-40	<0.06	0.18-0.20	6.1-8.4	([2])	High	High	Moderate.
100	95-100	30-40	20-40	<0.06	0.15-0.20	8.5-9.0	([2])	High	High	Moderate.

TABLE 5.—*Estimates of soil properties*

Soil series and map symbols	Hydrologic soil group	Depth to seasonal high water table	Depth from surface	USDA texture	Classification		Percentage less than 3 inches passing sieve—	
					Unified	AASHTO	No. 4 4.7 mm	No. 10 2.0 mm
		In	*In*					
Mustang: Mu	A/D	0-40	0-54	Fine sand and loamy fine sand.	SW-SM	A-3	100	95-100
Placedo: Pc	D	0-12	0-8	Clay	CH, CL	A-7-6	100	100
			8-36	Clay	CH	A-7-6	100	100
			36-62	Clay loam, loam, clay	CL, CH	A-6, A-7-6	100	100
*Portalto: Pr. For Roemer part of Pr, see Roemer soils.	B	40-60	0-58	Fine sand	SM, SP-SM	A-2-4	100	100
			58-96	Fine sandy loam and sandy clay loam.	SM-SC, CL, SC, CL-ML	A-2-4, A-4	95-100	95-100
Psamments: PS, Pt	A/D	0-20	0-70	Fine sand	SP-SM	A-3	100	95-100
Rahal: Ra	C	10-35	0-35	Fine sand	SM	A-2-4	100	100
			35-62	Sandy clay	CL	A-6, A-7-6	100	100
			62-96	Sandy clay loam, fine sandy loam.	SC, CL	A-6	100	100
Roemer. Mapped only with Portalto soils.	C	0-30	0-30	Fine sand, loamy fine sand	SM	A-2-4	98-100	98-100
			30-39	Sandy clay loam	SC	A-4, A-6	98-100	98-100
			39-61	Fine sandy loam	SC, SM-SC	A-2-4, A-4	95-100	95-100
			61-84	Loamy fine sand	SM	A-2-4	95-100	95-100
Telferner: Te	D	10-24	0-15	Very fine sandy loam	CL, SC, SM-SC, CL-ML	A-4, A-2-4	100	100
			15-52	Sandy clay, clay	CL, CH	A-7-6	100	100
			52-84	Sandy clay loam, clay loam.	CL	A-6, A-7-6	98-100	98-100
Veston: Ve, Vs	D	0-24	0-12	Fine sandy loam, loam	ML, CL-ML, SM, SM-SC	A-4	100	100
			12-24	Loam	CL, CL-ML	A-4, A-6	100	100
			24-60	Silty clay loam	CL, CH	A-7-6	100	100

[1] Nonplastic. [2] The amount of salinity present is not significant.

TABLE 6.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil that may have different column. Some terms in this table are explained in the

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill	Local roads and streets
Adamsville: Ad	Severe: floods	Severe: floods, seepage.	Severe: floods, too sandy.	Severe: floods	Severe: floods, too sandy.	Severe: floods
Aransas: Ar, As	Severe: floods, percs slowly.	Severe: floods	Severe: floods, too clayey, wet.	Severe: floods, low strength, shrink-swell, wet.	Severe: floods, too clayey, wet.	Severe: floods, shrink-swell, wet.
Austwell: At, Au	Severe: floods, percs slowly, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, low strength, shrink-swell, wet.	Severe: floods, too clayey, wet.	Severe: floods, low strength, shrink-swell, wet.
Bayucos: BA	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.
Beaumont: Be	Severe: percs slowly, wet.	Moderate: excess humus.	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.

significant in engineering—Continued

Percentage less than 3 inches passing sieve—*Continued*		Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion to—	
No. 40 0.42 mm	No. 200 0.074 mm								Uncoated steel	Concrete
				In/hr	*In/in of soil*	*pH*	*Mmhos/cm at 25° C*			
65-80	5-10		NP	6.0 -20.0	0.01-0.05	7.9-8.4	2-20	Low	High	Low.
95-100	85-100	45-70	30-45	<0.06	0.0 -0.05	7.4-7.8	0-20	High	Very high	High.
95-100	85-100	51-70	30-45	<0.06	0.0 -0.01	7.4-7.8	16-40	High	Very high	High.
95-100	75-100	35-60	25-40	<0.06	0.0 -0.01	7.4-7.8	16-40	Moderate	Very high	High.
90-100	10-20	<24	NP-3	6.0 -20.0	0.05-0.08	5.6-6.5	(2)	Very low	Low	Moderate.
80-95	30-55	20-25	5-10	0.60- 2.0	0.11-0.15	5.6-8.4	(2)	Low	Low	Moderate.
65-80	5-10		NP	>20.0	0.0 -0.10	5.6-7.8	2-16	Low	High	Low to moderate.
75-90	12-25	<24	NP-3	6.0 -20.0	0.05-0.09	5.6-7.3	(2)	Very low	High	Low.
85-95	55-75	35-50	20-30	<0.06	0.12-0.16	6.6-7.8	(2)	Moderate	High	Low.
80-90	40-60	30-40	15-25	0.20- 0.60	0.10-0.13	7.4-8.4	(2)	Moderate	High	Low.
90-100	13-30	<26	NP-3	6.0 -20.0	0.05-0.09	5.1-7.3	(2)	Very low	Moderate	Moderate.
90-100	36-49	20-35	8-15	0.20- 0.60	0.15-0.18	5.1-6.0	(2)	Low	Moderate	Moderate.
85-100	30-45	20-30	4-10	0.60- 2.0	0.11-0.15	5.1-6.0	(2)	Low	Moderate	Moderate.
85-100	20-35	<26	NP-3	2.0 - 6.0	0.07-0.11	5.6-6.0	(2)	Very low	Moderate	Moderate.
95-100	25-60	20-30	5-10	0.60- 2.0	0.10-0.15	5.6-6.5	(2)	Low	High	Low.
95-100	55-75	41-55	30-40	<0.06	0.14-0.17	5.6-8.4	(2)	High	High	Low.
90-100	55-75	30-45	20-30	0.06- 0.2	0.12-0.15	7.4-8.4	(2)	Moderate	High	Low.
70-85	40-55	15-22	1-5	0.60- 2.0	0.10-0.15	7.9-8.4	2-10	Low	Very high	Moderate.
85-95	60-75	20-30	5-15	0.60- 2.0	0.12-0.18	7.9-9.0	4-16	Moderate	Very high	Moderate.
95-100	85-95	41-55	20-35	0.06- 0.20	0.12-0.18	7.9-9.0	4-20	High	Very high	Moderate.

interpretations

properties and limitations. For this reason it is necessary to follow carefully the instructions for referring to other series that appear in the first Glossary, where they are identified by an asterisk]

Degree and kind of limitations for—*Continued*		Suitability as source of—			Soil features affecting—	
Pond reservoir areas	Embankments, dikes, and levees	Road fill	Sand	Topsoil	Drainage of cropland and pasture	Irrigation
Severe: seepage	Severe: piping, seepage.	Fair: wet	Fair: excess fines	Poor: too sandy	Floods	Floods.
Slight	Moderate: unstable fill.	Poor: low strength, shrink-swell, wet.	Unsuited	Poor: too clayey	Floods, percs slowly, wet.	Floods, percs slowly.
Slight	Moderate: unstable fill.	Poor: low strength, shrink-swell, wet	Unsuited	Poor: too clayey, wet.	Floods, percs slowly, wet.	Floods, percs slowly.
Severe: floods	Severe: erodes easily.	Poor: wet	Unsuited	Poor: excess salts, wet.	Floods, wet	Floods, excess salts, wet.
Slight	Moderate: low strength, unstable fill.	Poor: low strength, unstable fill, wet.	Unsuited	Poor: too clayey, wet.	Percs slowly, wet	Slow intake, wet.

TABLE 6.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill	Local roads and streets
Contee. Mapped only with Dacosta soils.	Severe: percs slowly.	Slight	Severe: too clayey, wet.	Severe: low strength, shrink-swell.	Severe: too clayey.	Severe: low strength, shrink-swell.
*Dacosta: Da, Dc, Dn. For Contee part of Dc and Dn, see Contee soils.	Severe: percs slowly.	Slight	Severe: too clayey, wet.	Severe: low strength, shrink-swell.	Severe: too clayey	Severe: low strength, shrink-swell.
*Dianola: Dp. For Portalto part of Dp, see Portalto soils.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, low strength, wet.
Edna: Ed, En	Severe: percs slowly.	Slight	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.
Fordtran: Fo	Severe: percs slowly, wet.	Severe: wet	Severe: wet	Moderate: low strength, shrink-swell, wet.	Moderate: too clayey, wet.	Severe: low strength.
Francitas: Fr	Severe: percs slowly, wet.	Slight	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.
Galveston: Ga, Gc	Severe: floods	Severe: floods, seepage.	Severe: floods, too sandy.	Severe: floods	Severe: floods, seepage, too sandy.	Moderate: floods
*Haplaquents: HA, Hd. For Dianola part of Hd, see Dianola soils.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.
Harris: Hr, Hs	Severe: floods, percs slowly, wet.	Severe: excess humus, floods.	Severe: floods, too clayey, wet.	Severe: floods, low strength, shrink-swell, wet.	Severe: floods, too clayey, wet.	Severe: floods, low strength, shrink-swell, wet.
Ijam: Ic	Severe: percs slowly, wet.	Severe: wet	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.
Kenney: Ke	Slight	Severe: seepage	Severe: cutbanks cave.	Slight	Severe: seepage, too sandy.	Slight
Lake Charles: La, Lc.	Severe: percs slowly.	Slight	Severe: too clayey, wet.	Severe: low strength, shrink-swell.	Severe: too clayey.	Severe: low strength, shrink-swell.
Livia: Lo, Lv, Lx	Severe: percs slowly.	Slight	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.
Matagorda: Ma	Severe: floods, percs slowly.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, shrink-swell, wet.	Severe: floods, wet.	Severe: low strength, shrink-swell.
*Midland: Mb, Mc, Md. For Dacosta part of Md, see Dacosta soils.	Severe: percs slowly.	Slight	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.
Mustang: Mu	Severe: floods, wet.	Severe: floods, seepage, wet.	Severe: floods, too sandy, wet.	Severe: floods, wet.	Severe: floods, too sandy, wet.	Severe: floods, wet.
Placedo: Pc	Severe: floods, percs slowly, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet
*Portalto: Pr. For Roemer part of Pr see Roemer soils.	Severe: wet	Moderate: seepage, wet.	Severe: cutbanks cave.	Slight	Severe: too sandy	Slight

interpretations—Continued

Degree and kind of limitations for—*Continued*		Suitability as source of—			Soil features affecting—	
Pond reservoir areas	Embankments, dikes, and levees	Road fill	Sand	Topsoil	Drainage of cropland and pasture	Irrigation
Slight	Moderate: low strength, unstable fill.	Poor: low strength, shrink-swell.	Unsuited	Fair: too clayey	Percs slowly	Slow intake.
Slight	Moderate: low strength, unstable fill.	Poor: low strength, shrink-swell.	Unsuited	Fair: too clayey	Percs slowly	Slow intake.
Severe: seepage	Severe: low strength, piping.	Poor: wet	Fair: excess fines	Poor: thin layer, wet.	Floods, wet	Floods, wet.
Slight	Moderate: low strength, unstable fill.	Poor: low strength, shrink-swell, wet.	Unsuited	Poor: thin layer, wet.	Percs slowly	Percs slowly.
Slight	Moderate: low strength.	Poor: low strength.	Poor: excess fines	Poor: too sandy	Percs slowly	Percs slowly.
Slight	Moderate: low strength.	Poor: low strength, shrink-swell, wet.	Unsuited	Poor: too clayey, wet.	Percs slowly	Excess salts, slow intake.
Severe: seepage	Severe: piping, seepage.	Good	Fair: excess fines	Poor: too sandy	Floods	Fast intake.
Severe: floods	Severe: erodes easily.	Poor: wet	Poor: excess fines	Poor: excess salts	Floods, wet	Floods, excess salts, wet.
Severe: floods	Severe: low strength.	Poor: low strength, shrink-swell, wet.	Unsuited	Poor: too clayey, wet.	Floods, percs slowly.	Floods, excess salts, wet.
Slight	Severe: low strength.	Poor: low strength, shrink-swell, wet.	Unsuited	Poor: excess salts, too clayey, wet.	Percs slowly, wet	Excess salts, wet.
Severe: seepage	Severe: piping, seepage.	Good	Poor: excess fines	Poor: too sandy	Favorable	Fast intake, seepage.
Slight	Moderate: low strength, unstable fill.	Poor: low strength, shrink-swell.	Unsuited	Poor: too clayey	Percs slowly	Slow intake.
Slight	Moderate: low strength, unstable fill.	Poor: low strength, shrink-swell, wet.	Unsuited	Poor: excess salts, wet.	Percs slowly	Excess salts, percs slowly.
Slight	Moderate low strength, unstable fill.	Poor: low strength, shrink-swell.	Unsuited	Fair: thin layer	Floods, percs slowly.	Excess salts, percs slowly.
Slight	Moderate: low strength, unstable fill.	Poor: shrink-swell, wet.	Unsuited	Poor: wet	Percs slowly, wet	Percs slowly.
Severe: seepage	Severe: piping, seepage.	Poor: wet	Fair: excess fines	Poor: excess salts, too sandy, wet.	Floods	Excess salts, floods.
Slight	Moderate: low strength.	Poor: shrink-swell, wet.	Unsuited	Poor: too clayey, wet.	Floods, wet	Excess salts, floods, wet.
Severe: seepage	Severe: erodes easily, piping, seepage.	Good	Fair: excess fines	Poor: too sandy	Wet	Fast intake.

TABLE 6.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill	Local roads and streets
Psamments: PS, Pt	Severe: floods, seepage, wet.	Severe: floods, seepage, wet.	Severe: floods, wet	Severe: floods, wet.	Severe: floods, too sandy.	Moderate: floods, wet.
Rahal: Ra	Severe: percs slowly, wet.	Severe: wet	Severe: cutbanks cave.	Severe: wet	Severe: wet	Severe: low strength.
Roemer. Mapped only with Portalto soils.	Severe: percs slowly, wet.	Severe: wet	Severe: too sandy, wet.	Severe: wet	Severe: too sandy, wet.	Moderate: wet
Telferner: Te	Severe: percs slowly, wet.	Severe: wet	Severe: too clayey, wet.	Severe: low strength, shrink-swell, wet.	Severe: wet	Severe: low strength, shrink-swell.
Veston: Ve, Vs	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, wet.	Severe: floods, low strength, shrink-swell, wet.

TABLE 7.—*Engi-*

[Tests performed by the

Soil name and location of sample	Parent material	Report No.	Depth	Soil shrinkage data			Mechanical analysis [1]
				Shrinkage limit	Linear shrinkage	Shrinkage ratio	Percentage passing sieve — ⅜-in.
			In				
Francitas clay: 3 miles southwest of Port Lavaca, 0.95 mile south of State Highway 238 from its intersection with State Highway 316, 1.1 miles northeast of field road. (Modal)	Moderately alkaline clay.	70-224-R	0-16	12	19.5	1.95	
		70-225-R	38-59	12	27.0	2.02	100
		70-226-R	69-82	10	27.8	2.06	
Livia silt loam: 5 miles southwest of Port Lavaca, 2.8 miles southeast of State Highway 238, 1.1 miles southeast of State Highway 316 and 456 feet southeast of private road. (Modal)	Moderately alkaline silty clay.	70-227-R	0-5	18	3.0	1.75	
		70-228-R	5-13	14	16.9	1.89	
		70-229-R	26-46	12	19.5	2.00	
		70-230-R	75-95	11	24.9	2.03	
Matagorda very fine sandy loam: 5 miles southwest of Port Lavaca, 7.3 miles southeast of State Highway 316, 0.75 mile south of Farm Road 112, 0.67 mile west of Farm Road 113 and 100 feet north of private road. (Modal)	Moderately alkaline sandy clay loam.	70-231-R	0-10	20	2.3	1.65	
		70-232-R	19-31	14	17.2	1.90	
		70-233-R	47-76	9	17.7	1.89	

[1] Mechanical analyses according to the AASHTO Designation T 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in

interpretations—Continued

Degree and kind of limitations for—*Continued*		Suitability as source of—			Soil features affecting—	
Pond reservoir areas	Embankments, dikes, and levees	Road fill	Sand	Topsoil	Drainage of cropland and pasture	Irrigation
Severe: seepage	Severe: erodes easily, piping, seepage.	Good	Fair: excess fines	Poor: excess salts, too sandy.	Floods, wet	Excess salts, floods, wet.
Moderate: seepage.	Moderate: low strength.	Fair: shrink-swell, wet.	Poor: excess fines	Poor too sandy	Percs slowly, wet	Fast intake, wet.
Severe: seepage	Moderate: piping	Fair: low strength.	Poor: excess fines	Poor: too sandy	Wet	Fast intake, wet.
Slight	Moderate: low strength.	Poor: low strength, shrink-swell.	Unsuited	Fair: thin layer	Percs slowly, wet	Percs slowly, wet.
Moderate: floods	Moderate: low strength, unstable fill.	Poor: low strength, shrink-swell, wet.	Unsuited	Poor: excess salts, wet.	Floods, wet	Excess salts, floods, wet.

neering test data

Texas Highway Department]

Mechanical analysis [1]—*Continued*							Liquid limit	Plasticity index	Classification [2]	
Percentage passing sieve—*Continued*				Percentage smaller than					AASHTO [3]	Unified
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.005 mm	0.002 mm	*Pct*			
----------	100	99	88	79	50	42	59	38	A-7-6(20)	CH
99	98	97	92	87	71	62	89	64	A-7-6(20)	CH
----------	100	99	91	83	55	45	63	45	A-7-6(20)	CH
----------	----------	100	77	60	18	11	24	6	A-4(8)	CL-ML
----------	----------	100	82	69	43	38	53	34	A-7-6(18)	CH
100	99	98	83	74	47	42	58	41	A-7-6(19)	CH
100	99	97	96	93	73	61	78	55	A-7-6(20)	CH
----------	----------	100	62	44	8	4	24	3	A-4(5)	ML
----------	----------	100	66	55	41	36	54	38	A-7-6(16)	CH
----------	----------	100	58	49	36	33	46	31	A-7-6(14)	CL

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 of soil.

[2] Classifications made by SCS personnel.

[3] Based on AASHTO Designation M 145-49.

pacted to medium density and the pond is protected from flooding. The properties considered affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic matter, and slope. If the floor needs to be leveled, depth to bedrock becomes important. Soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified Soil Classification and the amount of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Shallow excavations require digging or trenching to a depth of less than 6 feet, as for example, excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, no rock outcrop or big stones, no flooding, and no high water table.

Dwellings without basements, as rated in table 6, are no more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the suitability of a soil for dwellings relate to the capacity of the soil to support load and resist settlement under load and to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated the ratings in table 6 apply only to a depth of about 6 feet. Limitation ratings of *slight* or *moderate*, therefore, may not be valid if trenches are to be much deeper than that. For some soils, reliable predictions can be made to a depth of 10 or 15 feet, but regardless of that, every site should be investigated before it is selected.

Local roads and streets, as rated in table 6, have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that most affect design and construction of roads and streets are the load-supporting capacity and stability of the subgrade and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect the ease of excavation and the amount of cut and fill needed to reach an even grade.

Pond reservoirs hold water behind a dam or embankment. Soils suitable for a pond reservoir have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Stones or organic materials in a soil are among factors that are unfavorable.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

Sand is used in great quantities in many kinds of construction. The ratings in table 6 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, depth of the water table, or other factors that affect mining of the materials. Neither do they indicate quality of the deposit.

Topsoil is used in topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material, as in preparing a seedbed; the natural fertility of the material, or the response of plants when fertilizer is applied; and the occurrence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability. Also considered in the ratings is damage that results at the area from which topsoil is taken.

Drainage of crops and pasture is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope; stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion or soil blowing; soil texture; content of stones; accumulations of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer, as in a fragipan or another layer that restricts movement of water; amount of water held available to plants; the need for drainage; and depth to the water table or bedrock.

Engineering test data

Table 7 contains engineering test data for some soils in Calhoun County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications are based on data obtained by mechanical analyses and by tests to determine liquid limit and plastic limit. The mechanical analyses were made by combined sieve and hydrometer methods.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, as explained in the foregoing paragraphs.

Shrinkage limit is the percentage of moisture at which shrinkage of the soil material stops.

Shrinkage ratio is the relation of change in the volume of the soil material to the water content of the soil material at the shrinkage limit. The change in volume is expressed as a percentage of the air-dry volume of the soil material, and the water content is expressed as a percentage of the oven-dry weight.

Linear shrinkage is the decrease in one dimension, expressed as a percentage of the original dimension of the soil mass when the moisture content is reduced from the given value to the shrinkage limit.

Geology of Calhoun County [4]

Calhoun County is within the Western Gulf physiographic province, where the slopes and the subsurface geologic formations dip gently gulfward.

The surface geologic units, the parent material of the soils in this province, can be divided into three age groups. The youngest group, the Holocene, or Recent, consists of the alluvial and deltaic deposits of the Guadalupe River; the marsh, tidal, and washover fan deposits around the margins of Espiritu Santo and San Antonio Bays; and the sandy beach and barrier deposits on Matagorda Island. The second group, intermediate in age between the Holocene deposits and the generally higher upland deposits, is the terrace material in the northwestern part of the county, north of Green Lake and mainly west of Texas Highway 185. This terrace material can probably be assigned to the Deweyville Formation of Late Pleistocene or Early Holocene age, as mapped on the Geologic Atlas of Texas.[5] The oldest group can be placed in the Beaumont Formation of the Geologic Atlas. In this group are the uplands of the county, some low-lying areas of saline soils, and the large sandy tract between Port O'Connor and Seadrift.

The soil associations shown on the general soil map at the back of this publication can be used conveniently, but only approximately, in referring to these several geologic units.

Most of the Holocene alluvial-deltaic deposits are within the area of the Austwell-Aransas-Harris association. The clayey soils of this association formed mostly in interdistributary or interchannel marsh and lacustrine deposits. The high-bottom Aransas and Austwell soils are mostly on the levees flanking distributaries and channels, especially along Hog Bayou, an old channel of the Guadalupe, and along the present channel. More extensive levee deposits are shown on the maps compiled by Donaldson and others (*4*). This valley fill has been laid down as a series of advancing, successively abandoned deltas, which have been gradually filling San Antonio Bay for the past 2,000 years.

The sandy deposit on the gulfward side of Matagorda Island is the parent material for the offshore part of the Galveston-Adamsville association. The series of parallel ridges near the shore are beach ridges abandoned as the shoreline has moved gulfward. The ridges have been modified by eolian activity, and behind the ridges are sand dunes. The sand probably comes from such sources as the Brazos and Colorado Rivers, transported by longshore drift moving southwestward, and from the Continental Shelf (*5*).

On the landward side of Matagorda Island and on the northern shore and eastern margin of Espiritu Santo Bay are the mainly fine-grained coastal marsh areas of the Haplaquents-Bayucos association. The fan-shaped bulges of Matagorda Island along the southern shore of the bay and the elongate islands at the eastern side of the bay are the subaerial parts of active and abandoned tidal deltas and washover fans. Tidal deltas are deposits built by tidal water moving in and out through passes. Fine grained material is trapped by salt-tolerant vegetation on the tidal flats. The washover fans are laid down by hurricane driven storm surges, which crossed Matagorda Island in the past depositing both sandy and clayey material in the bay (*2, 6*).

The Deweyville Formation is mostly represented by the Kenney and Fordtran soils of the Telferner-Edna association, just east of the Guadalupe River and north of Green Lake. These soils are largely on terraces elevated above the deltaic-alluvial deposits of the Holocene Guadalupe River. The levels evident here—at least two distinct ones—record a complex history of deposition and downcutting. Sandy soils, such as Fordtran and Kenney soils, formed in stream-deposited sediments, which have probably been reworked by the wind before and during the formation of the soils. Other soils likely formed on the strath terraces or planed-off areas of older sediments, which were lowered topographically by the cutting of a pre-Holocene Guadalupe River.

The rest, and geologically the oldest part, of the county belongs to the Beaumont Formation. Within the area of the Beaumont Formation are two major genetic units—a deltaic-alluvial plain and barrier lagoon.

The deltaic plain was deposited by an older Guadalupe River and by an older Lavaca-Navidad system. The Guadalupe plain lies essentially between the alluvial valley and terraces of the present channel of the Guadalupe to the west and Lavaca Bay to the east and north of the Livia-Francitas association in this area. The smaller plain of the Lavaca-Navidad system is east of Lavaca Bay.

On the general soil map in this publication, the Guadalupe surface is shown as a relict depositional pattern. The elongate branching pattern of the Dacosta-Midland-Contee association shown on the map records the changing course of an older Guadalupe as a series of distributary belts or meander ridges. These belts and ridges contrast with the clayey deposit of back swamp or flood basin origin, which was the parent material of the Livia-Francitas association. The U.S. Geological Survey topographic maps of this area show the distributaries in many places to be generally less than 5 feet above the areas of the Livia-Francitas association. In many places no topographic difference between these associations is evident on the maps. The somewhat bulbous, or spatulate, ends of the Dacosta-Midland-Contee associations are probably the areas of little deltas, similar in size to the little subdelta lobes of the Guadalupe River (*4*).

The pattern is poorly developed and preserved in the Lavaca-Navidad part of this unit. In general, however, it is possible that the sandier soils of the Telferner-Edna and

[4] By SAUL ARONOW, professor of geology, Lamar University, Beaumont, Texas.

[5] Beaumont and Houston Sheets, Univ. Texas Bur. Econ. Geology, 1968a, 1968b.

Dacosta-Midland-Contee associations formed in distributary deposits and the clayey soils of the Livia-Francitas associations formed in flood-basin deposits.

The meandering stream patterns on the distributary belts are no longer evident. Mass-wasting and wind activity have destroyed most of the original depositional pattern. About the only place where a pattern is evident is the channel of Little Chocolate Bayou in the northern part of the Dacosta-Midland-Contee association northwest of Port Lavaca. In the Lavaca-Navidad area, only the gross north-south lineation of the soil association units is preserved.

The second major genetic unit in the area of the Beaumont Formation, the barrier lagoon, underlies the mainland part of the Portalto-Roemer and Livia-Francitas associations between San Antonio Bay and Lavaca Bay. The sandy soils of the Portalto-Roemer association formed in parent material derived from the relict Ingleside barrier island system, named for Ingleside, Texas, in Aransas County, where it was first identified by W. A. Price (*6*). This old system of barrier islands extends from the south side of Corpus Christi Bay to an area north of Lake Charles in Louisiana. Though the area is now covered with pimple mounds, the lineation of beach ridges, similar to that of Matagorda Island, is still evident on aerial photographs. The similarity of soils on the relict and modern barrier islands suggests a recent reworking of the parent material by the wind. Evidence of this fact is the many mounds of buried soils on the relict barrier, particularly Portalto and Rahal soils.

The level area of the Livia-Francitas association is in the almost filled relict lagoon behind the old barrier, a landscape similar to that of Espiritu Santo and San Antonio Bays landward of Matagorda Island. The parent material of this association was derived from the now-drained, subaqueous lagoonal deposits; the relict tidal and washover fans; and the sandy and silty material blown inland from the Ingleside barrier since the emergence of the lagoon.

The key events in the local geologic history are the effects of the several Pleistocene glaciations, which have occurred within the past 1 to 3 million years. An elaborate correlation of glacial events with those in the Gulf Coast region was worked out by A. N. Fisk and his associates (*3, 5*).

During the Pleistocene epoch continental glaciers advanced in at least four major surges. During this epoch of maximum glacial advance, the sea level fell approximately 350 to 450 feet. During the interglacials, or periods of glacial retreat, sea level rose to its present height or higher. The surface deposits of Calhoun County are related to the later events in the glacial history of North America.

The oldest surface geologic unit in the county, the Beaumont Formation, was deposited during an interglacial time at a sea level similar to the present. The Guadalupe and the combined Lavaca and Navidad Rivers built up deltaic-alluvial plains, filling indentations and shallow areas along the paleocoast in a manner similar to that of the present day Rio Grande and Brazos Rivers. Offshore from the old rivers, and probably with the seaward extension of the deltaic-alluvial plains, the Ingleside barrier was built much like the present Padre Island offshore from the Rio Grande delta. Some geologists believe that the Beaumont Formation was deposited during the Sangamon interglacial stage, between the Illinoian and Wisconsin stages; others assign it to a time of glacial retreat and high sea level within the Wisconsin, the last pre-Holocene glacial stage.

Following the laying down of the Beaumont Formation, glacial ice advanced; sea level dropped so that all of the Gulf Coast streams deepened their channels in response to this new base level. The streams flowed across the newly exposed Continental Shelf to a more distant Gulf. During this entrenchment the troughs now occupied by San Antonio and Lavaca Bays were cut. Some of the terrace material of the Deweyville Formation may have been deposited and related surfaces planed off as sea level was lowered.

With a subsequent rise in sea level, beginning perhaps 18,000 years ago, the bays were flooded, the surface of the Beaumont Formation tilted gently seaward, and possibly some of the lowermost Deweyville terrace material was laid down.

Sometime in the past 3,500 to 5,000 years, sea level reached its present height. All of the surface Holocene features, the Guadalupe delta complex, the marsh and related deposits of the Haplaquents-Bayucos association, and the Matagorda Island barrier have been deposited in relation to this present-day level of the sea. According to radiocarbon dates on related examples, all of these features are less than 5,000 years old. The deposits of the Deweyville Formation range in age from about 12,000 to 33,000 years. Radiocarbon dates on shell, wood, and bone fragments from the Beaumont Formation are almost all "dead" insofar as radiocarbon is concerned. Thus, this formation can be considered older than 40,000 years.

Formation and Classification of the Soils

The first part of this section defines the factors that influence soil formation, and the second part deals with the classification of soils (*9*).

Formation of Soils

Soil is produced by the action of soil-forming processes on material deposited or accumulated by natural forces. The characteristics of the soil at any given point are determined by the physical and mineral composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief or lay of the land; and the length of time the forces of soil formation have acted on the soil material.

Climate and living organisms, particularly vegetation, are the active forces of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil. The length of time may be short or long, but some time is always required for soil horizons to form. Usually a long time is required for the formation of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil formation are unknown.

Parent material

Old alluvium laid down by ancient streams and marine sediments physiographically related to the present Gulf of Mexico was the chief parent material of the soils of Calhoun County.

The surface geologic material—the unweathered earth material considered to be like the parent material of the soils—ranges widely in texture and mineralogy. The relative geologic age of the surface units bears little relationship to the texture of the parent material.

The alluvial and deltaic deposits associated with the Guadalupe River system consist mostly of dark colored clayey and silty sediments derived from the erosion of grassland plain soils of south-central Texas. Aransas and Austwell soils are typical examples of soils formed from these materials. The textural fractions were segregated to some extent as sediments were carried beyond stream channels during flood stages. As rivers flood, water spreads out over the flood plain, and the coarser sediments are dropped first. As the floodwaters continue to spread, they move more slowly and deposit finer sediments, such as silt. When the headwater flow is normal and still water is left standing in the lower areas of the flood plain, the finest sediments, or clay, settle out. As the material flows laterally out of swift-flowing channels, most often a raised border or natural levee deposit forms. The material deposited contains a higher proportion of the less fine sediments, such as silt or very fine sand. The high-bottom Aransas and Austwell soils formed on these landforms.

The marine deposits of Calhoun County, as related to the parent material, are of three broad types.

Matagorda Island, with its beaches and barrier system, and the mainland coastal beach complex are dissimilar as related to geologic age, but similar in texture and mineral composition. This fact suggests the effect of reworking of the parent material by wind action. These deposits are sandy, marked by dune mounds and ridges. Adamsville, Galveston, Portalto, and Roemer soils formed in this parent material.

A second depositional type occurs landward from the coastal beaches, but at a somewhat lower elevation than the mainland prairie. Its physiography was that of a broad basin, which is not evident today, but which tended to hold surface water and into which flowed runoff containing very fine sediments. As a result, this imperfectly drained geological material is clayey and in many places is saline. Livia and Francitas soils formed in this material.

The third category of geologic deposits occupies the most elevated part of the county, between the Guadalupe River system and the upper Lavaca Bay. These are calcareous clayey deposits, the parent material of Lake Charles, Dacosta, and Midland soils.

Climate

The main climatic forces that act on the parent material of soils are the amount and distribution of precipitation, the temperature, the humidity, and the wind. Climate directly affects soil formation through its influence on weathering, leaching of carbonates, downward movement of clay particles, reduction and movement of iron, and rate of erosion. Climatic forces also cause some of the variations in the plant and animal life on and in the soils. They thus influence changes in the parent material that are the result of differences in the kinds of plants and animals.

The climate in Calhoun County is humid subtropical. The humidity is high throughout the year, because the county is situated on the Gulf of Mexico, lacks any areas of appreciable land elevation, and has significant water areas in the form of inland bays. The high humidity lessens the amount of moisture that might otherwise be lost through evaporation and transpiration. As a result, clayey soils seldom dry below a depth of 20 inches and sandy soils at elevations within a few feet of mean sea level have a water table within root-growing depth for varying periods during the year. The effect of soil moisture on soil formation is pronounced in most soils. No deep soils can form where the water table is prevalent. Soil layers in which the water table fluctuates are predominately gray as a result of iron reduction in the absence of air. Soils having a continuous supply of moisture during an otherwise favorable growing regime produce large quantities of vegetative residue and a correspondingly high level of organic matter.

The temperature is never low for extended periods in Calhoun County and is high enough to allow the growth of some plants in all seasons of the year. Although temperature influences the formation of soils and the prevailing high temperatures affect soil formation by fostering a dynamic biological regime, soil differences that result from the temperature factor are only slight.

Plant and animal life

Plants, micro-organisms, earthworms, and other forms of life on and in the soil are active in soil-forming processes. They provide organic matter, help to decompose plant residue, influence the chemistry of the soil, and hasten soil formation. Living organisms also help to convert plant nutrients into a form readily available to higher plants. Some forms of life, such as burrowing animals, interfere with the formation of horizons by churning or mixing the soil.

The soils of Calhoun County formed mostly under a cover of native grasses, although this cover has varied considerably in type and quantity. The differences in native vegetation were associated mainly with variations in drainage and salinity. The narrow borders of freshwater streams had a hardwood forest cover of elm, hackberry, and oak and an understory of tall grasses.

The soils of the upland prairies, such as Lake Charles clay and Midland clay loam, formed under a dense stand of tall grasses. They contain more organic matter and are darker to a greater depth than the soils that formed under trees.

The poorly drained, saline soils of the upland basins, such as Livia and Francitas soils, formed under a native vegetation dominated by gulf cordgrass, paspalum, and low panicum. Soils of the undulating, duned coastal lowlands, such as Galveston and Adamsville soils, formed under a cover of drought-resistant bunch grasses, such as seacoast bluestem, reedgrass, and gulfdune paspalum.

Soils of the coastal marshes, such as Harris, Rahal, and Bayucos soils, formed under dense stands of salt-tolerant grasses and sedges that thrive in water. As a result they are darker in color and higher in content of organic matter than associated soils of the coastal prairie.

Man has had an important effect on the formation and rate of formation of some soils of Calhoun County. In order to cultivate the land, he has drained some soils and has protected others by diversion levees from inundation by flood and storm-blown waters. He has introduced new species of plants, added fertilizers, and irrigated crops. The results of such changes have a definite influence on soil genesis. The effect may be apparent only after the lapse of much time.

Relief

Relief influences the formation of soils through its effect on drainage and runoff, rate of erosion, plant cover, and exposure to sun and wind.

Most soils in the county have slow or very slow runoff because of the nearly level topography and the lack of defined natural flow channels. Where the percolation of water through the soil is slow or very slow because of permeability characteristics, drainage is a significant problem.

The broad upland expanses of Lake Charles, Dacosta, and Midland soils, in the more elevated parts of the county, are nearly level to gently sloping. These soils are mostly somewhat poorly drained. Some have moderately effective drainageways that are either natural or artificially installed. Large amounts of water penetrate deeply into subsurface layers because runoff is slow or very slow. As a result, a dense, clayey subsoil forms. Most of these soils have a mineralogy that promotes a high volume change as the soil dries and cracks and again becomes wet from rainfall. These are the so-called high shrink-swell soils—the soils that form a characteristic microrelief of pits and mounds or ridges and furrows where undisturbed.

A lateral band of soil extending the width of the central part of the county from Seadrift to Indianola is less well drained than soil to the northwest. This band is an old broad, depressed landform that has a basin effect, hardly perceptible to the eye. Slopes are less than one-half percent. Lacking soil slope and natural drainage channels, this band has very slow runoff and water remains at the soil surface and accumulates in the lower areas. Thus, in spite of very slow permeability, much water passes through the soil and it is wet for long periods. Examples in this area are the Francitas and Livia soils.

Soils of the coastal lowlands, including the sandy beaches, and soils of Matagorda Island are nearly level in the broad aspect, but are generally undulating in local relief. Most have formed mounds or dunes through wind action or parallel ridges separated by narrow, elongated basins. Minor differences in elevation influence the depth to permanent or fluctuating water table as well as the accumulation and removal of soluble salts. For example, Galveston soils on ridges or mounds may be leached of salts. Adamsville soils, in contrast, may vary in the amount and the vertical location of accumulated salts, depending on the season.

Alluvial soils and soils of the coastal marshes formed in more recent material than did the soils of higher elevation. The major factors in formation are the character of parent material and the kind and amount of vegetation that grows and has accumulated in and on the soils. Relief factors account for very little distinction among soils. All types are affected by wetness and the lack of adequate aeration. Soils of the coastal marches and the tidal flats, such as Placedo and Bayucos soils, are better protected from fire and overgrazing and are thus higher in content of organic matter than Adamsville, Dianola, and Galveston soils.

Time

Time, generally a long time, is required for the formation of soils that have distinct horizons. The degree of formation in the soil profile is mostly determined by the length of time that the parent material has been in place. Some soils, however, such as those formed in alluvial sediments on flood plains, require a shorter time than upland soils. When other factors are equal, the age of soils is reflected in the distinctness of the horizons in the profile. The importance of time as a factor in soil formation always depends on the other soil-forming factors.

According to the description of the soil parent material units in the geology section of this publication, the geologic ages, while distinguished, were not marked by important contrasts. There is otherwise little evidence that time has been the cause of many of the differences among the soils of Calhoun County. It has perhaps been an important factor in differences of formation between the alluvial and coastal marsh soils and the more elevated soils in the county. Some soils of the uplands are geologically older than others, but the effective differences appear to be slight. The differences among these soils mainly reflect differences in parent material and relief.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The system of soil classification currently used[a] was adopted by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in developments of the current system should search the latest literature available.

The current system of classification has six categories. Beginning with broadest, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. In table 8, the soil series of Calhoun County are classified in three categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates. Each order is identified by a word of three of four syllables ending in *sol* (Ent-i-sol).

Five orders are represented in Calhoun County.

Alfisols have a light-colored surface layer low in organic matter, a clay-enriched B horizon, an accumulation of aluminum and iron, and a base saturation of more than 35 percent.

Entisols show little or no evidence of the formation of pedogenic horizons.

Inceptisols have a light-colored surface layer low in organic matter, but lack a clay-enriched B horizon.

Mollisols have a dark-colored surface layer high in organic matter and have a base saturation of more than 50 percent.

Vertisols are clayey soils in which deep, wide cracks form.

SUBORDER. Each order is divided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. Each suborder is identified by a word of two syllables. The last syllable indicates the order. An example is *Aquent* (*Aqu*, meaning water or wet, and *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark-red and dark-brown colors associated with basic rocks, and the like. Each great group is identified by a word of three or four syllables; a prefix is added to the name of the suborder. An example is Haplaquents (*Hapl*, meaning simple horizons, *aqu* for wetness or water, and *ent*, from Entisols).

SUBGROUP. Each great group is divided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the

TABLE 8.—*Soil series classified according to current system of classification*

Series	Family	Subgroup	Order
Adamsville	Hyperthermic, uncoated	Aquic Quartzipsamments	Entisols.
Aransas	Fine, montmorillonitic (calcareous), hyperthermic.	Vertic Haplaquolls	Mollisols.
Austwell	Fine, montmorillonitic (calcareous), hyperthermic.	Typic Haplaquepts	Inceptisols.
Bayucos	Fine-loamy, mixed (calcareous), hyperthermic.	Typic Haplaquents	Entisols.
Beaumont	Fine, montmorillonitic, thermic	Entic Pelluderts	Vertisols.
Contee	Fine, montmorillonitic (calcareous), hyperthermic.	Vertic Haplaquepts	Inceptisols.
Dacosta	Fine, montmorillonitic, hyperthermic	Vertic Ochraqualfs	Alfisols.
Dianola	Siliceous, hyperthermic	Typic Psammaquents	Entisols.
Edna	Fine, montmorillonitic, thermic	Vertic Albaqualfs	Alfisols.
Fordtran	Clayey, mixed, hyperthermic	Arenic Albaqualfs	Alfisols.
Francitas	Fine, montmorillonitic, hyperthermic	Typic Natraqualfs	Alfisols
Galveston	Mixed, hyperthermic	Typic Udipsamments	Entisols.
Harris	Fine, montmorillonitic, thermic	Typic Haplaquolls	Mollisols.
Ijam	Fine, montmorillonitic, nonacid, thermic	Vertic Fluvaquents	Entisols.
Kenney	Loamy, mixed, thermic (siliceous)	Grossarenic Paleudalfs	Alfisols.
Lake Charles	Fine, montmorillonitic, thermic	Typic Pelluderts	Vertisols.
Livia	Fine, montmorillonitic, hyperthermic	Typic Natraqualfs	Alfisols.
Matagorda	Fine, mixed, hyperthermic	Typic Natraqualfs	Alfisols.
Midland	Fine, montmorillonitic, thermic	Vertic Ochraqualfs	Alfisols.
Mustang	Mixed, hyperthermic	Typic Psammaquents	Entisols.
Placedo	Fine, montmorillonitic, nonacid, hyperthermic.	Typic Fluvaquents	Entisols.
Portalto	Loamy, siliceous, hyperthermic	Grossarenic Paleudalfs	Alfisols.
Rahal	Clayey, mixed, hyperthermic	Arenic Albaqualfs	Alfisols.
Roemer	Loamy, siliceous, hyperthermic	Arenic Ochraqualfs	Alfisols.
Telferner	Fine, montmorillonitic, hyperthermic	Typic Albaqualfs	Alfisols.
Veston	Fine-silty, mixed, nonacid, hyperthermic	Typic Fluvaquents	Entisols.

TABLE 9.—*Temperature*

[Data from Port Lavaca, Tex.,

Month	Temperature [1]				Precipitation			
						Probability of receiving selected amounts during month		
	Mean daily maximum	Mean monthly maximum	Mean daily minimum	Mean monthly minimum	Mean total	0 inch or trace	0.5 inch or more	1 inch or more
	°*F*	°*F*	°*F*	°*F*	*In*	*Pct*	*Pct*	*Pct*
January	63.7	78.8	43.7	25.2	2.10	(3)	90	75
February	66.4	81.0	47.1	30.1	2.96	(3)	90	70
March	71.6	84.5	52.8	34.8	1.61	(3)	85	65
April	79.2	87.6	62.6	45.9	2.80	(3)	88	70
May	85.2	91.7	69.2	57.3	3.21	(3)	90	80
June	90.8	95.5	74.0	66.1	5.34	(3)	93	80
July	93.4	98.0	75.5	71.2	1.85	(3)	85	72
August	93.6	99.3	74.8	68.2	4.16	(3)	90	80
September	89.6	96.2	71.3	59.8	5.60	(3)	95	90
October	83.2	92.0	63.0	46.5	3.94	5	85	85
November	73.5	86.2	53.0	35.1	2.42	2	82	65
December	66.7	81.5	46.5	28.2	2.57	(3)	93	80
Year	79.7		61.1		38.56			

[1] Average length of record, 22 years.
[2] Average length of record, 13 years.
[3] Less than 1 percent.

group and also one or more properties of another great group, suborder, or order. Subgroups also represent intergrades outside the range of any other great group, suborder, or order. Each subgroup is identified by one or more adjectives before the name of the great group. An example is Typic Haplaquents (a typical Haplaquent).

FAMILY. Soil families are established within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture and mineralogy, for example, that are used as family differentiae; see table 8. An example is the coarse-loamy, siliceous, acid, thermic family of Typic Haplaquents.

Environmental Factors Affecting Soil Use

Permanent settlement of the area that is now Calhoun County began in 1828. Several colonies were established. Lavaca, now Port Lavaca, and Indian Point, later called Indianola, were settled in 1842.

Calhoun County was created in 1846 from Victoria, Jackson, and Matagorda Counties. Port Lavaca became the county seat. In 1852 the county seat was moved to Indianola, because of its faster growth and important shipping activities. Most of the supplies to be transported to San Antonio and other inland centers were docked at Indianola. Also, many cattle and agricultural products were exported from Indianola. By the early 1870's, Indianola had become the leading seaport in Texas.

In 1875, Indianola was almost destroyed by a tropical hurricane. In 1886, it was completely destroyed by a hurricane, accompanied by a tidal wave, and followed by fire. After this disaster the seat of county government was relocated to Port Lavaca, where it remains today.

In April 1861 the first railroad was completed to Port Lavaca. Boat cargo had declined rapidly by the 1880's. More railroads were built and the network of inland rail transport expanded.

Climate [6]

The climate of Calhoun County is humid subtropical and is marked by warm summers. Also, it is predominantly maritime, controlled largely by the warm and very moist air masses from the Gulf of Mexico. Prevailing winds are southeasterly to south-southeasterly during all months. Daytime temperatures are warmer in winter than at inland locations, but sea breezes in summer prevent daytime highs from becoming as warm as those farther inland. Annual precipitation averages 38.56 inches. Peak rainfall periods are late in spring and early in fall; March and July are relatively dry months. Daily changes in relative humidity are more significant than seasonal changes which are small. The mean annual relative humidity is 88 percent at 6:00 a.m. Central Standard Time, 60 percent at noon, and 65 percent at 6:00 p.m. In an average year, the area receives approximately 64 percent of the total possible sunshine. Thunderstorms occur on about 41 days each year. The mean annual lake evaporation is estimated at 55 inches.

Temperature and precipitation data as recorded at Port Lavaca are shown in table 9.

[6] By ROBERT B. ORTON, State climatologist, Environmental Science Services Administration.

and precipitation

1947-68, elevation, 19 feet]

Precipitation—*Continued*									
Probability of receiving selected amounts during month—*Continued*					Mean number of days [2]			Snow, sleet [1]	
2 inches or more	3 inches or more	4 inches or more	5 inches or more	6 inches or more	0.1 inch or more	0.5 inch or more	1 inch or more	Mean number of days	Maximum monthly
Pct	*Pct*	*Pct*	*Pct*	*Pct*					*In*
45	30	18	10	5	4	2	1	([4])	0.8
45	30	18	9	5	6	2	1	0.4	5.0
40	22	11	8	5	2	1	([4])	([5])	([5])
50	30	20	15	9	3	1	1	0	0
60	45	30	25	18	4	2	1	0	0
55	35	22	15	8	5	3	2	0	0
55	40	31	20	10	3	1	([4])	0	0
58	40	30	20	19	5	2	1	0	0
73	61	48	33	20	6	3	2	0	0
52	40	30	22	12	4	3	1	0	0
45	30	20	10	7	4	2	1	0	0
55	35	20	10	7	5	2	1	0	0
------------	------------	------------	------------	------------	51	24	12	0.4	5.0

[4] Less than half a day.
[5] Trace.

Winters are mild. Polar Canadian air masses that push southward across Texas and out over the Gulf in winter produce cool, cloudy, rainy weather. This weather rarely lasts more than 48 to 72 hours. The polar air masses undergo considerable warming by the time they reach the coast. The average daily maximum temperature in winter is 65.6° F, and the average daily minimum is 45.8° F. Freezing temperatures occur on an average of 11 nights each year, usually an hour or two near sunrise. Cloudiness is more prevalent in winter, limiting available sunshine to about 50 percent of the total possible. Precipitation is most often in the form of slow, gentle rains.

Spring is pleasant. The early morning cloudiness, so characteristic of winter, dissipates more quickly in the spring. March is a relatively dry month, but thundershower activity increases in April and May. Spring weather is somewhat changeable, but moderate.

Summer weather varies little in the day-to-day pattern. Occasionally slowly moving thunderstorms or weather disturbances embedded in the tropical easterlies dump excessive amounts of precipitation on the area. One such storm produced 13.68 inches of rain within a single 24-hour period at Port Lavaca in June, 1960. The season is one of abundant sunshine, averaging about 75 percent of the total possible. The mid-summer period is relatively dry.

Fall is perhaps the most delightful season on the Texas Gulf Coast. Temperatures are moderate. Rainfall increases, but frequently there are prolonged periods of mild, dry, sunny weather. Heavy rains may occur early in fall in association with tropical disturbances, which move westward from the Gulf.

Tropical storms are a threat to the Texas coast in summer and fall, but severe storms are rare. The probability of a storm of hurricane intensity causing severe damage to a particular location during a given season is exceedingly small.

The freeze-free period averages 300 days. The mean date of the last occurrence of 32° F or below in spring is February 19, and the first occurrence of 32° F or below in fall is December 16.

Relief and Drainage

Calhoun County is mostly a flat featureless plain, only slightly dissected by natural streams. On about 90 percent of the county, the elevation is less than 30 feet above sea level. It ranges from sea level to about 55 feet above sea level near the intersection of State Highway 185 and the Victoria County line. Elevation increases gradually in a northwesterly direction, parallel to the course of the Guadalupe River drainage system.

A great length of saltwater shoreline marks the Calhoun County gulf coast because of the many bays, Carancahua, Lavaca, and San Antonio Bays, for example, that extent for considerable distances inland. No land point is more than about 14 air miles from a sea level shoreline.

Slopes are generally less than one-half percent. Steeper slopes occur along the eastern border of the Guadalupe River flood plain and between the inland bay benches and the inland coastlines of San Antonio and Lavaca Bays.

Streams having outlets to the Gulf in Calhoun County are the Guadalupe River, which empties into San Antonio Bay, and the Garcitas Creek, which empties into Lavaca Bay. Minor coastal drainage systems are Big Chocolate Creek, which extends inland about 30 miles, Little Chocolate Creek, Cox Creek, Keller's Creek, and Coloma Creek.

Five drainage districts and one water control improvement district, subdivisions of government active through 1972, illustrate the importance of water disposal in Calhoun County. Of major concern in plans of improvement are the watersheds of Big Chocolate Creek and Lynn's Bayou. Lynn's Bayou, a 3-mile long collection channel, intersects urban subdivisions of Port Lavaca. It is a continuous threat to residential construction because of concentrated runoff discharge, continuous ground water flow, and unstable channel geologic material. Almost all drainage problems in the county have been identified, and treatment has been outlined in appropriate work plans.

In Calhoun County all cultivated acreages, including those in row crops, rice, and improved pasture, need a well-designed drainage plan. The extensive Lake Charles, Dacosta, and Fracitas soils, which form whole watersheds, commonly contribute to local flooding (fig. 12).

The drainage problem results from the level and depressed landforms, the very slow permeability, the fine soil texture, and the seasonally high precipitation rates. In addition to improved drainage on individual farms, improvement of public channel structures is needed, for example, grade stabilization, channel enlargement, and control of brush and woody vegetation in channels.

Farming

Before 1900, farming was chiefly a fluctuating cattle commerce. Little land was cultivated until 1910. By 1933, a balanced farm program was established and cotton was the principal crop. About 1950, the acreage of grain sorghum increased markedly. Also, important new and improved varieties suited to mechanical harvesting appeared.

A wide variety of crops are suited to the soils of Calhoun County. The major crops are grain sorghum, cotton, rice, flax, corn, and small grain for temporary grazing. Figs, peaches, and citrus also do well. Most farmers raise enough of this fruit for home use.

Livestock production, for the most part producing stocker calves for market, is the chief farm enterprise in Calhoun County. More than 60 percent of the county is grassland.

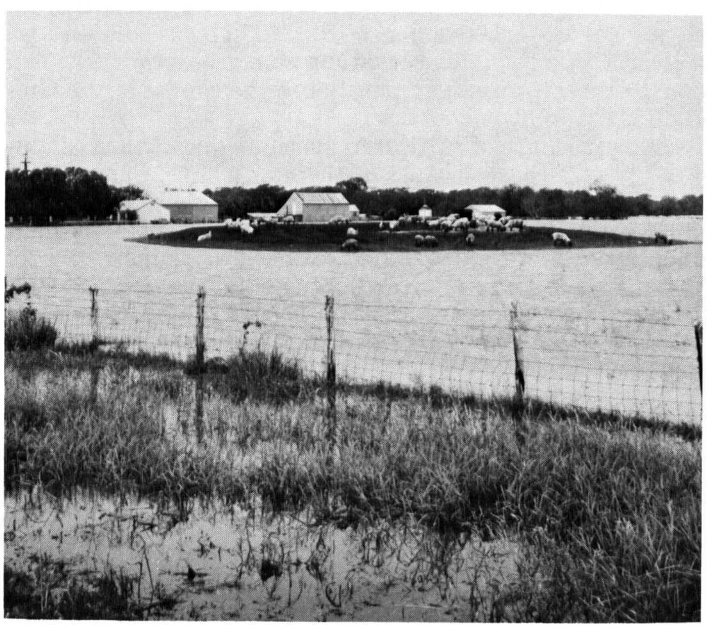

***Figure 12.*—Damage to farmshed from runoff of small watershed largely dominated by Lake Charles clay.**

Water Resources

The Guadalupe River, one of the most important drainage basins in Texas has its outlet into coastal waters by way of the San Antonio Bay. The river rises in the south-central part of the State from spring-fed streams, meandering through the Hill Country and the Coastal Plain. It has a total length of about 250 miles and a drainage area of about 6,000 square miles. The principal tributaries are the San Marcos, the Comal, and the San Antonio. The San Antonio joins the main stem just a few miles above the San Antonio Bay.

Green Lake, a 10,000-acre body of freshwater about 5 miles from the San Antonio Bay, is the largest natural body of freshwater in the State. Although Green Lake is near saltwater, it is never reached by even the highest tides because of a prominent bluff on the gulfward side.

Industrial plants have water stored in open reservoirs for use in their operations These reservoirs cover about 2,720 acres of the land area.

Bays, lakes, and other inland water areas amount to a total of 246,720 acres.

The Gulf Intracoastal Waterway, which parallels the Texas Gulf Coast along its entire length, traverses Calhoun County in a 30-mile course along Espiritu Bay and across San Antonio Bay. This channel is maintained at least at a depth of 12 feet and a width in excess of 125 feet at bottom. A barge canal, servicing industry from a point in Victoria County to the Gulf Intracoastal Waterway, began operation in 1965 and traverses the county through a course of about 15 miles.

Industry and Commerce

Calhoun County had a population of almost 18,000 in 1970. Port Lavaca, the county seat with a population of 10,491, is one of four principal Texas ports capable of handling foreign and domestic commerce. The amount of shipping cargo handled annually by the port and moving through the Gulf Intracoastal Waterway is in excess of 5 million tons. Principal foreign imports are residual fuel oil and basic chemicals. Foreign exports are coke, petroleum products, food, and feed grains. Coastwise shipping, in addition to the above, includes a large volume of mineral products, such as lime, shell, sand, and gravel, as well as manufactured products.

Shipping facilities available to the industrial complex of the county have encouraged the development of a number of important industrial plants and commodities. The commodities include aluminum products and material, starch, packing boxes, and petrochemicals.

Commercial fishing provides an important income to an appreciable work force. Shrimp is the most valuable of the commercial fish crops, and shrimp fleets operate yearlong out of Port Lavaca, Port O'Connor, and Seadrift. Second in importance is the oyster industry. The economic importance of oysters has been greatly increased by the use of oyster shell for a wide variety of products. Also significant, as a result of the accessibility of marine products, is the accelerated growth of the seafood processing industry over a period of years.

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Glossary

[Asterisks indicate terms used in tables 4 and 6]

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

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

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

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

Climax vegetation. The stabilized plant community on a particular site; it reproduces itself and does not change so long as the environment does not change.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

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

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

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

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

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

Cemented.—Hard and brittle; little affected by moistening.

* **Cutbanks cave.**—Unstable walls of cuts made by earthmoving equipment. This soil sloughs easily.

Decreasers. Any of the climax range plants most heavily grazed. Because they are the most palatable, they are first to be destroyed by overgrazing.

Deferred grazing. The practice of delaying grazing until range plants have reached a definite stage of growth, in order to increase the vigor of the forage and to allow the desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

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

***Excess fines.** Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

***Excess salts.** Excess water soluble salts. Excessive salts restrict the growth of most plants.

***Fast intake.** The rapid movement of water into the soil.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artifically.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Gilgai. Typically, the microrelief of Vertisols—clayey soils that have a high coefficient of expansion and contraction with changes in moisture; usually a succession of microbasins and microknolls, in nearly level areas, or of microvalleys and microridges that run with the slope.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Gypsum. Calcium sulphate.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

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

Increasers. Species in the climax vegetation that increase in relative amount as the more desirable plants are reduced by close grazing; increasers commonly are shorter than decreasers, and some are less palatable to livestock.

Invaders. On range, plants that come in and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface. (Most weeds are "invaders.")

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to relatively level plots surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops, or in orchards, to confine the flow of water to one direction.

Furrow.—Water is applied in small ditches made by cultivation implements used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Irrigation water, released at high points, flows onto the field without controlled distribution.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

***Low strength.** Inadequate strength to support the load.

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

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

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

Parent material. Disintegrated and partly weathered rock from which soil has formed.

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

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

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil series, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

***Piping.** Formation by moving water of subsurface tunnels or pipelike cavities.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

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

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

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

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

Range condition. The state of health or productivity of both soil and forage in a given range, in terms of what productivity could or should be under normal climate and the best practical management. Condition classes generally recognized are—*excellent, good, fair,* and *poor.* The classification is based on the percentage of original, or climax, vegetation on the site, as compared to what ought to grow on it if management were good.

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

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

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

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Only the upper part of this, modified by organisms and other soil-building forces, is regarded by soil scientists as soil. Most American engineers speak of the whole regolith, even to great depths, as "soil."

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

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Saline soil. A soil that contains soluble salts in amounts that impair growth of plants but that does not contain excess exchangeable sodium.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

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

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangements in the profile.

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

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on relatively steep slopes and in swelling clays, where there is marked change in moisture content.

***Slow intake.** The slow movement of water into the soil.

Soil A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

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

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

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

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

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

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

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

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

***Thin layer.** Otherwise suitable soil material too thin for the specified use.

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

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

***Unstable fill.** Risk of caving or sloughing in banks of fill material.

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

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

GUIDE TO MAPPING UNITS

Map symbol	Mapping unit	Page	Capability unit Symbol	Range site Name	Range site Page
Ad	Adamsville fine sand, saline	6	VIw-1	Low Coastal Sand	34
Ar	Aransas clay	6	Vw-1	Clayey Bottomland	32
As	Aransas clay, high bottom	6	IIIw-2	Clayey Bottomland	32
At	Austwell silty clay, high bottom	7	Vw-2	Salty Prairie	34
Au	Austwell clay	7	VIIw-2	Salty Prairie	34
BA	Bayucos soils	8	VIIIw-1	-----------------	--
Be	Beaumont clay	9	IIIw-1	Blackland	32
Da	Dacosta clay loam, saline	10	IIIw-6	Salty Prairie	34
Dc	Dacosta-Contee complex, 0 to 1 percent slopes	10	IIIw-1	Blackland	32
Dn	Dacosta-Contee complex, 1 to 3 percent slopes	10	IIIe-1	Blackland	32
Dp	Dianola-Portalto complex	11	VIIs-1	-----------------	--
	Dianola part	--	-------	Salty Prairie	34
	Portalto part	--	-------	Coastal Sand	33
Ed	Edna very fine sandy loam	12	IIIw-4	Claypan Prairie	33
En	Edna very fine sandy loam, low	12	IVw-1	Lowland	34
Fo	Fordtran loamy fine sand	13	IIIw-3	Sandy Prairie	35
Fr	Francitas clay	13	IVw-2	Salty Prairie	34
Ga	Galveston fine sand, undulating	14	VIe-1	Coastal Sand	33
Gc	Galveston complex, undulating	14	VIw-1	Coastal Sand	33
HA	Haplaquents, loamy	14	VIIIw-1	-----------------	--
Hd	Haplaquents-Dianola complex	15	VIIw-2	Salty Prairie	34
Hr	Harris clay	16	VIIw-1	Salt Marsh	34
Hs	Harris complex	16	VIIw-1	Salt Marsh	34
Ic	Ijam clay	16	VIIw-1	Salty Prairie	34
Ke	Kenney fine sand	17	IIIs-1	Sandy Prairie	35
La	Lake Charles clay, 0 to 1 percent slopes	17	IIw-1	Blackland	32
Lc	Lake Charles complex, 3 to 8 percent slopes	18	IVe-1	Blackland	32
Lo	Livia silt loam	19	IVw-3	Salty Prairie	34
Lv	Livia clay loam, 0 to 1 percent slopes	19	IVw-3	Salty Prairie	34
Lx	Livia clay loam, 2 to 5 percent slopes, eroded	19	VIe-2	Salty Prairie	34
Ma	Matagorda very fine sandy loam	20	IIIw-5	Salty Prairie	34
Mb	Midland clay loam	20	IIIw-4	Blackland	32
Mc	Midland clay loam, low	21	IVw-1	Lowland	34
Md	Midland-Dacosta complex	21	IIIw-4	Blackland	32
Mu	Mustang fine sand	21	VIw-1	Low Coastal Sand	34
Pc	Placedo clay	22	VIIw-1	Salt Marsh	34
Pr	Portalto-Roemer complex	23	IIIs-2	Coastal Sand	33
PS	Psamments, gravelly	23	VIIs-1	-----------------	--
Pt	Psamments	24	VIIIs-1	-----------------	--
Ra	Rahal fine sand, gently undulating	25	IIIw-3	Coastal Sand	33
Te	Telferner very fine sandy loam	26	IIIw-3	Loamy Prairie	34
Ve	Veston soils	26	VIIw-2	Salty Prairie	34
Vs	Veston soils, low	27	VIIw-2	Salty Prairie	34

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