SOIL SURVEY OF

Calhoun County, Texas

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

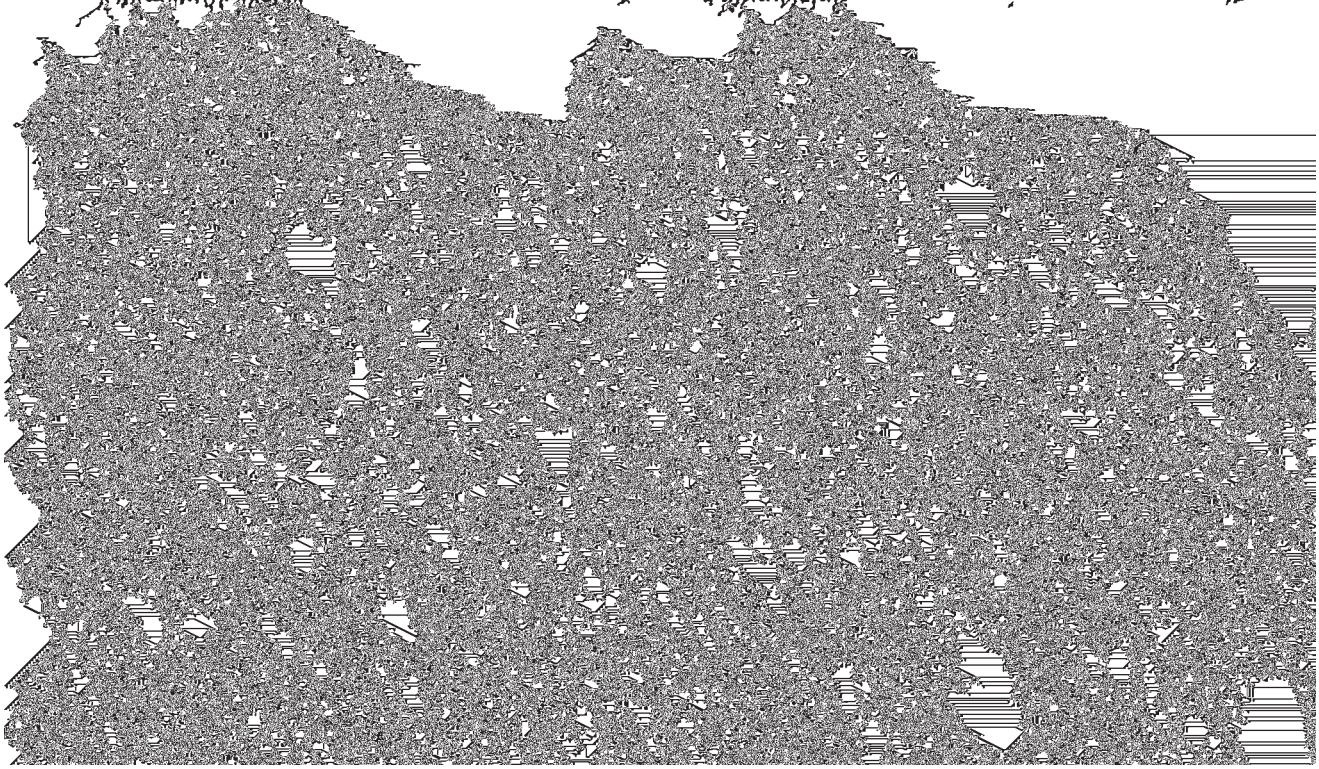
This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership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

Contents

	Page
Index to mapping units	II
Summary of tables	II
How this survey was made	1
General soil map	2
1. Lake Charles association	2
2. Livia-Francitas association	3
3. Portalto-Roemer association	3
4. Dacosta-Midland-Contee association	3
5. Haplaquents-Bayucos association	3
6. Galveston-Adamsville association	4
7. Austwell-Aransas-Harris association	4
8. Telferner-Edna association	4
Descriptions of the soils	5
Adamsville series	5
Psamments	23
Rahal series	24
Roemer series	25
Telferner series	25
Veston series	26
Use and management of the soils	27
General management of crops	27
Capability grouping	28
Predicted yields	30
Pasture and hay	31
Range	31
Range sites and condition classes	32
Descriptions of range sites	32
Wildlife habitat	35
Recreation	38
Engineering	38



Index to Mapping Units

	Page
Ad—Adamsville fine sand, saline	6
Ar—Aransas clay	6
As—Aransas clay, high bottom	6
At—Austwell silty clay, high bottom	7
Au—Austwell clay	7
BA—Bayucos soils	8
Be—Beaumont clay	9
Da—Dacosta clay loam, saline	10
Dc—Dacosta-Contee complex, 0 to 1 percent slopes	10
Dn—Dacosta-Contee complex, 1 to 3 percent slopes	10
Ic—Ijam clay	16
Ke—Kenney fine sand	17
La—Lake Charles clay, 0 to 1 percent slopes	17
Lc—Lake Charles complex, 3 to 8 percent slopes	18
Lo—Livia silt loam	19
Lv—Livia clay loam, 0 to 1 percent slopes	19
Lx—Livia clay loam, 2 to 5 percent slopes, eroded	19
Ma—Matagorda very fine sandy loam	20
Mb—Midland clay loam	20

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.

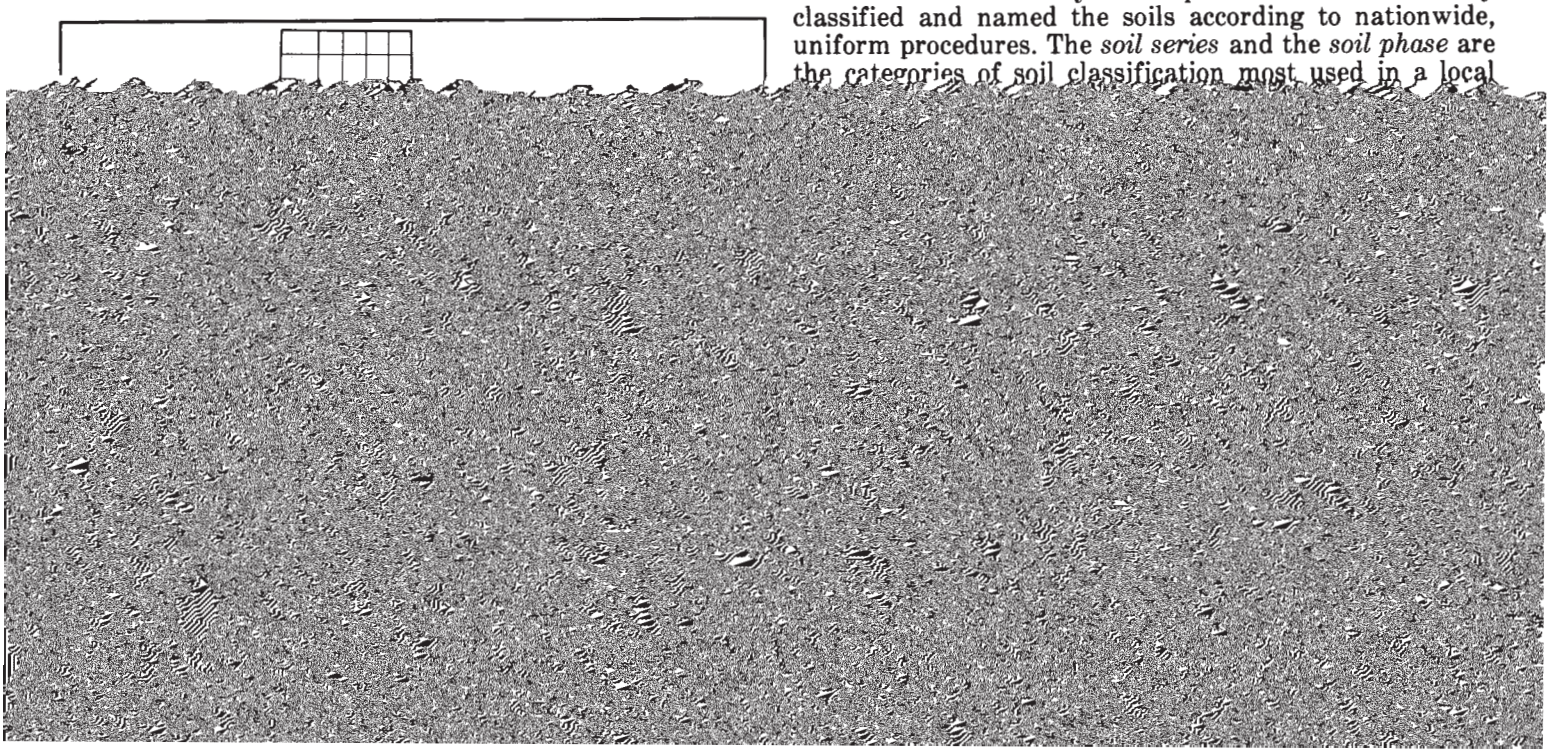
Calhoun County is a broad, smooth, almost featureless plain broken only by a few narrow, more sloping areas adjacent to the natural drains and the inland bays. Matagorda Island and the sandy lowlands between Port O'Connor and Seadrift have undulating topography. Prolonged wetness is typical of this area.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

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



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

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

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

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

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

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.

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	.3

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:

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

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 south-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;

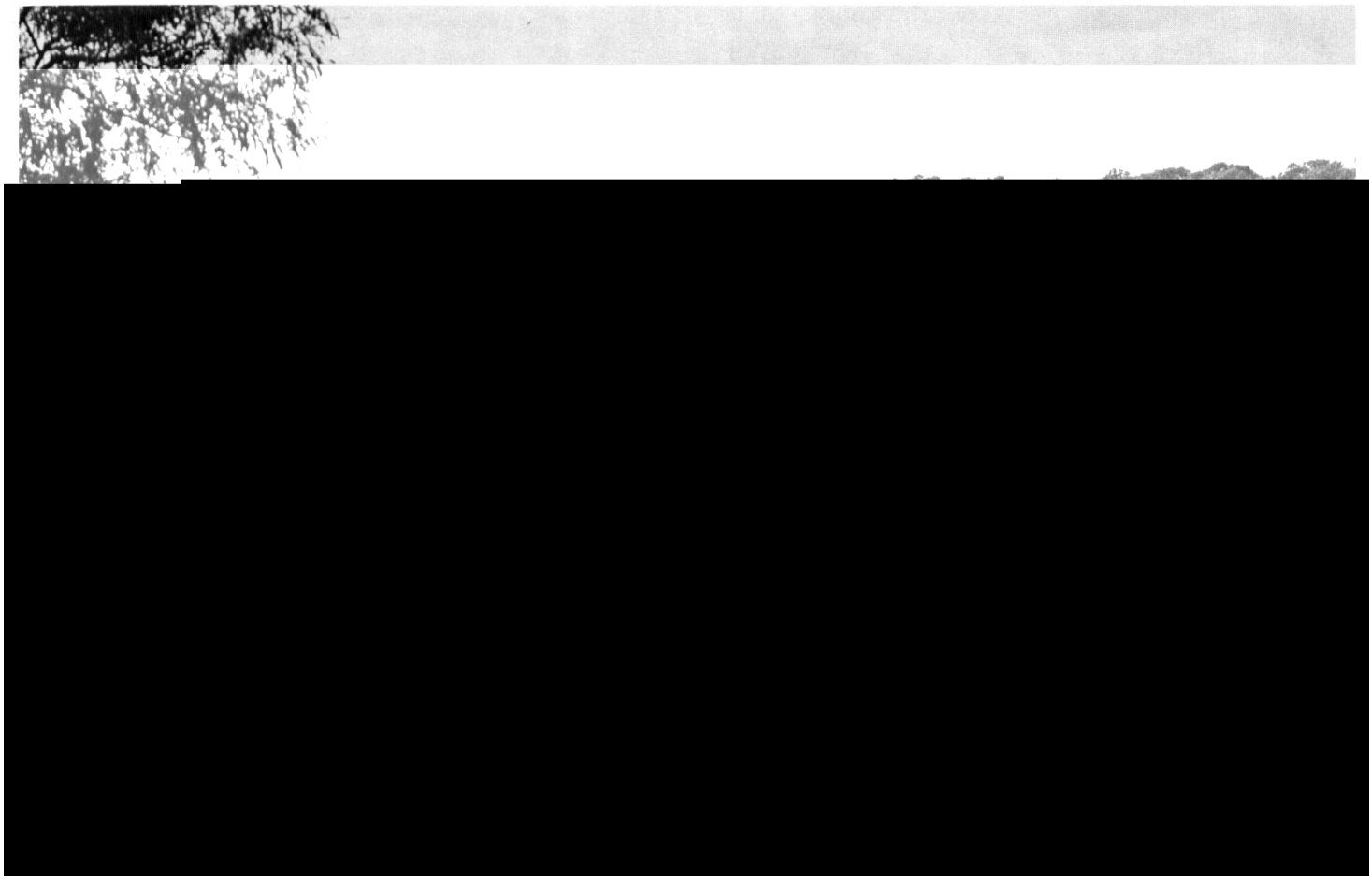


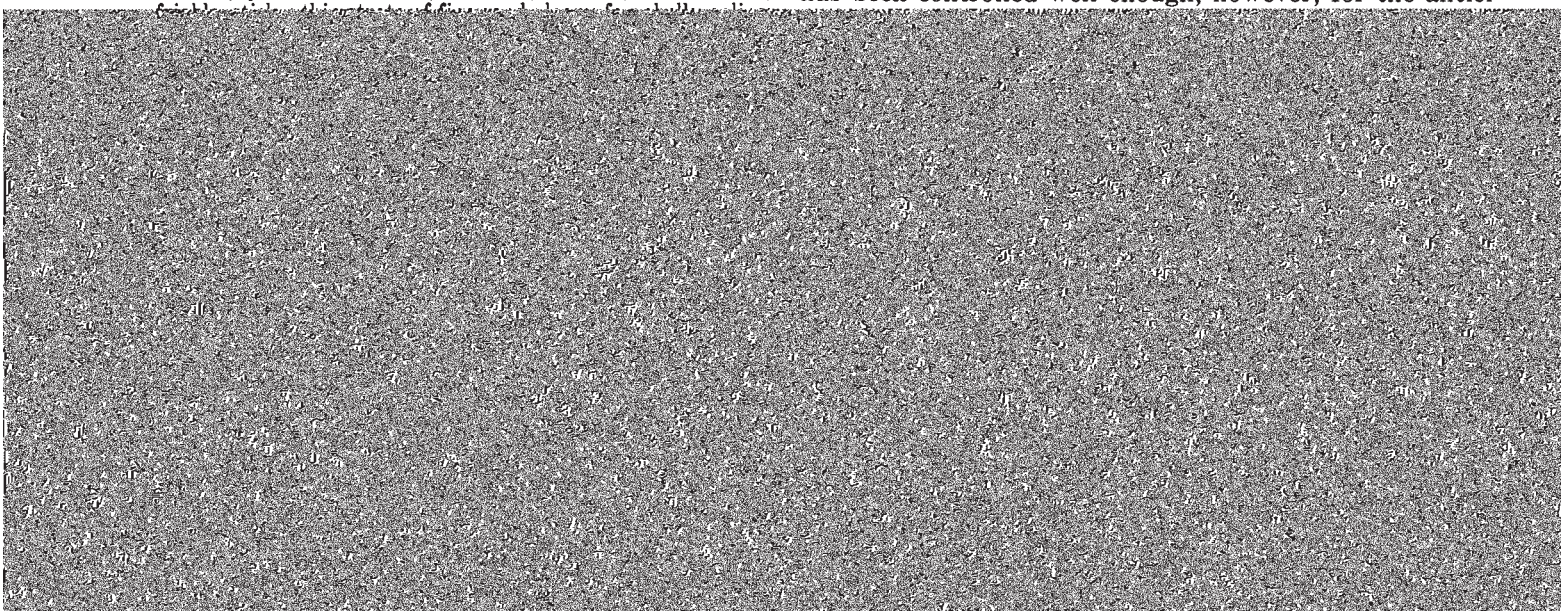
Figure 2.—**Seasonal high water table in Austwell clay. The dominant plant is spiny aster.**

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;

eter. 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 antici-



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

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 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. [illegible]

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

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

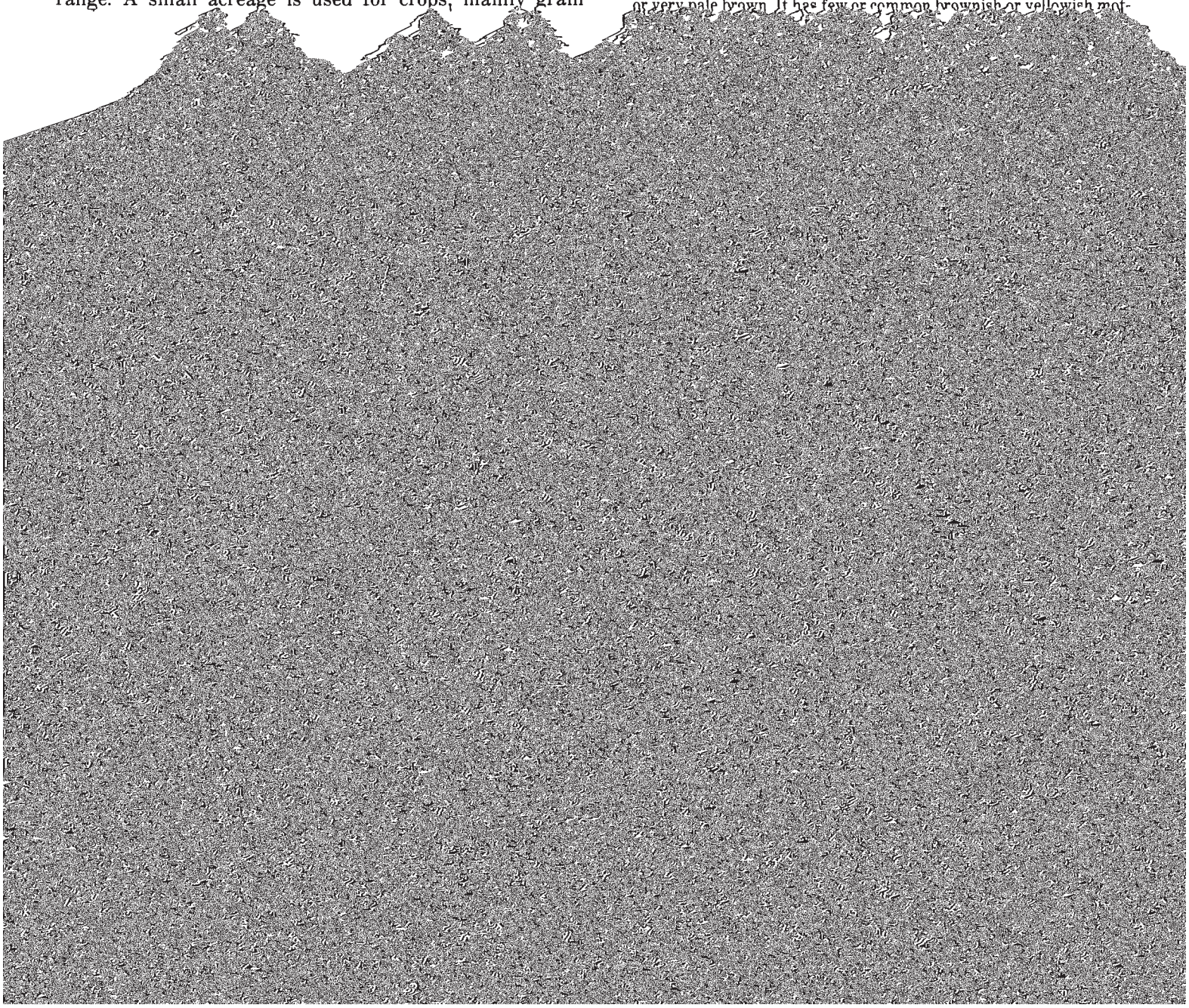
moist; few, fine, distinct, yellow (10YR 7/6) mottles; single grained; soft, loose; few fine roots; thin discontinuous lenses of very pale brown loamy fine sand; saline; moderately alkaline; clear, smooth boundary.

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 mot-



west 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. [illegible] 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.

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.

erately 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

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.

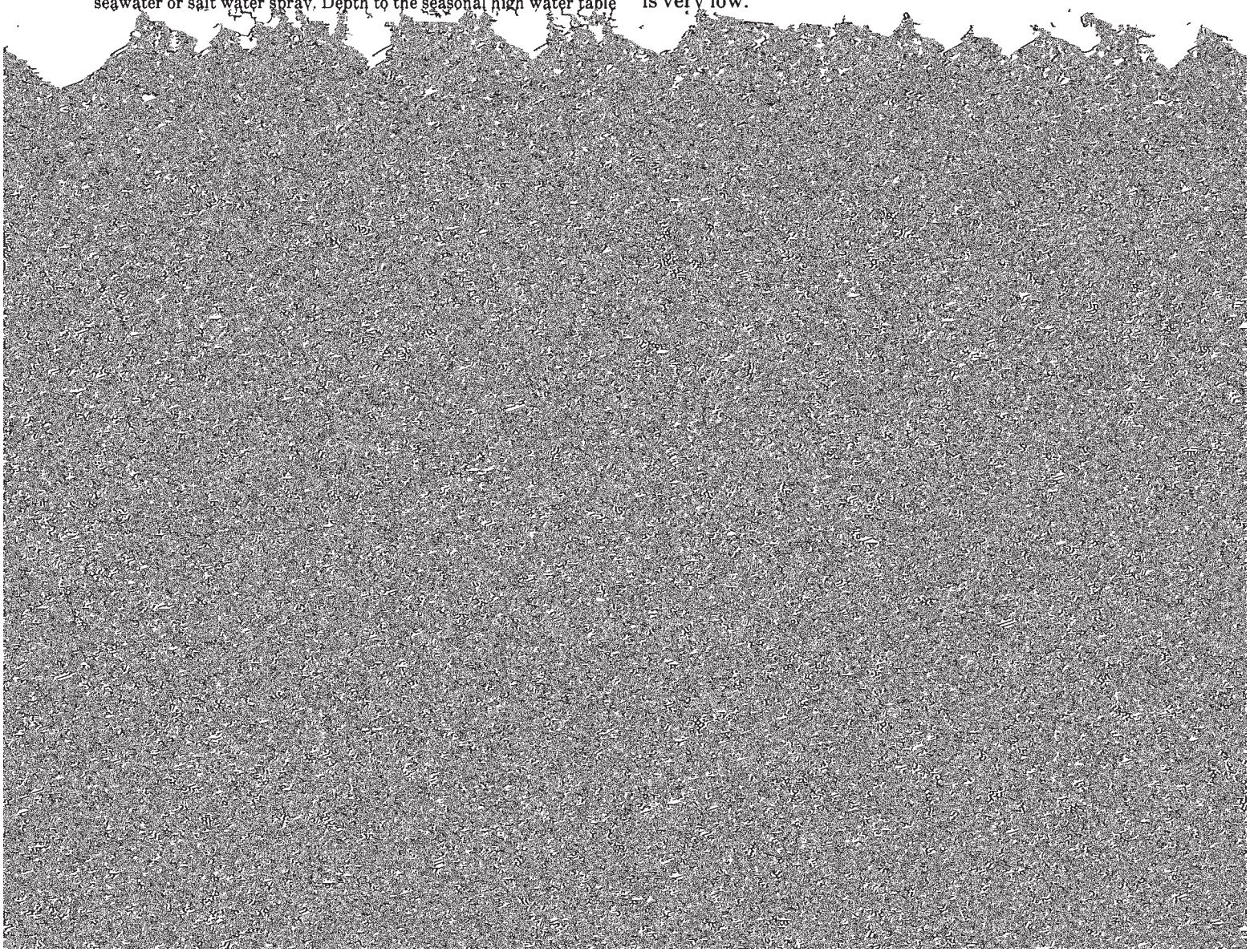
Reaction ranges from medium acid to mildly alkaline. Salinity ranges from none to high, depending on the action of stormblown seawater or salt water spray. Depth to the seasonal high water table ponds in the swales for extended periods during the wet season. Capability unit VIw-1; Coastal Sand range 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.



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

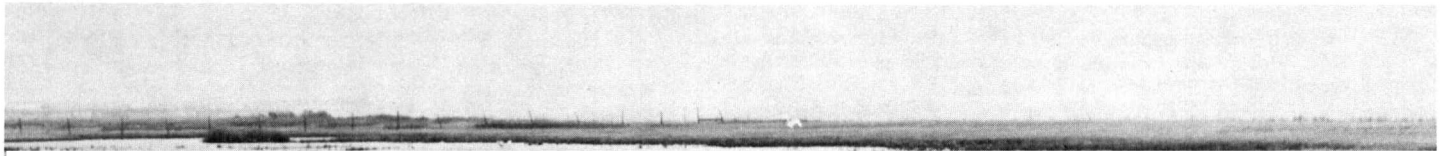


Figure 3.—**Soils of the Harris series. The dominant plant in this overgrazed site is salt-tolerant bushy sea oxeye.**

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

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 under-

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

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.

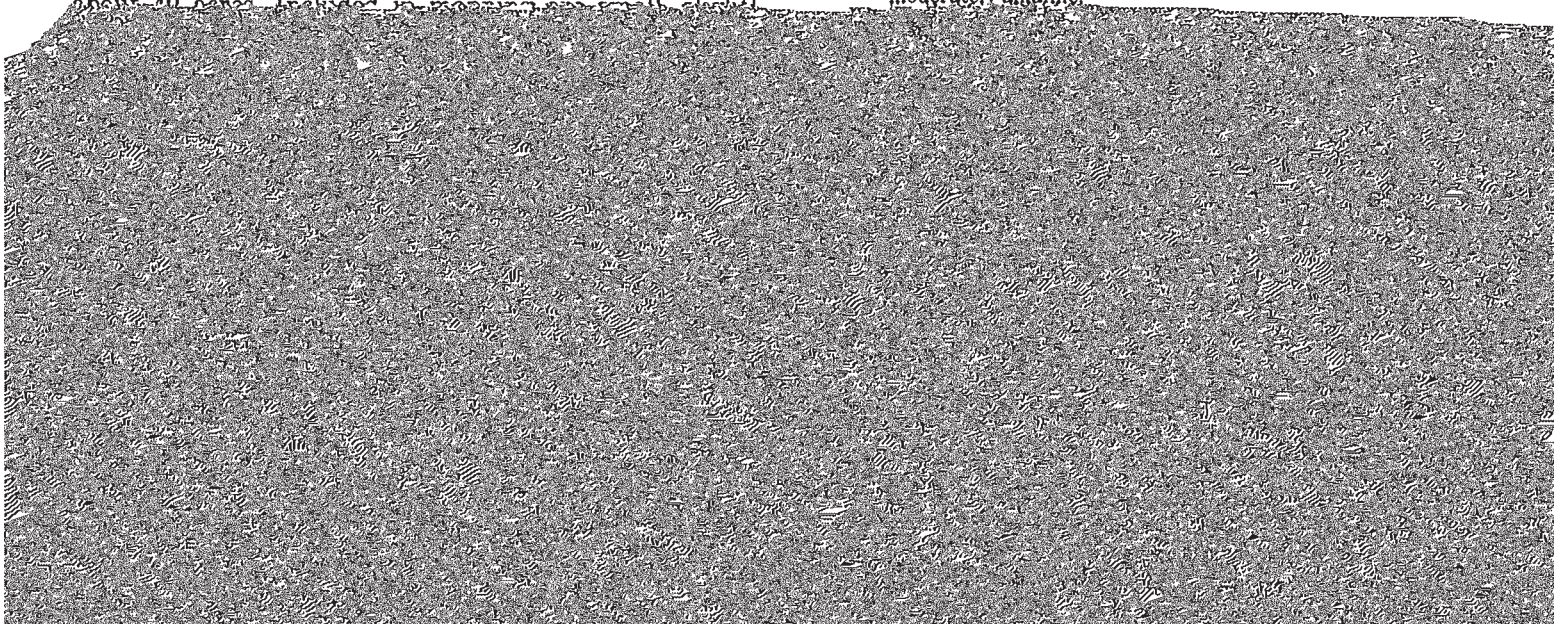


Figure 4.—**Hay meadow on Lake Charles clay after rain shower. Uncultivated areas have microrelief.**

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 Contas or Midland soils 2 to 5 acres in size. These included

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

(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 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

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. 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.

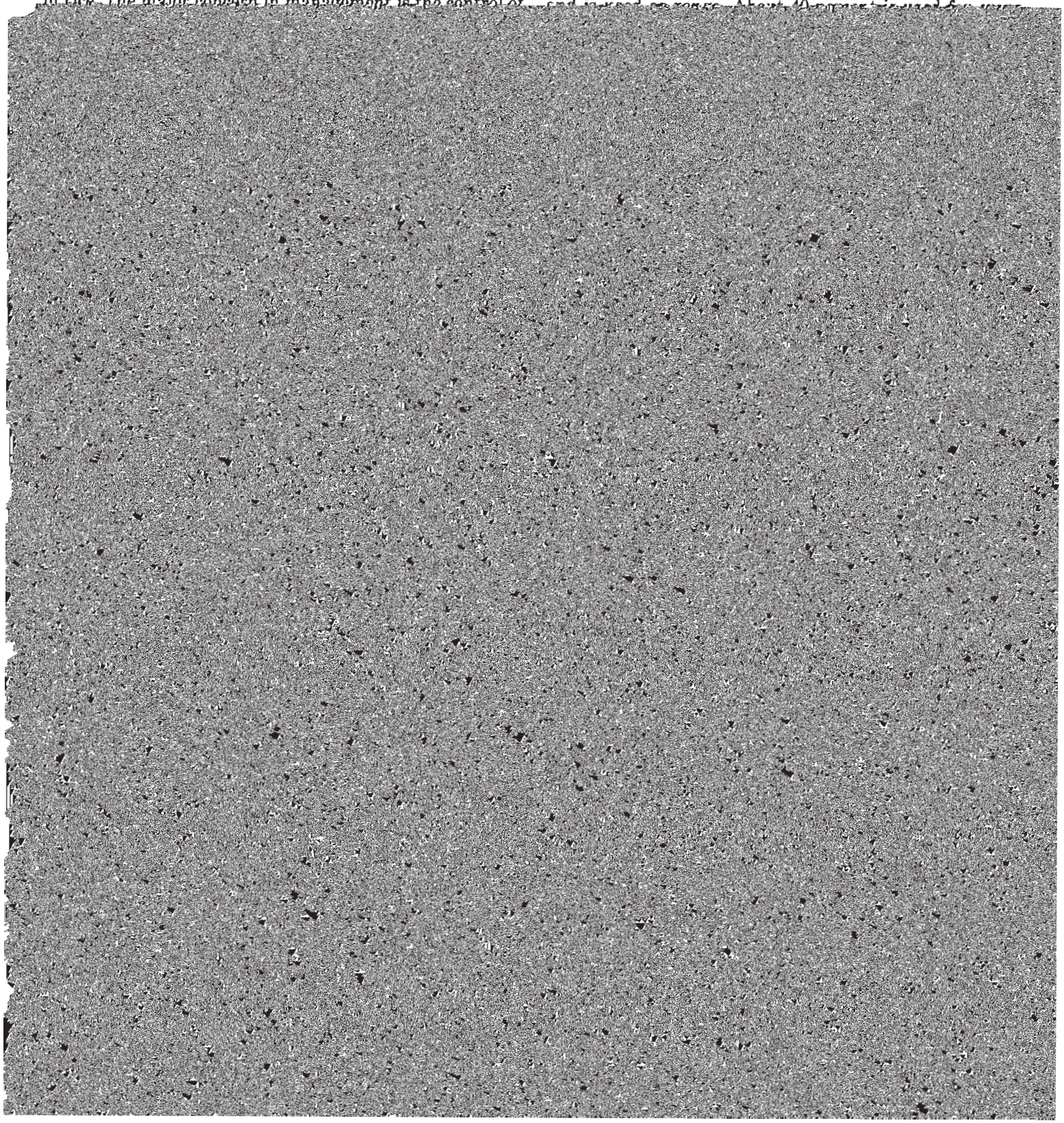
Representative profile of Midland clay loam, about 3 miles northeast of Port Lavaca; 2.77 miles east on Texas Highway 35 from its intersection with U.S. Highway 87 in the northwestern part of Port Lavaca; 0.25 mile northeast on a shell road; 60 feet west of a road in a cultivated field:

cent. 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

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



cent 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 south-

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

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

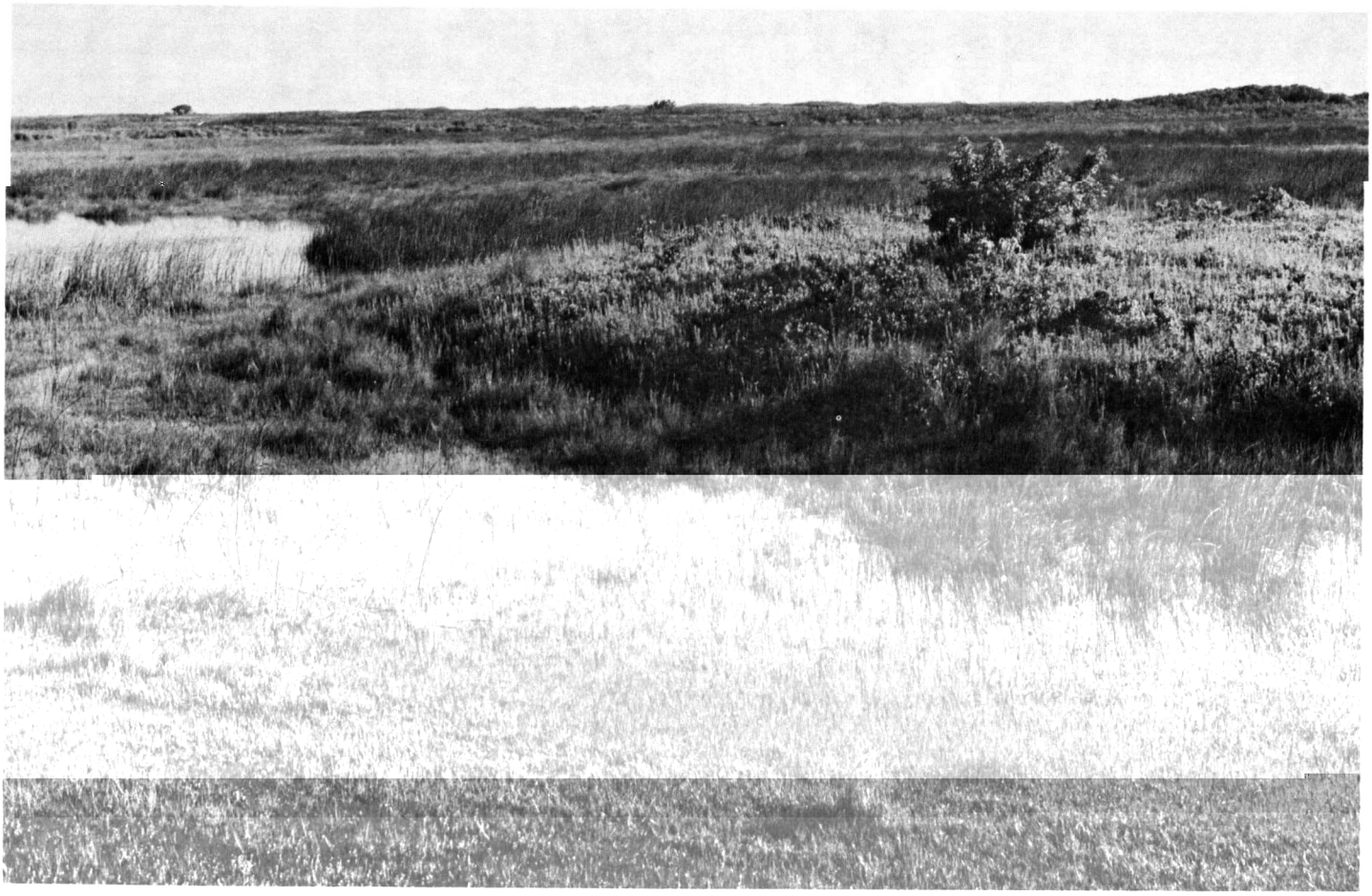
These are deep, nearly level, noncalcareous soil materials that are mostly saline. They are a mixture of shell fragments of various sizes and sand. Psamments are on the barrier islands and along the mainland coastal beaches. They are covered by cyclic tides and windblown water sev-

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



Pt—Psamments. This nearly level, white sand lacks distinct soil horizons. It is almost void of vegetation. A water- and distinctly mottled, and the lower 14 inches is white and prominently mottled. Below this is 18 inches of white

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.

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

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

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;

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

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

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

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

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 [illegible]

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

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

[illegible]

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.

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

The climax plant community varies from one type of community on the knolls to a different variety of grass in

gulfdune paspalum increase. If overgrazing is prolonged, gulf cordgrass becomes dominant, after which glasswort

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. [illegible] 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 gama- [illegible]

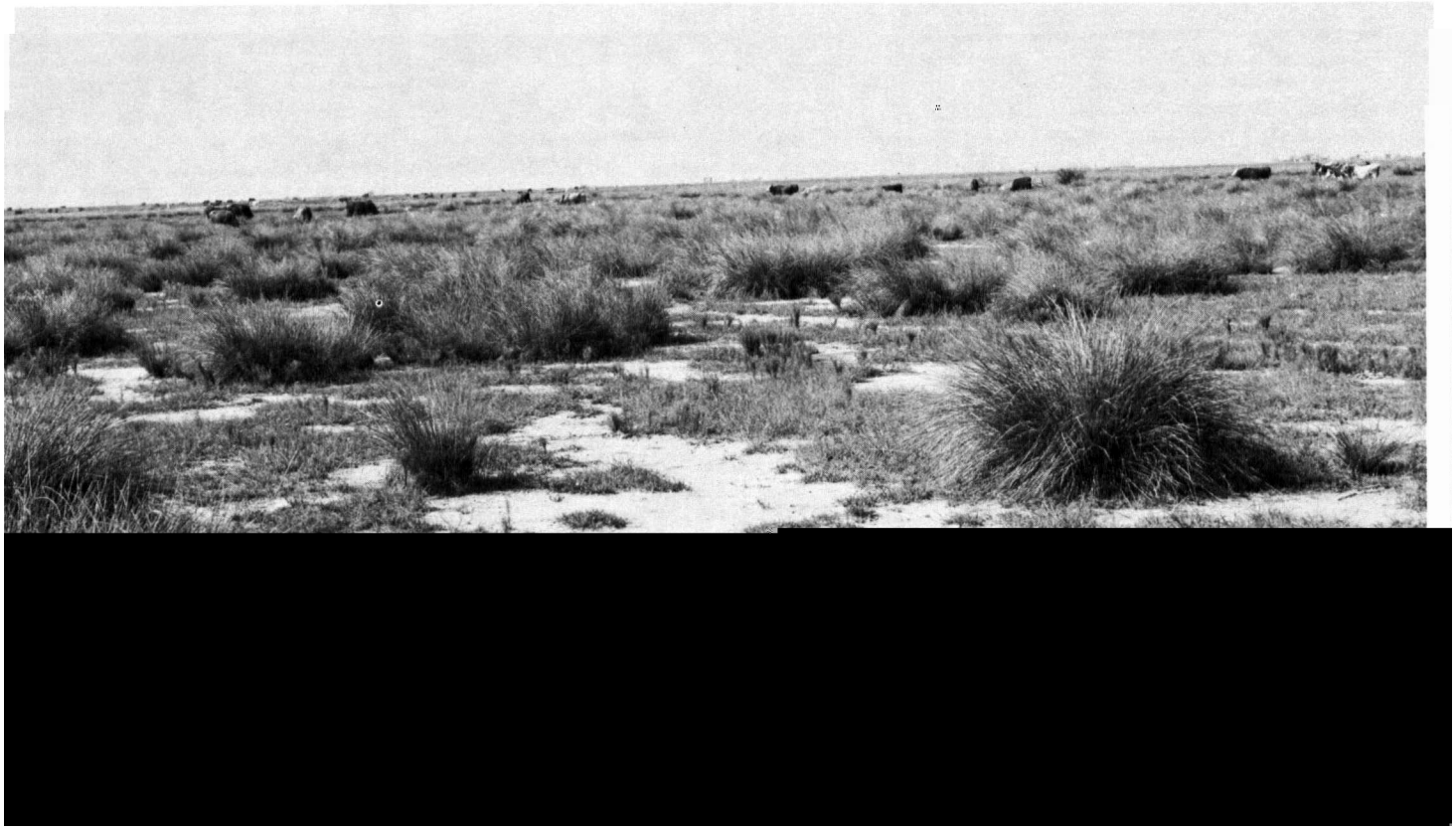


Figure 11.—**Salty Prairie range site, showing gulf cordgrass as the dominant species. The soil is Livia silt loam.**

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.

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

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:									

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,

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.

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	Severe: percs slowly, wet	Moderate: too clayey, wet	Severe: percs slowly, wet	Moderate: too clayey, 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,

ganic 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

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

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

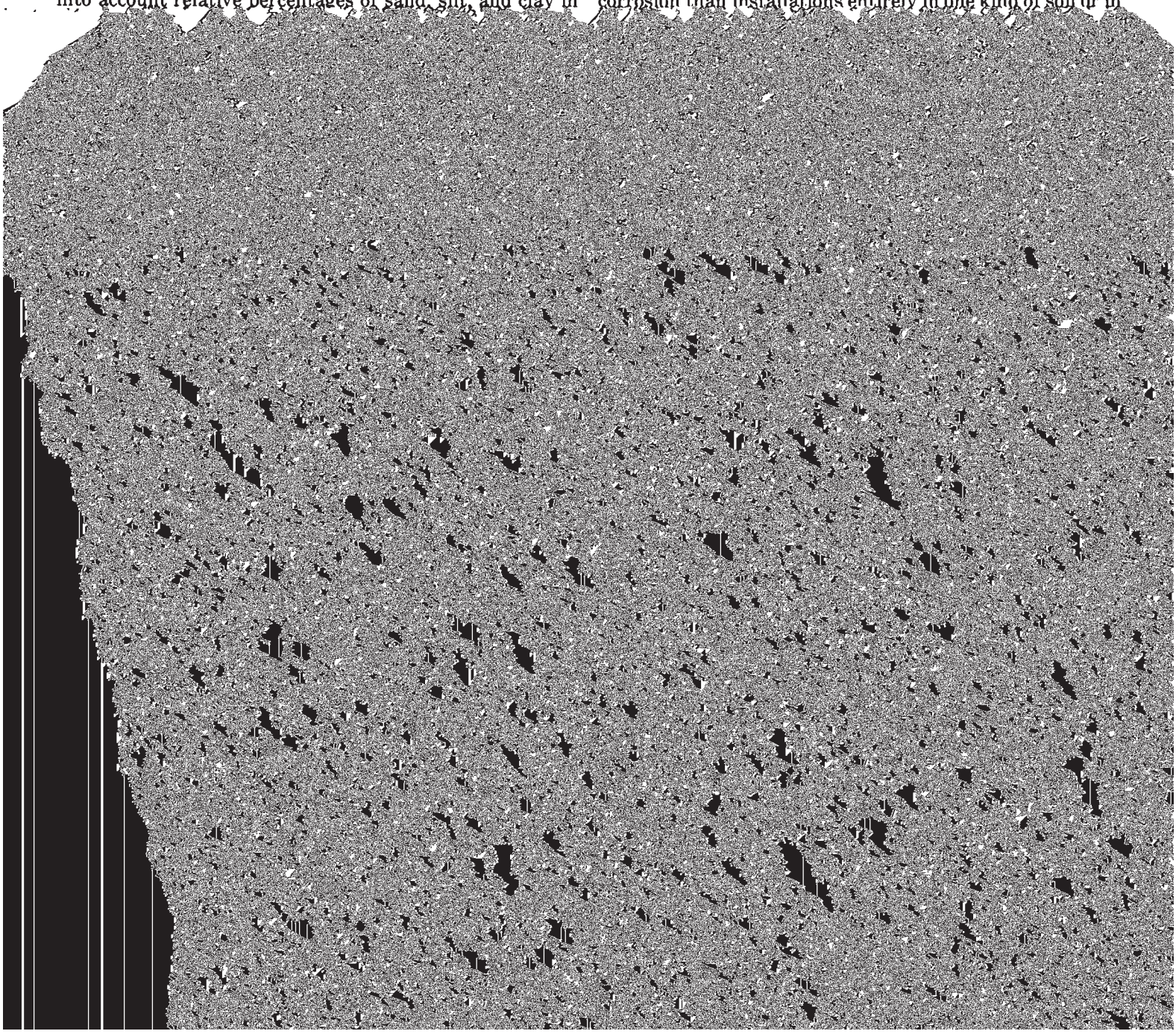


TABLE 5.—*Estimates of soil*

[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

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	B	40-60	0-58	Fine sand	SM, SP-SM	A-2-4	100	100
For Roemer part of Pr, see Roemer soils.			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	C	0-30	0-30	Fine sand, loamy fine sand	SM	A-2-4	98-100	98-100
Mapped only with Portalto soils.			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	Severe: floods	Severe: floods, too	Severe: floods	Severe: floods, too	Severe: floods

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:	Poor: low	Unsuited	Poor: too clayey	Floods, percs	Floods, percs

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	Severe: wet	Moderate:	Severe: cutbanks	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

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 physiogra-

fied 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

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 Beaudelta. 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 ma-

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

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

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 [illegible] soils formed under dense stands of salt-tolerant [illegible] cumulation 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

terested 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

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

TABLE 9.—*Temperature*

[Data from Port Lavaca, Tex.,

Month	Temperature [1]				Precipitation			
	Mean daily maximum	Mean monthly maximum	Mean daily minimum	Mean monthly minimum	Mean total	Probability of receiving selected amounts during month		
						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

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.

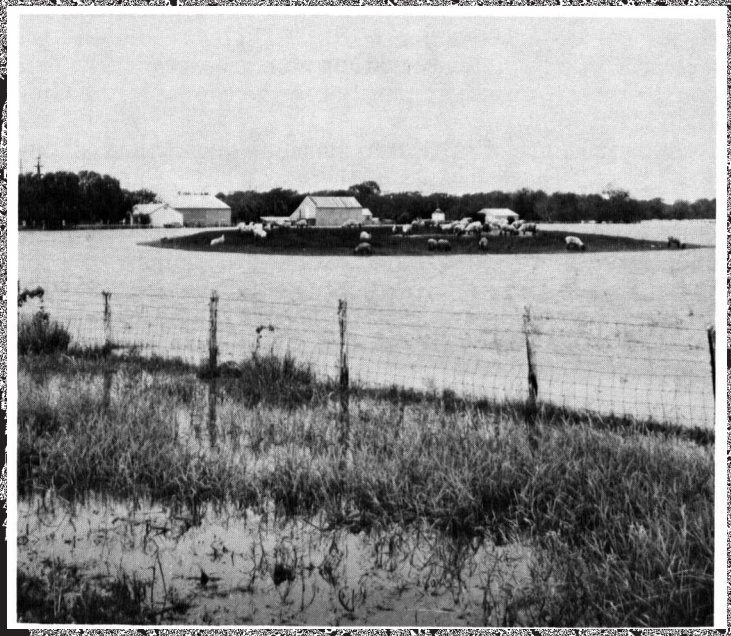
A great length of saltwater shoreline marks the Calhoun County gulf coast because of the many bays, Carancahua, Lavaca, and San Antonio Bays, for example, that extent for considerable distances inland. No land point is more than about 14 air miles from a sea level shoreline.

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 beaches and

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



Calhoun County. More than 60 percent of the county is grassland.

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

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

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.

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.

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

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 (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,

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

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