USDA United States Department of Agriculture

SOIL SURVEY Natural Resources Conservation Service

In cooperation with Louisiana Agricultural Experiment Station and Louisiana Soil and Water Conservation Committee

Soil Survey of Plaquemines Parish, Louisiana

How to Use This Soil Survey

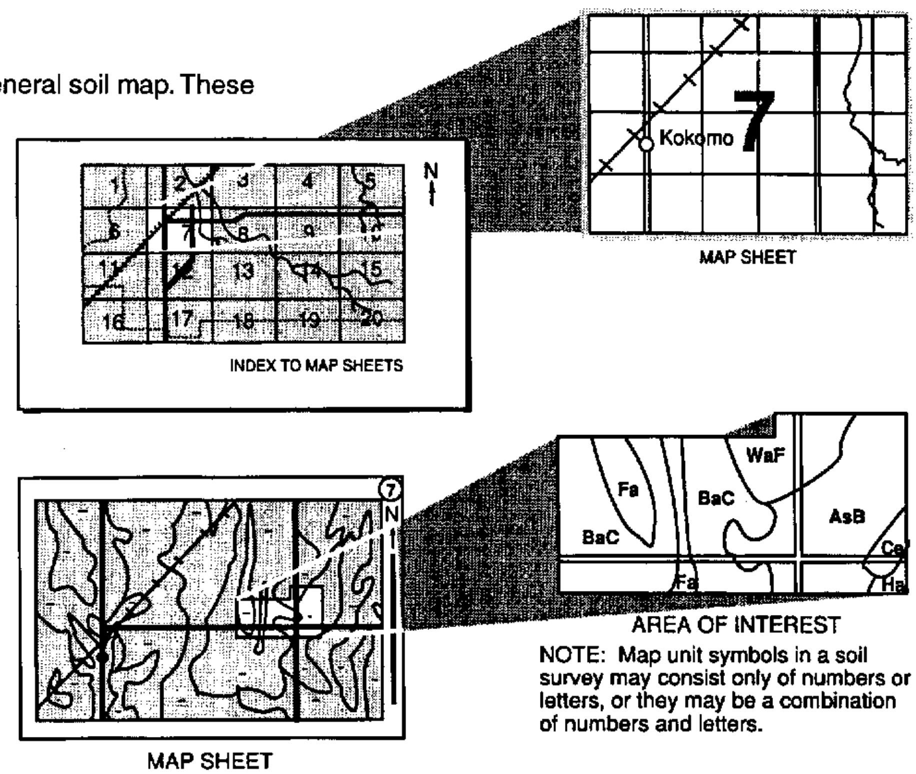
General Soil Map

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

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

Detailed Soil Maps

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



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

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

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

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

Major fieldwork for this soil survey was completed in 1987. Soil names and descriptions were approved in 1988. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1987. This survey was made cooperatively by the Natural Resources Conservation Service, the Louisiana Agricultural Experiment Station, and the Louisiana Soil and Water Conservation Committee. The survey is part of the technical assistance furnished to the Plaquemines Soil and Water Conservation District. The Plaquemines Parish Government provided assistance in the completion of the survey.

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

Cover: Citrus is a common crop in some areas of Commerce silt loam in Plaquemines Parish.

Contents

Issued 2000

Index to Map Units

Summary of Tables

Foreword

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

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

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Donald W. Gohmert

Donald W. Gohmert
State Conservationist
Natural Resources Conservation Service

Soil Survey of Plaquemines Parish, Louisiana

By Larry J. Trahan, Natural Resources Conservation Service

Fieldwork by Lyfon Morris, Jeanette J. Bradley, and Larry J. Trahan, soil scientists, Natural Resources Conservation Service; and Pam S. Porter, Louisiana Soil and Water Conservation Committee

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

PLAQUEMINES PARISH, the southernmost parish in Louisiana, is in the southeastern part of the state (fig. 1). It has a total area of 901,817 acres, of which 590,160 acres is land and 271,657 acres is large water areas—streams, lakes, bays, sounds, and the Gulf of Mexico. The parish is bordered on the north by Orleans Parish, on the north and west by Jefferson Parish, on the north and east by St. Bernard Parish, on the east by Breton Sound, and on the south by the Gulf of Mexico.

The population of the parish in 1980 was 26,049. The residents live along two strips of high ground that are separated by the Mississippi River.

The parish is entirely within the Mississippi River Delta. The natural levees of the Mississippi River and its distributaries are dominated by firm, loamy and clayey soils. These soils make up about one-tenth of the total land area of the parish. An extensive system of manmade levees protects these soils from flooding. These soils are mainly in urban uses. A small acreage is in pasture, woodland, home gardens, or cropland on which vegetables and citrus are grown.

The other nine-tenths of the land area in the parish consists mainly of ponded and frequently flooded, mucky, fluid soils in marshes and swamps. These soils are used mainly as habitat for wetland wildlife and for recreation. Large acreages of former marshes and swamps have been drained, covered with fill material to provide pastureland, or developed for urban uses. Elevations range from about 12 feet above sea level on the natural levees along the Mississippi River to about 5 feet below sea level in the former marshes and swamps that have been drained.

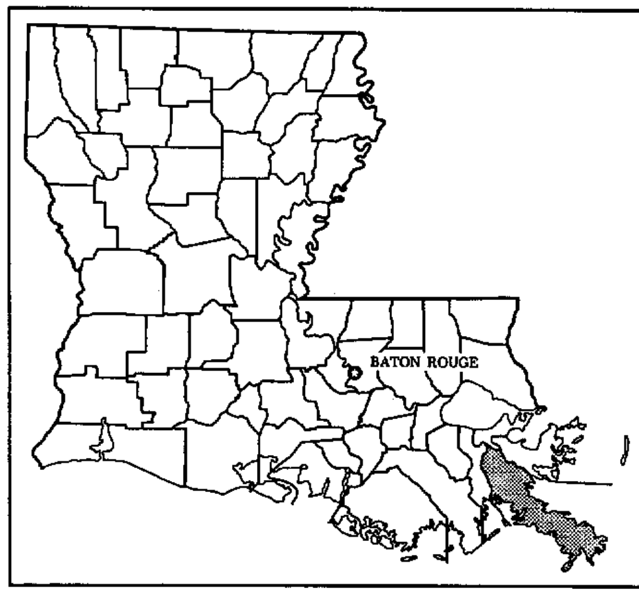


Figure 1.—Location of Plaquemines Parish in Louisiana.

General Nature of the Parish

This section gives general information concerning climate, transportation, water resources, industry, and history and development of the parish.

Climate

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

In winter, the average temperature is 55 degrees F, and the average daily minimum temperature is 48 degrees. The lowest temperature during the period of record, which occurred at Boothville on January 12, 1985, is 15 degrees. In summer, the average temperature is 82 degrees and the average daily maximum temperature is 89 degrees. The highest temperature during the period of record was 97 degrees on August 23, 1980.

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

The total annual precipitation is about 58 inches. Of this, about 39 inches, or 67 percent, usually falls in March through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 6.65 inches on July 21, 1974.

The average relative humidity in midafternoon is about 63 percent. Humidity is higher at night, and the average at dawn is about 87 percent. The sun shines 64 percent of the time possible in summer and 51 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 10 miles per hour, in March.

Thunderstorms occur on about 70 days each year, and most are in the summer. Tornadoes and severe thunderstorms occur occasionally. These storms are local and of short duration, and the pattern of damage is variable and spotty. Every few years, a hurricane crosses the parish.

Transportation

Roads in the parish are mostly hard-surfaced state and parish highways. A number of gravel roads are also in the parish. Louisiana Highway 23 extends northwest to southeast through the parish along the west bank of the Mississippi River. Louisiana Highway 39 parallels the east bank of the river as far south as Pointe a la Hache. At Braithwaite, a ferry crosses the Mississippi River to Belle Chasse, and another ferry at Pointe a la Hache crosses the river to West Pointe a la Hache *(25)*.

The parish is served by a north-south line of the Missouri Pacific Railroad to West Pointe a la Hache on the west bank of the Mississippi River. A line of the Louisiana Southern Railway extends to Braithwaite and serves the parish on the east bank of the river *(13)*.

The Mississippi River passes through the entire length of Plaquemines Parish. The river is part of a 19,000-mile water transportation system that serves much of the central United States and the Gulf Coast States (fig. 2).

Water Resources

Surface Water.—The hydrologic regime of Plaquemines Parish involves the movement of freshwater and saltwater masses through the region as a result of the interaction between the Mississippi River discharge, regional precipitation, winds, and tides *(24)*. This current hydrologic regime is influenced by both natural and manmade factors. The basic natural hydrologic system is governed by the pattern of major abandoned distributary channels of the ancient Mississippi River delta complex and interdistributary basin channels, which serve to drain swamps and marshes into the estuarine lakes, bays, and sounds.

Under natural conditions, the Mississippi River flowed through the wetlands to the Gulf via the distributary channels. Rainfall and Mississippi River floodwater flowed down the gentle slopes of the natural levees and slowly through the swamps and marshes as sheet flow and interdistributary basin channel flow. The wetland vegetation and the shallow, winding, interdistributary channels slowed the progress of this drainage and stored the fresh water for gradual release into the tidewaters. This situation contributed to a stable environment where water levels and salinity values changed gradually with changing tidal conditions.

During historic times, manmade factors greatly altered the natural hydrologic regime. Construction of levees on the Mississippi River halted the annual overbank flooding, and a channelized drainage network in the leveed area collected precipitation to be discharged into the wetlands at pumping stations and floodgates.

Manmade modifications of the wetlands also occurred within the recent historic period. Canals were developed as a result of logging activity, drainage, navigation improvement, and later, for oil and gas well drilling access and for pipelines. These modifications allowed surplus fresh water to pass more quickly from

Figure 2.—The Mississippi River is used to transport goods and to supply water.

the point discharge sources into the estuary. Spoil banks along the canals segmented the wetlands and hindered circulation. Greater water depths in the canals provided for greater tidal fluctuation and saltwater intrusion during dry periods.

Under these manmade conditions, the hydrologic circulatory system has shifted to reflect the competition between local runoff in the wetlands coupled with discharge from diked areas and daily tides. The overall effect of these modifications has been the rapid alteration of a stable hydrologic situation into one having a greater fluctuation of water levels and salinity values.

Ground Water.—Large quantities of moderately saline to highly saline ground water are available throughout Plaquemines Parish *(32)*. Potable water, however, is available only locally. Although the water is moderately salty, it would be satisfactory for industrial cooling because of its constant and relatively low (70 to 73 degrees F) temperature. Near-surface silt and very fine sand, which form lenses of permeable material in the generally clayey natural-levee deposits of the Mississippi River, yield the only known fresh ground water in the parish. Locally these lenses of permeable material are at a depth of 20 to 30 feet and provide sufficient quantities of water for some domestic use. Point-bar sand deposits of the Mississippi River form another possible source of fresh water in some areas *(21)*.

Industry

The economy of Plaquemines Parish is based primarily on the hydrocarbon industry in terms of both employment and income. Primary (extraction of oil, gas, and sulphur), secondary (refinement and transport of hydrocarbon products), and tertiary (various marine and land-based service industries) sectors of the hydrocarbon industry are important in the parish.

The seafood industry is also important in the economy of Plaquemines Parish. Louisiana accounted for 28 percent, by weight, and 10 percent, by value, of all commercial fisheries landings in the United States. More than one-third of Louisiana's landings, by value, were recorded at ports in or close by the parish. The major commercial species currently relied upon by the seafood industry are brown shrimp, white shrimp, blue crab, menhaden, spotted sea trout, and red drum.

Shrimp account for 47 percent of the total value, menhaden 27 percent, oysters 23 percent, and finfish 3 percent. The seafood industry supports many people, many of whom are self-employed.

Other industries in the parish are a refinery and a grain loading facility at Alliance, a nickel plant at

Braithwaite, the world's largest warehouse of sulphur at Port Sulphur, and two coal transfer facilities *(3)*.

History and Development

The earliest culture in Plaquemines Parish was mainly that of the Tchefuncte Indians. Pottery excavations reveal that the Coles, Creek, Marksville, Troyville, Plaquemines, and Pontchartrain Indians were also in the area. Many of the early explorers to the New World entered the mouth of the Mississippi River at the southernmost tip of what is now Plaquemines Parish and traveled northward by river to explore the inland area. The early settlers of the New Orleans area mostly traveled by boat through Plaquemines Parish.

The first road in Louisiana ran from English Turn in Plaquemines Parish to New Orleans on the levee of the Mississippi River. It was used as an overland route when ships became stalled in a bend of the river because of unfavorable winds *(14)*.

In 1805, Louisiana was formed into an organized territory, including the Territory of Orleans. Plaquemines Parish was one of 19 parishes formed from the Territory of Orleans when it was divided in 1806. The parish was named for an earlier establishment, the Post of Plaquemines, which mostly included the present-day boundaries. The name Plaquemines, in turn, came from the Mobilian dialect "Piakimin" or "Piakimina." The Creole French changed it from "Piakimin" to "Placmina," meaning persimmon.

The explorer, Robert Cavelier de La Salle, planted a cross with the coat of arms of France where the village of Venice stands today. Remnants of the Spaniards of De Soto's 1541 expedition were probably the first Europeans to settle the area. Later settlers included the French, Italians, Germans, Slavs, other Europeans, Africans, and a scattering of peoples mostly from the Canary Islands and Santo Domingo.

The seat of parish government was at St. Phillip (Felepe), formerly the site of Fuerte de Placaminas, which was built by the Spaniards in 1791. Since 1846, the seat of government has been at Pointe a la Hache. Towns with a population of 1,000 or more are Belle Chasse, Buras, Triumph, and Port Sulphur *(14)*.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the landforms and the kinds of native plants growing on the soils. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil.

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

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

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

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

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

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

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

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

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

The soils in the survey area vary widely in their suitability for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the suitability of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil suitability ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, pastureland, woodland, urban uses,* and *intensive recreation areas.* Cultivated crops are those grown extensively in the survey area. Pastureland is land planted to improved pasture plants for grazing. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic.

The boundaries of the general soil map units in Plaquemines Parish were matched, where possible, with those of previously published surveys of Jefferson and St. Charles Parishes. In a few places, however, the lines do not join, and the names of the map units differ. These differences resulted mainly because of differences in map unit design and changes in soil patterns near survey area boundaries.

The general soil map units in this survey have been grouped into four general kinds of landscapes for interpretive purposes. Each of the broad groups and the soil map units in each group are described in the following pages. The terms for texture used in the description of broad groups apply to the texture of the surface layer of the major soils.

Soils on Natural Levees

The map units in this group consist mainly of level, poorly drained and somewhat poorly drained, clayey and loamy soils that are on natural levees of the Mississippi River and its distributaries. Large earthen levees protect most of these soils from flooding by the Mississippi River. Soils in areas between the protection levees and the river are frequently flooded.

This group makes up about 8 percent of the land area of the parish. Most protected areas of these soils are in urban use. Frequently flooded soils are mainly in woodland or idle land. Wetness, flooding from river overflow or backwater, and the shrinking and swelling of the subsoil are the main limitations for urban use.

1. Sharkey-Commerce

Level, somewhat poorly drained and poorly drained soils that have a clayey or loamy surface layer and a clayey subsoil or that are loamy throughout; rarely flooded

The soils of this map unit are on the natural levees of the Mississippi River and its distributaries. Earthen levees protect these soils from overflows from the Mississippi River. Elevation ranges from sea level to 12 feet above sea level. Slopes are long and smooth and less than 1 percent.

This map unit makes up about 4 percent of the land area in the parish. It is about 50 percent Sharkey soils, 45 percent Commerce soils, and 5 percent soils of minor extent.

The poorly drained Sharkey soils are in

intermediate and low positions on natural levees. These soils are subject to rare flooding from backwater. They have a surface layer of dark gray silt loam or silty clay loam or very dark gray clay. The subsoil and substratum are dark gray and gray clay.

The somewhat poorly drained Commerce soils are in intermediate and high positions on natural levees. These soils have a surface layer of dark grayish brown or brown silt loam or dark gray silty clay loam. The subsoil and substratum are grayish brown and gray silty clay loam and silt loam.

Of minor extent are the Convent soils in high positions on natural levees and Vacherie soils in intermediate positions where the natural levees of the Mississippi River were breached by former floods. Areas where more than 85 percent of the ground is covered by concrete, buildings, and other impervious materials have been designated as Urban land on the detailed soil maps.

Most of the soils of this unit are in urban uses. A small acreage is used for cropland, pasture, or as woodland. Some idle land has been reserved for future urban uses.

These soils are poorly suited to building site development, sanitary facilities, and intensive recreation areas. Wetness, moderately slow permeability and very slow permeability, and the shrinking and swelling of the subsoil are the main limitations. In addition, the Sharkey soils are subject to rare flooding after unusually severe storms.

These soils are well suited to use as pasture and woodland. They are moderately well suited to cultivated crops. The soils have high fertility; however, a good drainage system is needed for optimum crop and forage production. The soils are well suited to the production of hardwoods, although wetness can limit the use of equipment.

2. Convent-Commerce-Sharkey

Level, somewhat poorly drained and poorly drained soils that have a loamy or clayey surface layer and a clayey subsoil or that are loamy throughout; frequently flooded

The soils of this map unit are in narrow areas between the Mississippi River and its protection levees. Elevation ranges from about 1 foot to 15 feet above sea level. The soils are frequently flooded and are subject to scouring and deposition by fast-flowing floodwater. Slope is 0 to 1 percent.

This map unit makes up about 4 percent of the land area in the parish. It is about 35 percent Convent soils, 25 percent Commerce soils, 25 percent Sharkey soils, and 15 percent soils of minor extent.

The somewhat poorly drained Convent soils are on low ridges. These soils have a surface layer of dark brown silt loam. The underlying material is grayish brown silt loam.

The somewhat poorly drained Commerce soils are in areas between the low ridges. These soils have a surface layer of brown or dark grayish brown silt loam or dark gray silty clay loam. The subsoil and substratum are grayish brown and gray silty clay loam and silt loam.

The poorly drained Sharkey soils are in low positions. These soils have a surface layer of dark gray silt loam or silty clay loam or very dark gray clay. The subsoil and substratum are dark gray and gray clay.

Of minor extent are Vacherie soils in intermediate positions and soils that have been covered with several feet of loamy fill material.

Most areas of the soils in this map unit are in woodland or idle land. A small acreage is used as pasture and as a source of loamy fill material.

The soils in this map unit are moderately well suited to the production of hardwoods. The main management concerns are seedling mortality and equipment use limitations because of wetness and the frequent flooding.

The soils in this map unit are not suited to cropland, urban uses, or intensive recreation areas. They are poorly suited to pasture. The frequent flooding and scouring are the main limitations.

Soils in Marshes and Swamps

The five map units in this group consist of level, very poorly drained, loamy and mucky soils that are in marshes and swamps. These soils are flooded or ponded most of the time.

This group makes up about 79.5 percent of the land area of the parish. Most areas of these soils are in native vegetation and are used for recreation and as habitat for wetland wildlife.

3. Balize-Larose

Level, very poorly drained soils that are loamy throughout or that have a thin mucky surface layer and clayey underlying material; in freshwater marshes

The soils of this map unit are in freshwater marshes that are flooded or ponded most of the time. Elevation ranges from sea level to about 1 foot above sea level. Slope is less than 1 percent.

This map unit makes up about 22 percent of the land area in the parish. It is about 48 percent Balize soils, 28 percent Larose soils, and 24 percent soils of minor extent.

The Balize soils have a surface layer of dark gray, very fluid silt loam and underlying material of dark gray and gray, very fluid silty clay loam and silt loam.

The Larose soils have a thin surface layer of very dark grayish brown, very fluid muck. The underlying material is dark gray and gray, very fluid mucky clay and clay.

Of minor extent are the Barbary soils in nearby swamps, the Convent soils on narrow ridges, and the organic Allemands, Kenner, and Clovelly soils in nearby marshes. Also included are a few small areas of Aquents, dredged soils on nearby spoil banks.

Most of the soils in this unit are in native vegetation and are used for recreation and as habitat for wetland wildlife. A small area has oil, gas, and sulphur wells.

These soils are well suited to use as habitat for wetland wildlife and provide suitable habitat for many species. Hunting, fishing, and other outdoor activities are popular in areas of these soils. This map unit is part of the estuary that contributes to the support of marine life in the Gulf of Mexico.

These soils are not suited to cropland, pasture, woodland, or urban uses because flooding, wetness, and low strength are too severe.

4. Kenner-Allemands

Level, very poorly drained soils that have a thick or moderately thick mucky surface layer and clayey and mucky underlying material; in freshwater marshes

The soils of this map unit are in freshwater marshes that are flooded or ponded most of the time. Elevation ranges from sea level to about 1 foot above sea level. Slope is less than 1 percent.

This map unit makes up about 2.5 percent of the land area in the parish. It is about 55 percent Kenner soils, 30 percent Allemands soils, and 15 percent soils of minor extent.

The Kenner soils are stratified, very fluid muck and very fluid clay throughout.

The Allemands soils have a moderately thick surface layer of very fluid muck and underlying material of very fluid clay.

Of minor extent are the Barbary soils in swamps on the landward side of the Allemands soils, and the Clovelly, Gentilly, and Lafitte soils in nearby brackish marshes. Many small ponds and perennial streams are throughout the map unit.

Most of the soils in this map unit are in native vegetation and used for recreation and as habitat for wetland wildlife. A small acreage has oil and gas wells.

These soils are well suited to use as habitat for wetland wildlife, and they provide habitat for many species. Hunting, fishing, and other outdoor activities are popular in areas of these soils.

These soils are not suited to cropland, pasture, woodland, urban uses, or intensive recreation areas. Flooding, subsidence, wetness, and low strength are too severe for these uses.

5. Clovelly-Lafitte-Gentilly

Level, very poorly drained soils that have a thick, moderately thick, or thin mucky surface layer and clayey or mucky underlying material; in brackish marshes

The soils of this map unit are in brackish marshes that are flooded or ponded most of the time. Elevation ranges from sea level to about 1 foot above sea level. Slope is less than 1 percent.

This map unit makes up about 29 percent of the land area of the parish. It is about 50 percent Clovelly soils, 38 percent Lafitte soils, 10 percent Gentilly soils, and 2 percent soils of minor extent.

The Clovelly soils have a moderately thick surface layer of very dark gray, very fluid muck and underlying material of gray, very fluid clay.

The Lafitte soils are very fluid muck throughout. The surface layer is very dark grayish brown and the underlying layers are very dark gray and very dark grayish brown.

The Gentilly soils have a thin surface layer of very dark gray, very fluid muck. The underlying material is dark gray, slightly fluid clay and gray, very plastic clay.

Of minor extent are the Barbary and Fausse soils in adjacent swamps and the Bellpass, Scatlake, and Timbalier soils in adjacent saline marshes. Many small ponds and perennial streams are in most areas.

Most of the soils in this unit are in native vegetation and are used for recreation and as habitat for wetland wildlife. A small acreage has oil and gas wells.

These soils are well suited to use as habitat for wetland wildlife, and they provide suitable habitat for many species. Hunting, fishing, and other outdoor activities are popular in areas of these soils. This map unit is part of the estuary that contributes to the support of marine life in the Gulf of Mexico.

These soils are not suited to cropland, pasture, woodland, or urban uses. Flooding, wetness, salinity, and low strength are too severe for these uses.

6. Bellpass-Timbalier

Level, very poorly drained soils that have a thick or moderately thick mucky surface layer and clayey or mucky underlying material; in saline marshes

The soils of this map unit are in saline marshes that are flooded most of the time. Elevation ranges from sea level to 1 foot above sea level. Slope is less than 1 percent.

This map unit makes up about 18.5 percent of the land area of the parish. It is about 50 percent Bellpass soils, 45 percent Timbalier soils, and 5 percent soils of minor extent.

The Bellpass soils have a moderately thick surface layer of dark gray and very dark grayish brown, very fluid muck and underlying material of dark gray and gray, very fluid clay.

The Timbalier soils have a thick surface layer of very fluid, saline muck and underlying material of very fluid, saline clay.

Of minor extent are the Felicity soils on narrow, sandy ridges; the Clovelly and Lafitte soils in nearby brackish marshes; and the Scatlake soils in saline marshes. Many small ponds and perennial streams are in most areas.

These soils are well suited to use as habitat for wetland wildlife and they provide habitat for many species. Hunting, fishing, and other outdoor activities are popular in areas of these soils. This map unit is part of an estuary that contributes to the support of many species of marine fishes and crustaceans in the Gulf of Mexico.

These soils are not suited to cropland, pasture, woodland, or urban uses. Flooding, wetness, salinity, and low strength are too severe for these uses.

7. Scatlake

Level, very poorly drained soils that have a mucky surface layer and clayey underlying material; in saline marshes

The soils of this map unit are in saline marshes that are flooded or ponded most of the time. Elevation ranges from sea level to about 1 foot above sea level. Slope is less than 1 percent.

This map unit makes up about 7.5 percent of the land area in the parish. It is about 90 percent Scatlake soils and 10 percent soils of minor extent.

The Scatlake soils have a surface layer of very dark gray, very fluid muck and underlying material of dark gray and gray, very fluid clay.

Of minor extent are the Bellpass and Timbalier soils in nearby positions and the Felicity soils on sandy ridges. Many small ponds and perennial streams are in most areas.

The soils in this map unit are mainly in native vegetation and are used for recreation and as habitat for wetland wildlife. Oil, sulphur, and gas wells are in some areas.

These soils are well suited to use as habitat for wetland wildlife, and they provide habitat for many species. Hunting, fishing, and other outdoor activities are popular in areas of these soils. This map unit is part of an estuary that contributes to the support of many species of marine fishes and crustaceans in the Gulf of Mexico.

These soils are not suited to cropland, pasture, woodland, and urban uses. Flooding, wetness, salinity, and low strength are too severe for these uses.

Soils in Former Swamps and Marshes

The map unit in this group consists of level, poorly drained clayey soils in drained swamps. The soils are protected from most floods by levees and are drained by pumps. Flooding is rare, but it can occur during severe storms or when protection levees fail.

This group makes up about 6 percent of the land area of the parish. Most areas are developed for urban uses or they are idle land reserved for future urban uses. Flooding, wetness, low strength, subsidence, and the shrinking and swelling of the underlying material are the main limitations.

8. Harahan-Westwego-Rita

Level, poorly drained soils that have a clayey surface layer and a clayey or loamy subsoil; in former swamps and marshes

The soils of this map unit are in former swamps that are protected from most floods by levees and are drained by pumps. Flooding is rare, but it can occur during severe storms or when levees or pumps fail. Elevation ranges from sea level to about 3 feet below sea level. Slope is less than 1 percent.

This map unit makes up about 6 percent of the land area of the parish. It is about 40 percent Harahan soils, 25 percent Westwego soils, 25 percent Rita soils, and 10 percent soils of minor extent.

The Harahan soils have a surface layer of very dark gray, firm clay; a subsoil of gray, firm clay; and a substratum of dark gray, slightly fluid clay and gray, very fluid clay.

The Westwego soils have a surface layer of very dark gray, firm clay; a subsoil of dark gray, firm clay; a buried surface layer of very dark grayish brown, very fluid muck; and a substratum of dark gray, very fluid clay. The subsoil contains a network of permanent cracks.

The Rita soils have a surface layer of very dark gray mucky clay; a subsoil of dark gray and very dark gray, firm clay; and a substratum of gray, slightly fluid silty clay loam and olive gray, slightly fluid silt loam.

Of minor extent are the drained Allemands soils in former marshes, and the Commerce and Sharkey soils on narrow ridges.

The soils in this map unit are mainly in pasture or woodland. A small acreage is in homesites or is idle land that has been reserved for future urban uses.

These soils are poorly suited to most urban uses and to intensive recreation areas mainly because of flooding, wetness, low strength, very slow permeability, and the shrinking and swelling of the subsoil. Adequately controlling the water table is difficult. Foundations for buildings need to be specially designed and set upon pilings.

These soils are moderately well suited to woodland, cropland, and pastureland. Wetness and poor tilth are the main limitations.

Soils in Spoil Areas and on Sandy Ridges

The map units in this group consist mainly of level and gently sloping, poorly drained and somewhat poorly drained, variable-textured soils on spoil banks and sandy soils on ridges or barrier islands. The soils are subject to frequent flooding by high storm tides.

This group makes up about 6.5 percent of the land area of the parish. Most areas are in native vegetation and are used for recreation and as habitat for wetland wildlife. A few areas have been developed for commercial uses. Flooding, wetness, and salinity are the main limitations of the soils for urban uses.

9. Aquents

Level, poorly drained soils that are stratified and clayey to mucky throughout; on spoil banks

The soils of this map unit are in areas of hydraulic fill dredged from nearby waterways, swamps, and marshes. The largest area of this unit is the spoil area created by the dredging of the Mississippi River. This map unit is frequently flooded by high tides during storms. Elevation ranges from sea level to about 5 feet above sea level. Slope is 0 to 1 percent.

This map unit makes up about 5.5 percent of the land area in the parish. It is about 95 percent Aquents and 5 percent soils of minor extent.

The Aquents soils are stratified with layers of clayey, loamy, mucky, and sandy material. The soil is slightly saline to saline throughout.

Of minor extent are the Allemands, Fausse, Harahan, and Westwego soils in areas where these soils have not been covered by fill material.

The soils of this map unit are used mainly as habitat for wetland wildlife and for extensive recreation areas. A small acreage is in commercial uses.

These soils are well suited to use as habitat for wetland wildlife, and they provide habitat for many species. Hunting and other outdoor activities are popular in areas of these soils.

These soils are generally not suited to most urban uses, to intensive recreation areas, and to cultivated crops and woodland. Wetness, flooding, low strength, salinity, and subsidence potential are too severe for these uses. These soils are poorly suited to pasture. Rarely flooded areas are poorly suited to urban and intensive recreation uses, and they are moderately well suited to cultivated crops, pasture, and woodland.

10. Felicity

Gently sloping, somewhat poorly drained soils that are sandy throughout; on ridges

The soils of this map unit are on ridges that are mainly near the beaches of the Gulf of Mexico. The largest areas of these soils are on the Chandeleur Islands and Breton Islands. The soils are frequently flooded by high tides during storms. Elevation ranges from about 1 to 5 feet above sea level. Slope ranges from 1 to 3 percent.

This map unit makes up about 1 percent of the land area of the parish. It is about 58 percent Felicity soils and 42 percent soils of minor extent.

The Felicity soils have a surface layer of brown loamy fine sand and underlying material of dark brown and grayish brown loamy sand and dark gray sand. They are saline throughout.

Of minor extent are the Bellpass, Scatlake, and Timbalier soils in saline marshes on the landward side of the ridges.

The soils in this map unit are mainly used as habitat for wetland wildlife and openland wildlife.

These soils are not suited to most urban uses and intensive recreation areas, and they are not suited to cropland, pasture, or woodland. Flooding, salinity, and wetness are too severe for these uses. Seepage is also a problem where the soils are used for sanitary facilities.

These soils are poorly suited to use as habitat for wetland wildlife and openland wildlife. The areas are used mainly by shore birds. Soil salinity is the main limitation for managing vegetation for wildlife habitat.

Detailed Soil Map Units

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

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

Soils that have profiles that are almost alike make up a *soil series.* All the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, salinity, wetness, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Commerce silt loam is a phase of the Commerce series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called undifferentiated groups.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Balize and Larose soils is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Dumps is an example.

The soils on the detailed soil maps were mapped at the same level of detail, except for those soils that are not protected from flooding. Most of the soils in Plaquemines Parish are subject to frequent flooding or ponding. Poor accessibility, particularly in the marshes and swamps, limited the number of soil observations in those areas. In addition, wetness from flooding or ponding limits the use and management of these soils, and separating all of the soils in these areas would be of little value to the land user. Where flooding or ponding are the overriding limitations for expected land use, fewer onsite observations were made and the soils were not mapped separately.

The boundaries of the map units in Plaquemines Parish were matched, where possible, with those of previously published surveys of Jefferson and St. Charles Parishes. In a few places, however, some differences exist in the names of the map units. These differences resulted mainly from differences in map unit design and changes in soil patterns near survey area boundaries.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and suitabilities for many uses. The "Glossary" defines many of the terms used in describing the soils or miscellaneous areas.

AD—Allemands muck. This organic soil is level and very poorly drained. It is in freshwater marshes, and it is flooded and ponded most of the time. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the surface layer is very dark grayish brown, very fluid muck about 14 inches thick. The next layer to a depth of about 36 inches is dark grayish brown, very fluid muck. The underlying material to a depth of about 70 inches is dark gray, very fluid clay. In places, buried logs and stumps are in the underlying material.

This Allemands soil is flooded or ponded by fresh water most of the time, and it is wet throughout the year. During storms, this soil is covered by 4 or more feet of water. The water table is commonly at or above the surface, but during periods of sustained north wind and low gulf tides, the water table drops to about 0.5 foot below the surface. This soil has low strength and poor trafficability. Permeability is rapid in the organic surface layer and very slow in the clayey underlying material. The total subsidence potential is high. If drained, the organic material, on drying, initially shrinks to about half the original thickness and then subsides further as a result of compaction and oxidation. These losses are most rapid during the first 2 years. If the soil is drained, it continues to subside at the rate of about 1 inch per year. The lower the water table, the more rapid the loss. Also, if the soil is drained, the clayey underlying material can shrink and swell markedly upon wetting and drying.

Included in mapping are a few small to large areas of Balize, Barbary, Clovelly, Gentilly, Kenner, and Larose soils. The Balize, Barbary, Gentilly, and Larose soils are mineral soils in nearby marshes and swamps. The Clovelly soils are in nearby brackish marshes and are more saline than the Allemands soil. The Kenner soils are in landscape positions similar to those of the Allemands soil, and they have organic layers more than 51 inches thick. The included soils make up about 20 percent of the map unit.

The natural vegetation is mainly maidencane, bulltongue, alligatorweed, cattail, common rush, pickerelweed, giant cutgrass, and swamp knotweed.

Most areas of this soil are used as habitat for wetland wildlife and for extensive forms of recreation, such as hunting or fishing.

This soil is well suited to use as habitat for wetland wildlife. Roosting and feeding areas are available for large numbers of ducks and many other species of waterfowl. This soil also provides habitat for large populations of crawfish, swamp rabbits, American alligators, and furbearers, such as mink, nutria, otter, raccoon, and muskrat. The small ponds and perennial channels included in this map unit provide habitat for significant numbers of freshwater fish. Trapping of American alligators and furbearers and commercial fishing are important enterprises in areas of this map unit. Water control structures designed for the management of habitat are difficult to construct and maintain because of the instability of the organic material.

This Allemands soil is not suited to cropland, pasture, or woodland because of wetness, flooding, and low strength. This soil is generally too soft and boggy to support livestock grazing. Drainage and protection from flooding are possible, but extensive water control structures, such as levees and water pumps, are required.

This soil is not suited to urban uses and intensive recreation areas because of wetness, flooding, and low strength. Drainage is only feasible with an extensive system of levees and water pumps. This soil is poorly suited to the construction of levees because it shrinks and cracks as it dries, causing the levees to fail. If this soil is drained, the clayey underlying material can shrink and swell markedly upon wetting and drying.

This Allemands soil is in capability subclass VIIIw. It is not assigned a woodland group.

Ae—Allemands muck, drained. This organic soil is level and poorly drained. It is in former freshwater marshes that have been drained, and it is protected from most flooding by levees. Slope is less than 1 percent.

Where undisturbed, this soil typically has a surface layer of very dark gray or black muck about 36 inches thick. The underlying material to a depth of about 60 inches is gray, very fluid clay. In places, buried logs and stumps are in the underlying material. In most developed areas, the surface layer has been covered with 1 to 3 feet of mineral material.

This Allemands soil is drained by pumps and protected from most floods by levees. Under normal conditions, the water table is at a depth of 2 to 4 feet below the surface. After high intensity rains of long duration, the water table is within 0.5 foot of the surface for short periods. Flooding is rare, but it can occur during hurricanes and when water pumps or protection levees fail. Permeability is rapid in the organic surface layer and very slow in the clayey underlying material. Although the surface has been covered with mineral fill material, the cracks in the organic material remain open and extend into the clayey underlying material. Water and air move freely through these cracks. Natural fertility is high. The content of organic matter is very high. Adequate water is available to plants in most years. The total subsidence potential is high. The shrink-swell potential is very high in the clayey underlying material.

Included in mapping are a few small areas of Harahan, Rita, Sharkey, and Westwego soils. The Harahan, Rita, and Westwego soils are also in drained swamps or marshes, but they are mineral soils. Sharkey soils are mineral soils and are in higher positions on the landscape. Also included are a few small areas of Allemands muck, drained soils that have severely subsided and have a water table that is at the surface most of the time. The included soils make up about 15 percent of this map unit.

Most areas of this soil are in urban land, pasture, or idle land that is reserved for future urban uses. A small acreage is in residential areas.

This soil is poorly suited to urban uses and intensive recreation areas because of flooding, wetness, subsidence, low strength, and the very high shrink-swell potential. When the water table is lowered, the organic matter oxidizes and slowly subsides. In places, buried logs and stumps cause uneven subsidence. If dry, the organic matter is subject to burning.

When this soil is used for dwellings, pilings and specially constructed foundations are needed. Removing the organic material and replacing it with suitable mineral material or covering the surface with mineral material can also help to reduce subsidence where buildings, local roads and streets, and playgrounds are to be constructed. Adequate water control is needed to reduce wetness and to control the rate of subsidence. Septic tank absorption fields do not function properly in this soil; therefore, community sewage systems are needed to prevent contamination of water sources by effluent seepage. Drainage ditches and levees are difficult to construct and maintain because of the fluid nature of the underlying mineral material and the subsidence of the organic material.

This soil is moderately well suited to pasture. Common bermudagrass, dallisgrass, white clover, and tall fescue are the main pasture plants. Wetness is the main limitation. Adequate water control is needed. For short periods after heavy rainstorms, this soil is too soft and boggy to support livestock grazing.

This Allemands soil is in capability subclass IVw. It is not assigned a woodland group.

AN—Aquents, dredged. This map unit consists of level, poorly drained soils forming in hydraulically deposited fill material dredged from nearby marshes and swamps during the construction and maintenance of waterways. Areas extend a distance of 0.25 to 1.0 mile from one or both sides of the waterway. Slope is less than 1 percent.

Aquents are slightly saline or saline throughout, and they are stratified throughout with mucky, clayey, loamy, and sandy layers. Typically, these soils are firm in the upper part and slightly fluid or very fluid in the lower part. In places, the soil layers contain small to large amounts of oyster and clam shells.

Flooding is rare, but it can occur because of high tides during storms. The seasonal high water table ranges from the soil surface to a depth of 3 feet. These soils have low strength. The total subsidence potential ranges from medium to high.

Included in mapping are a few small to large areas of Allemands, Harahan, and Westwego soils where the soil has not been covered by fill material. Also included

Figure 3.—Roseau cane is the main vegetation in this area of Aquents, dredged, on a spoil bank of a manmade canal.

are a few long, narrow areas of Aquents that have slopes of from 1 to 5 percent. Included soils make up about 10 percent of the map unit.

Natural vegetation consists mainly of eastern baccharis, roseau cane, goldenrod, marshhay cordgrass, rattlebox, waxmyrtle, willow, hackberry, and sumpweed (fig. 3).

Most areas of these soils are developed for docks and other shipping facilities. A small acreage is in idle land that is reserved for future development.

This map unit is poorly suited to urban uses and intensive recreation areas because of wetness, flooding, and low strength. If the map unit is used for buildings, piles and specially constructed foundations are needed. A drainage system is needed for most urban uses. Septic tank absorption fields do not function properly because of wetness and flooding.

These Aquents soils are not assigned a capability subclass or a woodland group.

AT—Aquents, dredged, frequently flooded. This map unit consists of level, poorly drained soils forming in hydraulically deposited fill material dredged from nearby marshes during the construction and maintenance of waterways. Areas extend a distance of 0.25 to 1.0 mile from one or both sides of the waterways. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soils. Slope is less than 1 percent.

Aquents are slightly saline or saline throughout, and they are typically stratified throughout with mucky, clayey, loamy, and sandy layers. Typically, the soils are firm in the upper part and slightly fluid or very fluid in the lower part. In places, the soil layers contain small to large amounts of oyster and clam shells.

This map unit is flooded for long or very long periods by high tides during storms. The seasonal high water table ranges from the soil surface to a depth of

1.5 feet. These soils have low strength. The total subsidence potential ranges from medium to high.

Included in mapping are a few small to large areas of Fausse soils where the soil has not been covered by fill material. Also included are a few long, narrow areas of Aquents that have slopes of from 1 to 5 percent. The included soils make up about 10 percent of the map unit.

Natural vegetation consists mainly of eastern baccharis, rattlebox, marshhay cordgrass, saltmarsh bulrush, and sumpweed.

Most areas of this map unit are used as habitat for wetland wildlife. A small acreage is developed for docks and other shipping facilities. Extensive forms of recreation are popular in the area.

These Aquents soils are well suited to extensive forms of recreation and to use as habitat for wetland wildlife. Food and roosting areas are available for ducks, geese, and other waterfowl. The map unit also provides habitat for alligators and furbearers, such as mink, otter, raccoon, and muskrat.

These soils are not suited to cropland, woodland, or pasture because of wetness, flooding, salinity, and low strength.

Unless additional fill material is added to raise surface elevation and unless levees are improved to protect from flooding, these soils are generally not suited to urban uses and intensive recreation areas. The hazard of flooding and the limitations of wetness, low strength, and subsidence potential are too severe for these uses.

These Aquents soils are not assigned a capability subclass or a woodland group.

BA—Balize and Larose soils. These mineral soils are level and very poorly drained. They are in freshwater marshes and are flooded or ponded most of the time. The soil pattern is irregular; some areas are all Balize soil, some areas are all Larose soil, and other areas have both soils. The texture of the surface layer changes as the Mississippi River reworks the deposits. The Balize soil makes up about 50 percent of the map unit, and the Larose soil makes up about 30 percent. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of these soils. Slope is less than 1 percent.

Typically, the surface layer of the Balize soil is dark gray, very fluid silt loam about 8 inches thick. The underlying material to a depth of 66 inches is dark gray and gray, very fluid silty clay loam in the upper part and dark gray, slightly fluid silt loam in the lower part.

Typically, the Larose soil has a surface layer of very dark grayish brown, very fluid muck about 6 inches thick. The next layer to a depth of about 17 inches is dark gray, very fluid mucky clay. The underlying material to a depth of about 60 inches is dark gray and gray, very fluid clay.

The Balize and the Larose soils are frequently flooded by fresh water from overflow of the Mississippi River. Depth of the floodwater ranges from 1 to 5 feet. During severe storms, tides from the Gulf of Mexico cover this map unit with over 5 feet of water. During nonflood periods, the water table ranges from 1 foot above the soil surface to 1 foot below the surface. These soils have low strength. They are saturated with water and very fluid throughout. While continuously saturated, these soils have a low shrink-swell potential. If drained, these soils have a medium total subsidence potential and a very high or moderate shrink-swell potential. Permeability is slow.

Included in mapping are a few large areas of Allemands, Aquents, Convent, and Kenner soils. Allemands and Kenner soils are in landscape positions similar to those of the Balize and Larose soils, and they are organic soils. The Aquents soils are on nearby spoil banks. Convent soils are in slightly higher positions and are firm soils with less clay throughout. Also included are a few small areas of soils near the Gulf of Mexico that are similar to the Balize and Larose soils except that they are saline. Included in most areas are many small ponds, perennial streams, and mudflats. Included soils make up about 20 percent of the map unit.

The natural vegetation is mainly elephant's ear, delta threesquare, roseau cane, delta duckpotato, Walter's millet, pickerel weed, bulltongue, cattail, alligatorweed, and willow (fig. 4).

Most areas of these soils are used as habitat for wetland wildlife and for extensive forms of recreation. There are oil and gas wells in some areas.

These soils are well suited to habitat for wetland wildlife. They provide habitat for large populations of ducks and other species of waterfowl. They also provide habitat for alligators, swamp rabbits, deer, nutria, mink, otter, muskrat, and raccoon. The small ponds and tidal channels produce many species of freshwater fish. Sport fishing and duck hunting are popular in areas of these soils. Intensive habitat management is difficult. Water control structures are difficult to construct because of the instability and very fluid nature of the soils.

These soils are not suited to urban uses or intensive recreation areas because of flooding, wetness, subsidence, and low strength. The soils are poorly suited to use in constructing levees. Upon

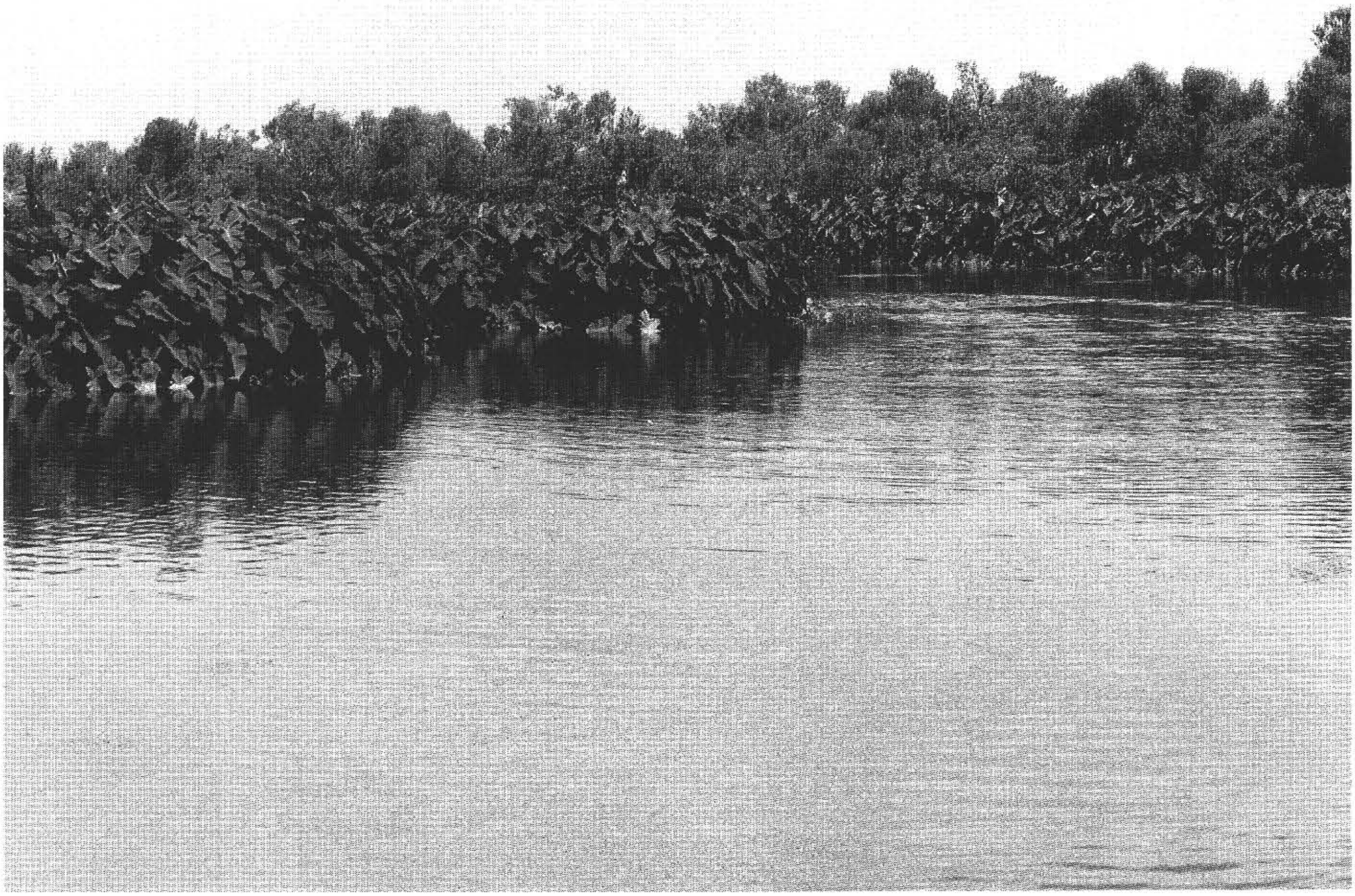


Figure 4.—Balize and Larose soils are commonly in small areas of open water and are densely vegetated by elephant's ear, willows, and roseau cane.

drying, the soil material shrinks and cracks considerably, and levees commonly fail. If these soils are drained, the Balize soil will have a moderate shrink-swell potential, and the Larose soil will have a very high shrink-swell potential.

This map unit is in capability subclass VIIIw. It is not assigned a woodland group.

BB—Barbary muck. This mineral soil is level and very poorly drained. It is in broad, ponded freshwater swamps. Areas range from about 50 to 2,000 acres. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the surface layer is very dark grayish brown, very fluid muck about 4 inches thick. The underlying material to a depth of about 60 inches is dark gray, very fluid clay. In places, buried logs are in the underlying material.

This Barbary soil is flooded most of the time by fresh water, and it is saturated throughout the year. Most areas are also occasionally flooded by salt water during storms. During nonflood periods, the seasonal high water table ranges from 1 foot above the surface to 0.5 foot below the surface. Permeability is very slow. The total subsidence potential is medium. While the soil is continuously saturated, the shrink-swell potential is low. If the soil is drained, the shrink-swell potential is very high.

Included in mapping are a few small to large areas of Allemands, Kenner, and Sharkey soils. The Allemands and Kenner soils are in nearby freshwater marshes, and they have thick organic layers. The Sharkey soils are higher on the landscape than the Barbary soil and have firm mineral layers. Also included are large areas of mineral soils that are similar to the Barbary soil, except that they are slightly saline and have been encroached upon by brackish marsh vegetation. The included soils make up about 20 percent of the map unit.

Natural vegetation on this Barbary soil consists of water-tolerant trees and aquatic understory plants. The common trees are baldcypress, black willow, and water tupelo. Understory and aquatic vegetation consist mainly of alligatorweed, bulltongue, maiden cane, buttonbush, duckweed, pickerelweed, and water hyacinth.

Most areas of this soil are used as woodland, mainly as habitat for wildlife and for extensive forms of recreation.

This soil is well suited to use as habitat for wetland wildlife. It provides habitat for large populations of crawfish, ducks, squirrels, alligators, wading birds, and furbearers, such as raccoon, muskrat, and otter. White-tailed deer and swamp rabbits use areas of this soil when it is dry or not flooded too deeply. Trapping of alligators, crawfish, and furbearers is an important enterprise. Constructing shallow ponds and artificially flooding this soil can improve the habitat for waterfowl.

This soil is poorly suited to use as woodland, mainly because of wetness, flooding, and poor trafficability. Few areas are managed for timber production because trees grow slowly and special equipment is needed to harvest the timber. This soil cannot support the weight of most types of harvesting equipment.

Unless drained and protected from flooding, this soil is not suited to use as pasture or cropland. The wetness limitation and the flooding hazard are too severe for these uses. This soil is generally too soft and boggy to support livestock grazing.

This soil is not suited to urban uses and intensive recreation areas. Wetness and low strength are severe limitations, and flooding is a severe hazard. Drainage and protection from flooding are possible only by constructing large water control structures. Drainage ditches are difficult to construct because stumps and logs are buried in the soil. In addition, subsidence and shrink-swell potential are limitations if the soil is drained.

This Barbary soil is in capability subclass VIIw and woodland group 4W.

BE—Bellpass muck. This organic soil is level, very poorly drained, and saline. It is in saline marshes, and it is ponded or flooded by salt water most of the time. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the organic surface layer is dark gray and very dark grayish brown, very fluid muck about 29 inches thick. The underlying mineral material to a depth of about 70 inches is dark gray and gray, very fluid clay.

This Bellpass soil is flooded most of the time by salt water, and it is wet throughout the year. During tidal storms this soil is covered by as much as 5 feet of water. Water is perched above the surface most of the year, but during periods of sustained north wind and low tides the water table drops to about 0.5 foot below the surface. This soil has low strength and poor trafficability. Permeability is rapid in the organic surface layer and very slow in the clayey underlying material. The total subsidence potential is high. If drained, the organic material, on drying, initially shrinks to about half the original thickness and then subsides further as a result of compaction and oxidation. These losses are most rapid during the first 2 years, and the soil continues to subside at the rate of about 1 inch per year. The lower the water table, the more rapid the loss. While the soil is continuously saturated, the shrink-swell potential is low. If the soil is drained, the clayey underlying material will have a very high shrink-swell potential.

Included in mapping are a few small to large areas of Clovelly, Lafitte, Scatlake, and Timbalier soils. The Clovelly and Lafitte soils are in brackish marshes and are less saline throughout than the Bellpass soil. The Scatlake and Timbalier soils are in landscape positions similar to those of the Bellpass soil. The Scatlake soils are very fluid, mineral soils. The Timbalier soils have organic material that is more than 51 inches thick. The included soils make up about 20 percent of the map unit.

The natural vegetation consists mainly of marshhay cordgrass, needlegrass rush, seashore saltgrass, smooth cordgrass, bushy sea-oxeye, saltwort, and saltmarsh aster.

Most areas of this soil are used as habitat for wetland wildlife and for extensive forms of recreation, such as hunting and fishing.

This soil is well suited to use as habitat for wetland wildlife. It is part of an estuary that provides a nursery for saltwater fish and crustaceans, such as shrimp, blue crab, menhaden, croaker, redfish, speckled trout, spot, and bay anchovy. These fish and estuarine larval forms are sources for a large fishing industry. This soil also provides habitat for geese, muskrat, mink, otter, raccoon, nutria, and ducks.

This soil is not suited to cropland, woodland, or pasture because of flooding, wetness, and low strength. This soil is generally too soft and boggy to support livestock grazing. Drainage and protection from flooding are possible, but extensive water control structures, such as levees and water pumps, are required. Subsidence and low strength are continuing limitations after drainage.

This soil is not suited to urban uses or intensive recreation areas because of wetness, flooding, and low strength. Drainage is only feasible with an extensive system of levees and water pumps. This soil is poorly suited to the construction of levees because it shrinks and cracks as it dries, causing the levees to fail. If the soil is drained, the very high shrink-swell potential of the underlying material is a management concern.

This Bellpass soil is in capability subclass VIIIw. It is not assigned a woodland group.

CE—Clovelly muck. This organic soil is level, very poorly drained, and slightly saline. It is in brackish marshes, and it is flooded and ponded most of the time. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the organic surface layer is a very dark gray, very fluid muck about 42 inches thick. The underlying material to a depth of about 70 inches is gray, very fluid clay.

This Clovelly soil is flooded most of the time by brackish water, and it is wet throughout the year. During tidal storms it is covered by as much as 5 feet of water. Water is above the surface during most of the year, but during periods of sustained north wind and low tides, the water table drops to about 0.5 foot below the surface. This soil has low strength and poor trafficability. Permeability is rapid in the organic surface layer and very slow in the clayey underlying material. The total subsidence potential is high. If drained, the organic material, on drying, initially shrinks to about half the original thickness and then subsides further as a result of compaction and oxidation. These losses are most rapid during the first 2 years, and the soil continues to subside at the rate of about 1 inch per year. The lower the water table, the more rapid the loss. While continuously saturated, this soil has a low shrink-swell potential. The shrink-swell potential will be very high in the clayey underlying material if the soil is drained.

Included in mapping are a few small to large areas of Barbary, Bellpass, Gentilly, Lafitte, Scatlake, and Timbalier soils. The Barbary soils are in nearby swamps and are mineral soils. The Bellpass, Scatlake, and Timbalier soils are in saline marshes and are more saline throughout than the Clovelly soil. The Gentilly and Lafitte soils are in landscape positions similar to those of the Clovelly soil. The Lafitte soils have a thicker organic layer, and the Gentilly soils are mineral throughout. In places, there are few to many small ponds and tidal channels (fig. 5). Also included are large areas of soils that are similar to the Clovelly soil except that they have a few dead cypress trees and buried logs in the soil profile. The included soils make up about 20 percent of the map unit.

The natural vegetation consists mainly of marshhay cordgrass, olney bulrush, big cordgrass, dwarf spikesedge, marsh morningglory, saltmarsh bulrush, widgeongrass, and sumpweed.

Most areas of this soil are used as habitat for wetland wildlife and for extensive forms of recreation, such as hunting and fishing.

This soil is well suited to use as habitat for wetland wildlife. It provides habitat for large populations of geese and furbearers, such as mink, muskrat, otter, and raccoon. Intensive management of wildlife habitat generally is not practical. Water control structures are difficult to construct and maintain because of the instability and very fluid nature of the soil material. Saltwater intrusion is a problem in the management of the vegetation for wildlife habitat. The small ponds and streams included in this map unit provide areas for sport and commercial fishing.

This soil is not suited to cropland, pasture, or woodland because of wetness, flooding, salinity, low strength, and poor accessibility. This soil is generally too fluid and boggy to support livestock grazing.

This soil is not suited to urban uses and intensive recreation areas because of flooding, wetness, low strength, and subsidence potential. If this soil is drained and protected from flooding, it will subside 1 to 5 feet below sea level. In addition, the very high shrink-swell potential of the clayey underlying material will be a management concern.

This Clovelly soil is in capability subclass VIIIw.

Cm—Commerce silt loam. This mineral soil is level and somewhat poorly drained. It is in high and intermediate positions on natural levees of the Mississippi River and its distributaries. Slope is less than 1 percent.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of about 38 inches. It is grayish brown silty clay loam in the upper part, grayish brown silt loam in the next part, and gray silty clay loam in the lower part. The substratum to a depth of about 60 inches is gray silt loam.

This Commerce soil has high fertility. Permeability is moderately slow. Water runs off the surface slowly. Adequate water is available to plants in most years. A seasonal high water table fluctuates between depths of about 1.5 and 4 feet from December through April. This soil has a moderate shrink-swell potential.

Included in mapping are a few small areas of

Figure 5.—Many small ponds are in this area of Clovelly muck in brackish marsh. The typical vegetation is marshhay cordgrass.

Convent, Harahan, Sharkey, Vacherie, and Westwego soils. The Convent soils are higher on the landscape than the Commerce soil and contain less clay throughout. The Harahan, Sharkey, and Westwego soils are in lower positions and have a clayey subsoil. The Vacherie soils are in landscape positions similar to those of the Commerce soil, and they are clayey in the lower part. The included soils make up about 10 percent of the map unit.

Most of the acreage of this map unit is in residential areas or idle land reserved for future urban uses. A small acreage is used for pasture, cropland, or woodland. Most of the cropland is used for truck crops, home vegetable gardens, and citrus.

This soil is firm, consists of mineral materials throughout, and can support the foundations of most low structures without the use of pilings. Wetness and the moderate shrink-swell potential are the main limitations for dwellings without basements. These limitations can be overcome by installing a drainage system and by using proper engineering designs. The moderately slow permeability and the high water table increase the possibility that septic tank absorption fields will fail. During the rainy season, effluent from onsite sewage disposal systems may seep at points downslope. Low strength is a limitation for local roads and streets, but this limitation can be minimized by adding sand or other suitable fill material to the road base.

This soil is well suited to pasture. Improved bermudagrass, common bermudagrass, dallisgrass, ryegrass, tall fescue, vetch, arrowleaf clover, red clover, and white clover are the main pasture plants. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture in good condition.

This soil is well suited to cultivated crops, and it is one of the best soils in the survey area for this use. The main crops are vegetables and citrus; soybeans, sugarcane, and corn are also grown. This soil is friable, easy to keep in good tilth, and can be worked throughout a wide range in moisture content. Proper row arrangement, field ditches, and vegetated outlets are needed to remove excess surface water. Land grading and smoothing can also help. A tillage pan forms easily if this soil is tilled when wet, but it can be broken up by chiseling or subsoiling. Surface crusting and soil compaction can be reduced by returning crop residue to the soil.

This soil is well suited to the production of hardwoods. American sycamore and eastern cottonwood are suitable trees for planting. Equipment use limitations are moderate because of wetness.

This soil is moderately well suited to intensive recreation areas. Wetness is the main limitation. Excess surface water can be removed by shallow ditches and by providing the proper grade for drainage. Plant cover can be maintained by applying fertilizer and by controlling traffic.

This Commerce soil is in capability subclass IIw and in woodland group 13W.

Co—Commerce silty clay loam. This mineral soil is level and somewhat poorly drained. It is in intermediate positions on natural levees of the Mississippi River and its distributaries. Slope is less than 1 percent.

Typically, the surface layer is dark gray silty clay loam about 4 inches thick. The subsoil to a depth of about 30 inches is grayish brown silty clay loam. The underlying material to a depth of about 60 inches is grayish brown silt loam in the upper part and gray silty clay loam in the lower part.

This Commerce soil has high fertility. Permeability is moderately slow. Water runs off the surface slowly. Adequate water is available to plants in most years. A seasonal high water table fluctuates between depths of about 1.5 and 4 feet from December through April. This soil has a moderate shrink-swell potential.

Included in mapping are a few small areas of Convent, Harahan, Sharkey, and Vacherie soils. The Convent soils are in higher landscape positions than the Commerce soil and have less clay throughout. The Harahan and Sharkey soils are in lower positions and have a clayey subsoil. The Vacherie soils are in similar positions, and they have clayey underlying material. The included soils make up about 5 percent of the map unit.

Most of the acreage of this map unit is in residential areas or idle land that is reserved for future urban uses. A small acreage is used for pasture, cropland, or woodland. Most of the cropland is used for truck crops, home vegetable gardens, and citrus.

This soil has moderate limitations for most urban uses. It is firm, consists of mineral materials throughout, and can support the foundations of most low structures without the use of pilings. Wetness and moderate shrink-swell potential are the main limitations for dwellings without basements. These limitations can easily be overcome by installing a drainage system and by using proper engineering designs. The moderately slow permeability and the high water table increase the possibility that septic tank absorption fields will fail. During the rainy season, effluent from onsite sewage disposal systems may seep at points downslope. Low strength is a limitation for local roads and streets, but this limitation can be minimized by adding sand or other suitable fill material to the road base.

This soil is well suited to use as pasture. Improved bermudagrass, common bermudagrass, dallisgrass, ryegrass, tall fescue, wheat, vetch, arrowleaf clover, red clover, and white clover are the main pasture plants. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture in good condition.

This Commerce soil is well suited to cultivated crops, and it is one of the best soils in the survey area for this use. This soil, however, is sticky when wet and hard when dry, and it becomes cloddy if tilled when it is too wet or too dry. The main crops are vegetables and citrus; soybeans, sugarcane, and corn are also grown. Wetness is the main limitation. Proper row arrangement, field ditches, and vegetated outlets are needed to remove excess surface water. Land grading and smoothing can also help. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Most crops, other than legumes, respond well to additions of nitrogen fertilizer.

This soil is well suited to the production of hardwoods. American sycamore and eastern cottonwood are suitable trees for planting. Equipment use limitations are moderate because of wetness and the silty clay loam surface layer.

This soil is moderately well suited to intensive recreation areas. Wetness is the main limitation. Good drainage should be provided for intensively used areas, such as campgrounds and playgrounds. Plant cover can be maintained by controlling traffic.

This Commerce soil is in capability subclass IIw and in woodland group 13W.

Ct—Convent silt loam. This mineral soil is level and somewhat poorly drained. It is in high positions on natural levees of the Mississippi River and its distributaries. Slope is less than 1 percent.

Typically, the surface layer is dark brown silt loam about 4 inches thick. The underlying material to a depth of about 60 inches is grayish brown silt loam.

This Convent soil has high fertility. Permeability is moderate. Water runs off the surface slowly. Adequate water is available to plants in most years. A seasonal high water table fluctuates between depths of about 1.5 and 4 feet from December through April. This soil has a low shrink-swell potential.

Included in mapping are a few small areas of Commerce, Harahan, Rita, Sharkey, Vacherie, and Westwego soils. The Commerce soils are in similar and slightly lower landscape positions than those of the Convent soil and contain more clay throughout. The Harahan, Rita, Sharkey, and Westwego soils are lower on the landscape and have a clayey subsoil. The Vacherie soils are in positions similar to those of the Convent soil and are clayey in the lower part. The included soils make up about 10 percent of the map unit.

Most of the acreage of this map unit is in residential areas or idle land that is reserved for future urban development. A small acreage is used as woodland, cropland, or pasture.

This soil has moderate limitations for most urban uses. It is firm, consists of mineral materials throughout, and can support the foundations of most low structures without the use of pilings. Wetness is the main limitation for dwellings without basements. This limitation can be overcome by installing a drainage system. The high water table increases the possibility that septic tank absorption fields will fail. During the rainy season, effluent from onsite sewage disposal systems may seep at points downslope.

This soil is well suited to use as pasture. Improved bermudagrass, common bermudagrass, dallisgrass, ryegrass, tall fescue, vetch, arrowleaf clover, red clover, and white clover are the main pasture plants. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture in good condition.

This Convent soil is well suited to cultivated crops, and it is one of the best soils in the survey area for this use. The main crops are vegetables and citrus; soybeans, sugarcane, and corn are also grown. This soil is friable, easy to keep in good tilth, and can be worked throughout a wide range of moisture content. Proper row arrangement, field ditches, and vegetated outlets are needed to remove excess surface water. Land grading and smoothing can also help. A tillage pan forms easily if this soil is tilled when wet, but it can be broken up by chiseling or subsoiling. Surface crusting and soil compaction can be reduced by returning crop residue to the soil.

This soil is well suited to the production of hardwoods. American sycamore and eastern cottonwood are suitable trees for planting. Equipment use limitations are moderate because of wetness.

This soil is moderately well suited to intensive recreation areas. Wetness is the main limitation. Excess surface water can be removed by shallow ditches and by providing the proper grade for drainage. Plant cover can be maintained by applying fertilizer and by controlling traffic.

This Convent soil is in capability subclass IIw and in woodland group 13W.

CV—Convent, Commerce, and Sharkey soils, frequently flooded. These mineral soils are level and somewhat poorly drained and poorly drained. They are on the unprotected river banks between the Mississippi River and the protection levees (fig. 6). These soils are subject to frequent flooding by rapidly moving water as the river seasonally rises and falls. The soil pattern is irregular; some areas are all Convent soil, some are all Commerce soil, some are all Sharkey soil, and other areas contain all of these soils. The soils were mapped together because the frequent flooding is a common feature controlling use and management. The texture of the surface layer changes as the river reworks the deposits. The Convent soil makes up about 40 percent of the map unit, the Commerce soil about 30 percent, and the Sharkey soil about 20 percent. Slope is less than 1 percent.

Typically, the surface layer of the Convent soil is dark grayish brown silt loam about 8 inches thick. The underlying material to a depth of 60 inches is grayish brown silt loam in the upper part and gray silt loam in the lower part. In places, the surface layer is fine sandy loam or very fine sandy loam.

Typically, the surface layer of the Commerce soil is brown silt loam about 11 inches thick. The subsoil is grayish brown silt loam to a depth of about 21 inches. The underlying material to a depth of about 60 inches is gray silty clay loam and silt loam. In places, the surface layer is very fine sandy loam.

Typically, the surface layer of the Sharkey soil is dark gray silt loam about 10 inches thick. The subsoil to a depth of about 43 inches is gray clay. The substratum to a depth of about 60 inches is gray stratified clay, silt loam, and very fine sandy loam. In places, the surface layer is silty clay loam or clay.

The Convent, Commerce, and Sharkey soils are frequently flooded by overflow from the Mississippi

Figure 6.—Convent, Commerce, and Sharkey soils, frequently flooded, are in areas adjacent to flood protection levees.

River, mostly in the spring. Depth of the floodwater ranges from 2 to 10 feet. During nonflood periods, the Sharkey soils are wet, and the water table is at the surface or within 2 feet of the surface. During nonflood periods, the Convent and Commerce soils have a water table at a depth of 1.5 to 4 feet. These soils have low strength. The Commerce soil is moderately slowly permeable. It has a moderate shrink-swell potential. The Sharkey soil is very slowly permeable. It has a very high shrink-swell potential. The Convent soil is moderately permeable. It has a low shrink-swell potential.

Included with these soils in mapping are a few small areas where mineral fill material has been added to raise the elevation above flooding elevations. Several areas that are above normal flooding elevation are included. Also included are a few small areas of Vacherie soils in landscape positions similar to those of the Convent and Commerce soils. Vacherie soils have a loamy over clayey subsoil. The included areas make up about 10 percent of the map unit.

Most areas of these soils are used as woodland or idle land. A small acreage is used for extensive forms of recreation and for urban areas.

These soils are moderately well suited to use as woodland. Flooding and wetness limit the use of equipment on these soils. In addition, the risk of seedling mortality is severe. Eastern cottonwood and American sycamore are suitable trees for planting on the Convent and Commerce soils. Baldcypress is a suitable tree for planting on the Sharkey soil.

The soils in this map unit are well suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for wetland wildlife and openland wildlife. Wildlife habitat can be improved by maintaining undisturbed areas of permanent vegetation.

This map unit is not suited to cropland and is poorly suited to pasture because of frequent, deep flooding. Scouring and sedimentation are also management concerns.

Unless drained and protected from flooding, the soils in this map unit are generally not suited to urban uses or to intensive recreation areas. The main hazard is flooding and the main limitations are wetness and the very high shrink-swell potential. If the soils are developed for commercial uses, sufficient fill material is needed to raise the surface elevation above normal flood levels.

This map unit is in capability subclass Vw. The Commerce soils are in woodland group 12W, the Convent soils are in woodland group 10W, and the Sharkey soils are in woodland group 6W.

Dp—Dumps. This map unit consists of sanitary landfills into which solid refuse is deposited. The landfills are mostly within areas of swamps and marshes. Dumps are nearly level to moderately steep. Areas range from 5 to 20 acres.

Typically, these areas consist of alternating layers of compacted refuse and thin soil layers. The combined thickness of these layers can range from 5 feet to more than 30 feet. The landfill is covered with a thick layer of soil material when it is completed.

Included with these areas in mapping are a few small areas of Allemands, Barbary, Clovelly, Harahan, Rita, and Westwego soils that are not yet covered by refuse.

This map unit is mainly used for the disposal of solid waste. Dumps are generally not suited to agricultural, forest, or urban uses. If areas of this map unit are drained, the underlying refuse can decay. The surface may then cave in and subside unevenly.

Dumps are not assigned to a capability subclass or woodland group.

FA—Fausse muck, saline. This mineral soil is level and very poorly drained. It is in swamps on subsided natural levees of distributaries of the Mississippi River. This soil is near sea level and is frequently covered by salt water. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the surface layer is about 12 inches thick. It is very dark gray, very fluid muck in the upper part and dark gray, firm clay in the lower part. The subsoil and substratum to a depth of about 60 inches are dark gray and gray, firm clay.

This Fausse soil is subject to frequent, shallow flooding by the highest of the normal tides. It is also subject to occasional, deep flooding by storm tides. Tides can be as much as 10 feet above normal when hurricanes and tropical storms pass over or near the parish. The water table fluctuates from about 1 foot above the surface to 1.5 feet below the surface year-round. This soil is seldom dry enough to shrink or crack. However, if it is drained, it has a very high shrink-swell potential. Permeability is very slow.

Included in mapping are a few small to large areas of Bellpass, Clovelly, Gentilly, and Sharkey soils. The Bellpass and Clovelly soils are organic soils in nearby marshes. Gentilly soils are in lower positions than the Fausse soil and are more fluid in the upper part. The Sharkey soils are not saline, and they are higher on the landscape than the Fausse soil. The included soils make up as much as 20 percent of the map unit.

The native vegetation once consisted of baldcypress, water tupelo, and red maple trees. Most of this native vegetation has been damaged or killed by saltwater intrusion.

Most areas of this soil are used as habitat for wetland wildlife or for camp sites.

This soil is well suited to use as habitat for wetland wildlife. When the soil is flooded, it provides feeding and roosting areas for ducks and other waterfowl. Properly managed low-level weirs for water control, controlled burning, and controlled harvest are needed to improve the habitat for wetland wildlife. Because of the intrusion of salt water, the native vegetation is dying and salt-tolerant species are encroaching. This soil also provides habitat for deer, rabbits, nutria, and associated species. Hunting and fishing are popular in some areas.

Unless it is drained and protected from flooding, this soil is not suited to cropland, pasture, woodland, or urban uses. The hazard of flooding and the limitations of wetness and soil salinity are generally too severe for these uses.

This soil is in capability subclass VIIw. It is not assigned a woodland group.

FE—Felicity loamy fine sand, frequently flooded. This mineral soil is gently sloping, somewhat poorly drained, and saline. It is on ridges along the coast of the Gulf of Mexico and on barrier islands, and it is subject to flooding by salt water during high storm tides. Slope ranges from 1 to 3 percent.

Typically, the uppermost layer of this Felicity soil is brown loamy fine sand about 16 inches thick. The underlying material to a depth of about 60 inches is dark brown loamy sand in the upper part, grayish brown loamy sand in the next part, and dark gray sand in the lower part. Shell fragments are in all layers.

This Felicity soil is low in fertility. Permeability is very rapid above the water table. Water runs off the surface slowly. Adequate water is available to plants only in some years. The water table fluctuates with the normal tides and is 2 to 3 feet below the surface most

Figure 7.—This area of Gentilly muck is in brackish marsh. The large natural waterway in the background is River Aux Chenes.

of the time. During storms, this soil is frequently flooded by salt water from the Gulf of Mexico.

Included in mapping are a few small areas of Bellpass, Scatlake, and Timbalier soils. All of these soils are in saline marshes. The Bellpass and Timbalier soils have thick organic layers. The Scatlake soils are very fluid, clayey soils. The included soils make up about 5 percent of the map unit.

The natural vegetation is mainly black mangrove, sumpweed, seashore saltgrass, saltwort, smooth cordgrass, bushy sea-oxeye, marshhay cordgrass, and needlegrass rush. In some areas, the soil is barren of vegetation.

Most areas of this soil are used as habitat for wetland wildlife and openland wildlife. Areas of this soil serve to break wave action from the Gulf of Mexico.

This soil is poorly suited to use as habitat for wetland wildlife. It provides some plant growth for food, but it is used mainly as a resting area by geese, ducks, and shore birds.

This soil is not suited to cropland, pasture, and woodland. The hazard of flooding and the limitation of salinity generally are too severe for these uses.

This soil is not suited to urban uses and to intensive recreation areas, mainly because of flooding and wetness. Occasional hurricanes and high storm tides are severe hazards. Soil salinity and droughtiness are limitations to plant growth.

This Felicity soil is in capability subclass VIIw. It is not assigned a woodland group.

GE—Gentilly muck. This mineral soil is level and very poorly drained. It is in brackish marshes, and it is flooded or ponded most of the time (fig. 7). The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the surface layer is very dark gray, very fluid muck about 10 inches thick. The underlying material to a depth of about 60 inches is dark gray, slightly fluid clay in the upper part and gray, very plastic clay in the lower part. In places, a few stumps and logs are buried in the underlying material.

This Gentilly soil is flooded most of the time and is wet throughout the year. During storms, this soil is covered by as much as 4 feet of water. The water table ranges from 3 feet above the surface to 0.5 foot below the surface. This soil has low strength. It is saturated with water and is very fluid in the upper part. The total subsidence potential is medium. While the soil is continuously saturated, the shrink-swell potential is low. If the soil is drained, the shrink-swell potential will be very high. Permeability is very slow.

Included in mapping are a few large areas of Clovelly, Fausse, and Lafitte soils. Clovelly and Lafitte soils are slightly lower on the landscape than the Gentilly soil and have a thick organic surface layer. Fausse soils are in higher positions and are less fluid in the upper part. Also included are many small ponds and perennial streams. The included soils make up about 20 percent of the map unit.

The natural vegetation is mainly marshhay cordgrass, olney bulrush, dwarf spikesedge, saltmarsh bulrush, and sumpweed.

Most areas of this soil are used as habitat for wetland wildlife and for extensive forms of recreation.

This soil is well suited to use as habitat for wetland wildlife. It provides habitat for large populations of ducks and other waterfowl species. It also provides habitat for crawfish, alligators, swamp rabbits, deer, nutria, mink, otter, and raccoon. The small ponds and perennial streams contain many species of fish. Sport fishing and duck hunting are popular in areas of this soil. Intensive habitat management is difficult. Water control structures are difficult to construct because of the instability and very fluid nature of the upper part of the soil.

This soil is not suited to cropland, woodland, or pasture because of wetness and flooding. The soil is generally too soft and boggy to support livestock grazing.

This soil is not suited to urban uses or intensive recreation areas because of flooding, wetness, subsidence, and low strength. The soil is poorly suited to the construction of levees because it shrinks and cracks as it dries, causing the levees to fail. If the soil is drained, the very high shrink-swell potential is a management concern.

This Gentilly soil is in capability subclass VIIw. It is not assigned a woodland group.

Ha—Harahan clay. This mineral soil is level and poorly drained. This soil is in low positions on the Mississippi River flood plain in former swamps, and it is protected from most flooding by levees and drained with pumps. Slope is less than 1 percent.

Typically, the surface layer is very dark gray, firm clay about 5 inches thick. The subsoil is gray, firm clay about 17 inches thick. The substratum to a depth of about 65 inches is dark gray, slightly fluid clay in the upper part and gray, very fluid clay in the lower part.

This Harahan soil is protected from most flooding by levees, and it is drained by pumps. Under normal conditions the water table is maintained at a depth of about 1 to 3 feet below the surface. After heavy rains, the water table is near the surface for short periods. Flooding is rare, but it can occur during hurricanes or when water pumps or protection levees fail. Permeability is very slow. Water runs off the surface slowly. Adequate water is available to plants in most years. This soil is high in fertility. It has a very high shrink-swell potential and a medium total subsidence potential. The part of the subsoil and underlying material that remains continuously saturated has a low shrink-swell potential.

Included in mapping are a few small areas of drained Allemands soils and Sharkey and Westwego soils. The Allemands soils are in former marshes and are organic soils. The Sharkey soils are higher on the landscape than the Harahan soil and are firm and clayey throughout. The Westwego soils are in landscape positions similar to those of the Harahan soil, and they have buried layers of organic material. The included soils make up about 10 percent of the map unit.

Most areas of this soil are used for pasture or woodland (fig. 8). A small acreage is in residential areas or is idle land that is reserved for future urban uses.

This soil is moderately well suited to use as pasture and cropland. Common bermudagrass, improved bermudagrass, dallisgrass, ryegrass, tall fescue, and white clover are the main pasture plants. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture. Water control is a major concern for crops and pasture.

This soil is poorly suited to urban uses and intensive recreation areas because of flooding, wetness, very slow permeability, subsidence, low strength, and the very high shrink-swell potential. If buildings are constructed on this soil, pilings and specially constructed foundations are needed. Additional support and stability for buildings and roads can be provided by adding loamy fill material to the soil surface. Adequate water control is needed to reduce wetness and to control the rate of subsidence. Using proper design and backfilling with mineral soil material that has a low shrink-swell potential can minimize the effects of shrinking and swelling. Shallow excavations are difficult to construct because of the buried stumps and logs in the soil and the slightly fluid to very fluid nature of the substratum. Septic tank absorption fields do not function properly because of

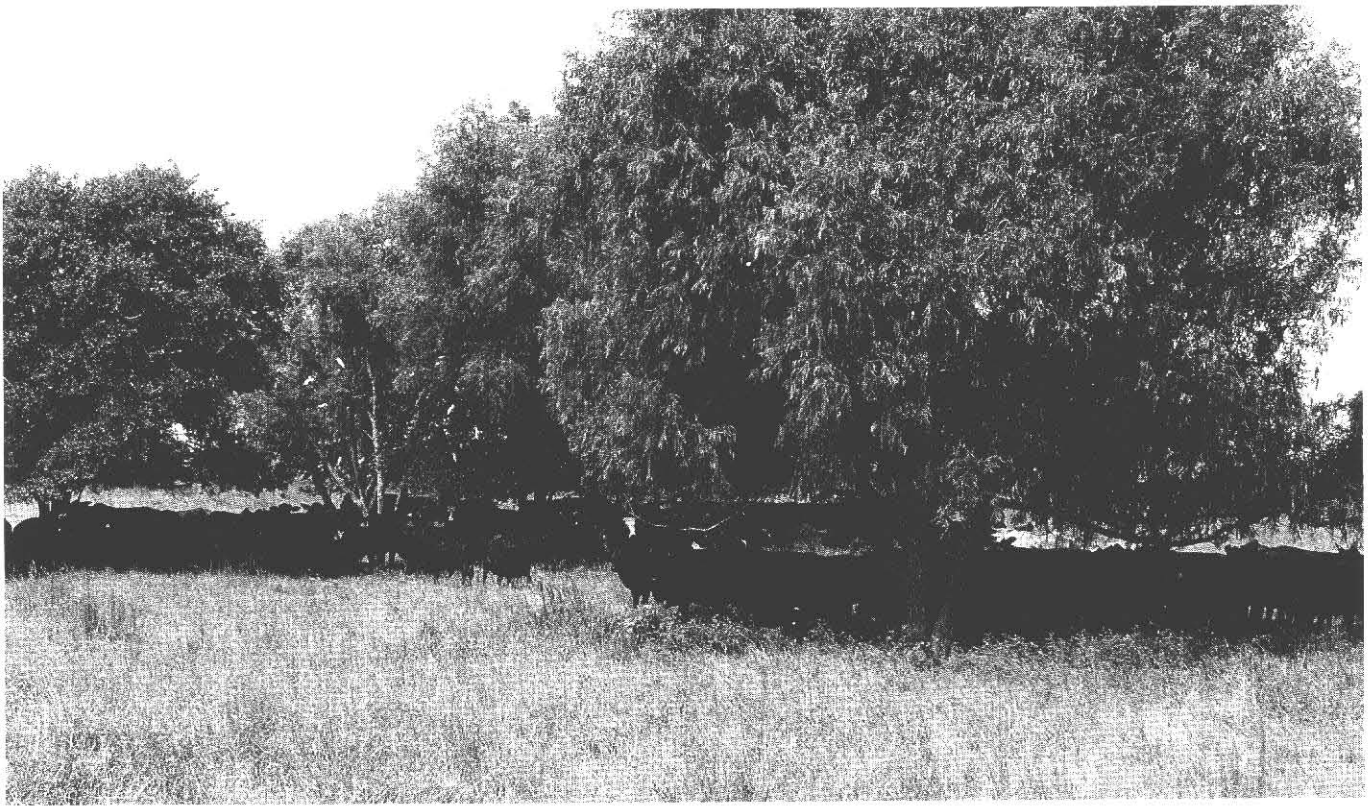


Figure 8.—Harahan clay is moderately well suited to pasture.

wetness and the very slow permeability. If housing density is moderate to high, a community sewage system is needed.

This Harahan soil is in capability subclass IIIw and woodland group 5W.

KE—Kenner muck. This organic soil is level and very poorly drained. It is in freshwater marshes, and it is flooded and ponded most of the time. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the surface layer is dark brown and black, very fluid muck about 24 inches thick. The next layer is dark gray, very fluid clay about 3 inches thick. From a depth of 27 to 38 inches is very dark gray, very fluid muck. The underlying material to a depth of about 68 inches is dark gray, very fluid clay in the upper part and black, very fluid muck in the lower part.

This Kenner soil is flooded most of the time by fresh water, and it is wet throughout the year. During tidal storms, this soil is covered by 4 or more feet of water. During nonflood periods, the seasonal high water table ranges from 1 foot above the surface to 0.5 foot below the surface. This soil has low strength and poor trafficability. Permeability is rapid in the organic layers and very slow in the clayey layers. The total subsidence potential is very high. If drained, the organic material, on drying, initially shrinks to about half the original thickness and then subsides further as a result of compaction and oxidation. These losses are most rapid during the first 2 years, and the soil continues to subside at the rate of about 1 inch per year. The lower the water table, the more rapid the loss. In addition, if drained, the clayey underlying material can have a very high shrink-swell potential.

Included in mapping are a few small areas of Allemands, Barbary, Clovelly, Gentilly, and Lafitte soils. The Allemands soils are in landscape positions similar to those of the Kenner soil, and they have a thick layer of clay within 51 inches of the surface. The Barbary soils are in nearby swamps, and they are mineral soils. The Clovelly and Lafitte soils are in brackish marshes and are more saline throughout than the Kenner soil. Gentilly soils are in brackish marshes and are saline, mineral soils. In places, there are few to many small ponds and tidal channels. The included soils make up about 20 percent of the map unit.

The natural vegetation consists mainly of alligatorweed, bulltongue, common buttonbush, common rush, cattail, giant cutgrass, California bulrush, and maidencane. A few scattered baldcypress trees are in some areas.

Most areas of this soil are used as habitat for wetland wildlife and for extensive forms of recreation, such as hunting and fishing.

This soil is well suited to use as habitat for wetland wildlife. Food and roosting areas are available for ducks, geese, and other waterfowl. This soil also provides habitat for the American alligator and furbearers, such as mink, muskrat, otter, raccoon, and nutria. Fishing, hunting, and trapping are popular in areas of this soil. The small ponds and perennial streams included in this map unit contain many species of freshwater fish. Intrusion of salt water is a problem in managing the vegetation for wetland wildlife. Water control structures, designed to improve the habitat for wildlife, are difficult to construct and maintain because of the instability of the organic materials.

This soil is not suited to cropland, woodland, or pasture because of wetness, flooding, and low strength. This soil is too soft and boggy to support livestock grazing.

This soil is not suited to urban uses and intensive recreation areas because of flooding, wetness, low strength, and subsidence potential. If this soil is drained and protected from flooding, it will subside 5 feet or more below sea level. Also, the shrink-swell potential of the clayey underlying material is a management concern.

This Kenner soil is in capability subclass VIIIw. It is not assigned a woodland group.

LF—Lafitte muck. This organic soil is level, very poorly drained, and slightly saline. It is in brackish marshes, and it is flooded and ponded most of the time. The number of observations made in this map unit was restricted by poor accessibility. The detail of mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the surface layer is very dark grayish brown, very fluid muck about 6 inches thick. The underlying layers to a depth of about 60 inches are very dark gray and very dark grayish brown, very fluid muck.

This Lafitte soil is flooded most of the time by brackish water, and it is wet throughout the year. During storms this soil is covered by as much as 5 feet of water. Water covers the soil surface most of the year, but during periods of sustained north wind and low tides, the water table drops to 0.5 foot below the surface. This soil has low strength and poor trafficability. Permeability is moderately rapid in the organic layers. The subsidence potential is very high. If drained, the organic material, on drying, initially shrinks to about half the original thickness and then subsides further as a result of compaction and oxidation. These losses are most rapid during the first 2 years after reclamation. The soil continues to subside at the rate of about 1 inch per year after the initial subsidence following drainage. The lower the water table, the more rapid the loss.

Included in mapping are a few small to large areas of Bellpass, Clovelly, Gentilly, Scatlake, and Timbalier soils. The Bellpass, Scatlake, and Timbalier soils are in saline marshes and have higher salt content than the Lafitte soil. The Clovelly and Gentilly soils are in landscape positions similar to those of the Lafitte soil. Clovelly soils have a thinner layer of organic material over the clayey underlying material. Gentilly soils are mineral soils. In places, there are few to many small ponds and tidal channels. Also included are a few small areas of soils similar to the Lafitte soil, except that they contain buried logs and stumps. The included soils make up about 20 percent of the map unit.

The natural vegetation consists mainly of marshhay cordgrass, olney bulrush, marsh morningglory, big cordgrass, widgeongrass, and sumpweed.

Most areas of this soil are used as habitat for wetland wildlife and for extensive forms of recreation, such as hunting and fishing.

This soil is well suited to use as habitat for wetland wildlife. It provides habitat for large populations of geese and furbearers, such as mink, muskrat, otter, and raccoon. Intensive management of wildlife habitat generally is not practical. Water control structures are difficult to construct and maintain because of the instability and very fluid nature of the soil material. Saltwater intrusion is a concern in the management of the vegetation for wildlife habitat. The small ponds and streams included in this map unit provide areas for sport and commercial fishing. Goose hunting is also popular in areas of this soil.

This soil is not suited to cropland, pasture, and woodland because of wetness, flooding, salinity, low strength, and poor accessibility. These soils are generally too soft and boggy to support livestock grazing.

This soil is not suited to urban uses and intensive recreation areas because of flooding, wetness, low strength, and subsidence potential. If this soil is drained and protected from flooding, it will subside 1 to 5 feet below sea level.

This Lafitte soil is in capability subclass VIIIw. It is not assigned a woodland group.

Ra—Rita mucky clay. This mineral soil is level and poorly drained. It is in former freshwater marshes that are drained, and it is protected from most flooding. Slope is less than 1 percent.

Typically, the surface layer is very dark gray mucky clay about 5 inches thick. The subsoil is about 27 inches thick. It is dark gray and very dark gray, firm clay. The subsoil is permanently cracked in the upper part. The substratum to a depth of about 60 inches is gray, slightly fluid silty clay loam in the upper part and olive gray silt loam in the lower part.

This Rita soil is protected from most flooding by levees and drained with pumps. Under normal conditions the water table is maintained at a depth of 2 to 3 feet below the surface. After high intensity rains of long duration, however, the water table is within 1 foot of the surface for short periods. Flooding is rare and occurs only during hurricanes or other severe storms. Permeability is very slow in the soil material and rapid in the network of permanent cracks in the subsoil. Adequate water is available to plants in most years. This soil has high fertility. The content of organic matter is very high. The total subsidence potential is medium. The upper part of the soil typically becomes increasingly acid as the organic matter decomposes. In places where the soil has subsided, the water table is near the surface most of the time. The shrink-swell potential is high; however, any part of the substratum that remains continuously saturated will have a low shrink-swell potential.

Included in mapping are a few small areas of drained Allemands soils and Commerce, Harahan, Sharkey, and Westwego soils. The Allemands soils are in slightly lower positions and have a thicker organic surface layer than the Rita soil. The Commerce and Sharkey soils are in slightly higher positions. The Commerce soils are loamy throughout, and the Sharkey soils are clayey throughout. The Harahan and Westwego soils are in landscape positions similar to those of the Rita soil, and they do not have a loamy substratum.

Most areas of this soil are used as pasture or are idle land. A small acreage is developed for urban uses.

This soil is poorly suited to pasture. Common bermudagrass, dallisgrass, tall fescue, and ryegrass are the main pasture plants. Wetness is the main limitation. Adequate water control is needed. The addition of lime is needed for the optimum growth of grasses and legumes. Fertility generally is sufficient for production of pasture plants. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture and soil in good condition.

This soil is well suited to use as habitat for wetland wildlife and moderately well suited to use as habitat for openland wildlife. Habitat for openland wildlife can be improved by maintaining vegetated areas for wildlife cover. Shallow ponds can be constructed to provide open water areas for use by waterfowl and furbearers.

This soil is poorly suited to cultivated crops. Wetness and acidity are the main limitations. If water is adequately controlled, this soil is suited to some crops, such as soybeans. This soil has a limited capacity to support heavy machinery. Applications of lime and fertilizer are generally needed.

This soil is poorly suited to woodland. Native trees did not grow on this soil before it was drained. Wetness is the main limitation. Only water-tolerant and acid-tolerant trees should be planted. Seedling mortality and limited use of equipment are management concerns.

This soil is poorly suited to urban uses and to intensive recreation areas because of flooding, wetness, shrink-swell potential, and low strength. Flooding is rare, but it can occur during hurricanes and if pumps or protection levees fail. Adequate water control is needed. Support and stability for buildings can be provided by constructing buildings on piers, adding loamy fill material to the soil, and controlling the level of the water table. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. In areas where housing density is medium to high, community sewage systems are needed to prevent contamination of the ground water.

This Rita soil is in capability subclass IIIw. It is not assigned a woodland group.

SC—Scatlake muck. This mineral soil is level and very poorly drained. It is in saline marshes and is flooded or ponded most of the time. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the surface layer is very dark gray, very fluid muck about 7 inches thick. The next layer is dark gray, very fluid clay about 6 inches thick. The underlying material to a depth of about 70 inches is gray, very fluid clay.

This Scatlake soil is flooded most of the time by salt water, and it is wet throughout the year (fig. 9). During tidal storms, floodwater is as deep as 4 feet or more. Water covers the soil surface during most of the year, but during periods of sustained north wind and low tides the water table drops to about 0.5 foot below the surface. Permeability is very slow. The total

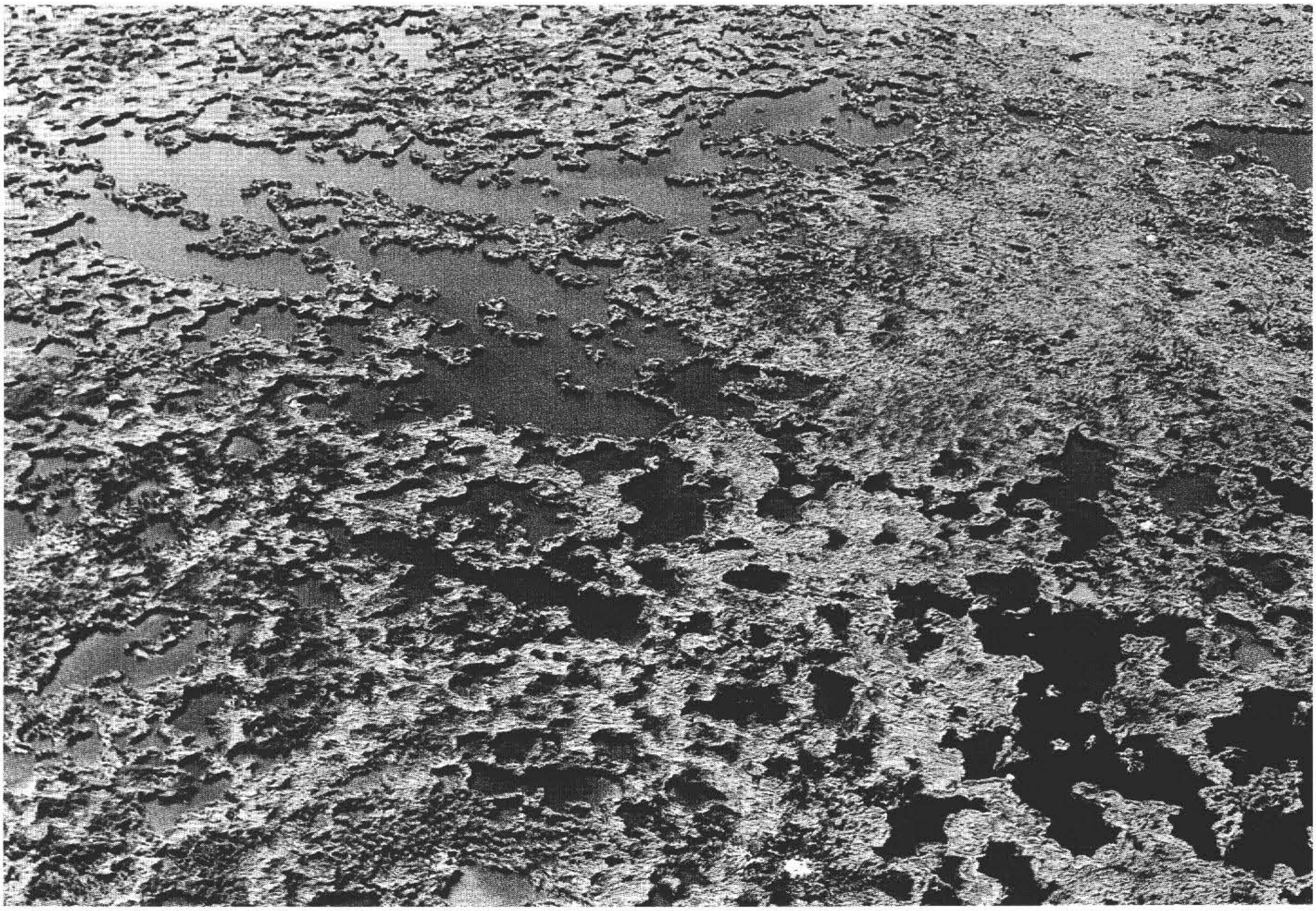


Figure 9.—This area of Scatlake muck is in saline marsh. A continuing intrusion of salt water has caused a breakup of the marsh vegetation.

subsidence potential is medium. While the soil is continuously saturated, the shrink-swell potential is low. If drained, the shrink-swell potential will be very high.

Included in mapping are a few small to large areas of Bellpass and Timbalier soils. The Bellpass and Timbalier soils are in landscape positions similar to those of the Scatlake soil, and they have thick organic layers. In places, there are few to many small ponds and tidal channels. The included soils make up about 20 percent of the map unit.

The natural vegetation is mainly needlegrass rush, seashore saltgrass, smooth cordgrass, bushy sea-oxeye, marshhay cordgrass, and saltwort.

This soil is well suited to uses as habitat for wetland wildlife and for extensive forms of recreation, such as hunting. It provides habitat for geese, muskrat, mink, otter, and raccoon. This soil is part of an estuary that provides a nursery for saltwater fish and crustaceans, such as shrimp, blue crab, menhaden, croaker, redfish, spot, speckled trout, and bay anchovy. These fish and estuarine larval forms are sources for a large fishing industry. The many natural ponds and waterways provide access for fishing, shrimping, and hunting.

This Scatlake soil is not suited to cropland, woodland, and pasture because of wetness, flooding, salinity, low strength, and poor accessibility. This soil cannot support the weight of farm machinery or cattle.

This soil is not suited to urban uses or to intensive recreation areas because of flooding, wetness, and low strength. In addition, hurricanes are common. If this soil has been drained and is protected from flooding, it shrinks, cracks, and subsides to elevations below sea level. Also, the very high shrink-swell potential is a management concern.

This Scatlake soil is in capability subclass VIIIw. It is not assigned a woodland group.

Sh—Sharkey silty clay loam. This mineral soil is level and poorly drained. It is in low and intermediate positions on the natural levees of the Mississippi River and its distributaries; and it is protected from most flooding by earthen levees. Slope is less than 1 percent.

Typically, the surface layer is dark gray silty clay loam about 5 inches thick. The subsoil is about 40 inches thick. It is gray clay in the upper part and dark gray clay in the lower part. The substratum to a depth of about 60 inches is gray clay. In places, the surface layer is silt loam.

This Sharkey soil has high fertility. Permeability is very slow. Water runs off the surface slowly and stands in low places for short periods after heavy rains. Flooding is rare, but it can occur after heavy rains of long duration. Adequate water is available to plants in most years. A seasonal high water table fluctuates between a depth of about 2 feet and the soil surface during the winter and spring. The surface layer of this soil is sticky when wet and hard when dry. This soil has a very high shrink-swell potential.

Included in mapping are a few small areas of Commerce, Convent, Harahan, Rita, Vacherie, and Westwego soils. The Commerce, Convent, and Vacherie soils are slightly higher on the landscape than the Sharkey soil and are loamy. The Harahan, Rita, and Westwego soils are slightly lower on the landscape. Harahan and Westwego soils have slightly fluid, clayey underlying material. Rita soils have a loamy substratum. The included soils make up about 5 percent of the map unit.

Most of the acreage of this soil is in residential areas or idle land that is reserved for future urban uses. A small acreage is used as woodland, pasture, or cropland.

This soil is poorly suited to urban uses or intensive recreation areas because of flooding, wetness, very slow permeability, and the very high shrink-swell potential. This soil is firm, has mineral material throughout, and can support the foundations of most low structures without the use of pilings. A drainage system is needed if roads and building foundations are constructed. Excess water can be removed by using shallow ditches and providing the proper grade for drainage. Septic tank absorption fields do not function properly because of wetness and the very slow permeability. Using sandy backfill for the trench and constructing long absorption lines help to compensate for the very slow permeability. This soil can be used for playgrounds and other intensive recreation areas by providing drainage and adding sandy or loamy material to the surface.

This soil is well suited to pasture. Common bermudagrass, improved bermudagrass, dallisgrass, ryegrass, tall fescue, wheat, vetch, red clover, and white clover are the main pasture plants. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture in good condition.

This soil is moderately well suited to crop production. Vegetables and citrus are the main crops; but soybeans, sugarcane, rice, corn, and grain sorghum are also grown. This soil is sticky when wet and hard when dry, and it becomes cloddy if tilled when it is too wet or too dry. Surface drainage is needed for most cultivated crops and pasture plants. Land grading and smoothing can improve surface drainage. Crop residue left on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content.

This soil is well suited to the production of hardwoods. American sycamore and eastern cottonwood are suitable trees for planting. Trees should be water-tolerant, and they should be planted or harvested during dry periods. Equipment use limitations are a concern unless drainage is provided.

This Sharkey soil is in capability subclass IIIw and woodland group 7W.

Sk—Sharkey clay. This mineral soil is level and poorly drained. It is in low positions on the natural levees of the Mississippi River and its distributaries, and it is protected from most flooding by large earthen levees. Slope is less than 1 percent.

Typically, the surface layer is very dark gray clay about 4 inches thick. The subsoil is dark gray and gray clay. It is about 36 inches thick. The substratum to a depth of about 65 inches is gray clay.

This Sharkey soil has high fertility. Permeability is very slow. Water runs off the surface slowly and stands in low places for long periods after heavy rains. Flooding is rare, but it can occur after prolonged heavy rainfall. Adequate water is available to plants in most years. A seasonal high water table fluctuates between the soil surface and a depth of about 2 feet during the winter and spring. The surface layer of this soil is very sticky when wet and very hard when dry. This soil has a very high shrink-swell potential.

Included in mapping are a few small areas of Commerce, Convent, Harahan, Vacherie, and Westwego soils. The Commerce, Convent, and Vacherie soils are slightly higher on the landscape than the Sharkey soil and have a loamy subsoil. The Harahan and Westwego soils are in slightly lower positions and have a substratum that is fluid in some part.

Most of the acreage of this map unit is in residential uses, or it is idle land that is reserved for future urban development. A small acreage is used as woodland, pasture, or cropland.

This soil is poorly suited to urban uses or intensive recreation areas because of flooding, wetness, very slow permeability, and the very high shrink-swell potential. This firm, mineral soil can support the foundations of most low structures without the use of pilings. A drainage system is needed if roads and building foundations are constructed. Excess water can be removed by using shallow ditches and providing the proper grade for drainage. Septic tank absorption fields do not function properly because of wetness and the very slow permeability. Using sandy backfill for the trench and constructing long absorption lines help to compensate for the very slow permeability. If this soil is used for playgrounds or other intensive recreation areas, providing surface drainage and adding sandy or loamy material to the surface reduce wetness and stickiness of the surface layer.

This Sharkey soil is well suited to use as pasture. Common bermudagrass, improved bermudagrass, dallisgrass, ryegrass, tall fescue, wheat, vetch, red clover, and white clover are the main pasture plants. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This soil is moderately well suited to crops. Vegetables and citrus are the main crops; but soybeans, sugarcane, rice, corn, and grain sorghum are also grown. This soil is difficult to keep in good tilth. The surface layer of this soil is very sticky when wet and very hard when dry, and it becomes very cloddy if tilled when it is too wet or too dry. It can be worked only within a narrow range of moisture content. Surface drainage is needed for most cultivated crops and pasture plants. Land grading and smoothing also help to remove excess water. Crop residue left on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content.

This soil is well suited to the production of hardwoods. American sycamore and eastern cottonwood are suitable trees for planting. Trees should be water-tolerant, and they should be planted or harvested during dry periods. The clay surface layer and wetness limit the use of equipment.

This Sharkey soil is in capability subclass IIIw and woodland group 7W.

TM—Timbalier muck. This organic soil is level and very poorly drained. It is in saline marshes, and it is flooded and ponded most of the time. The number of observations made in this map unit was restricted by poor accessibility. The detail in mapping, however, is adequate for the expected uses of the soil. Slope is less than 1 percent.

Typically, the surface layer is dark gray muck about 8 inches thick. The underlying material to a depth of about 60 inches is very dark gray muck in the upper part and black muck in the lower part. The soil is very fluid throughout.

This Timbalier soil is flooded most of the time by salt water, and it is wet throughout the year. During tidal storms this soil is covered by as much as 5 feet of water. Water covers the soil surface during most of the year, but during periods of sustained north wind and low tides the water table drops to about 0.5 foot below the surface. This soil has low strength and poor trafficability. Permeability is rapid in the organic layers. The total subsidence potential is very high. If drained, the organic material, on drying, initially shrinks to about half the original thickness and then subsides further as a result of compaction and oxidation. These losses are most rapid during the first 2 years, and the soil continues to subside at the rate of about 1 inch per year. The lower the water table, the more rapid the loss.

Included in mapping are a few large areas of Bellpass and Scatlake soils. These soils are in landscape positions similar to those of the Timbalier soil. The Bellpass soils have a thinner layer of organic material overlying clay. The Scatlake soils are very fluid mineral soils. The included soils make up about 20 percent of the map unit.

The natural vegetation consists mainly of smooth cordgrass, needlegrass rush, seashore saltgrass, saltwort, and marshhay cordgrass.

Most areas of this soil are used as habitat for wetland wildlife and for extensive forms of recreation, such as hunting and fishing.

This soil is well suited to use as habitat for wetland wildlife. Areas of this soil are part of the estuarine complex that helps support gulf marine life. Saltwater fish and the young of crustaceans, such as shrimp, blue crab, menhaden, croaker, redfish, spot, speckled trout, and bay anchovy, use these areas as part of their nursery grounds. These fish and estuarine larval forms are sources for a major fishing and shrimping industry. This soil also provides habitat for geese, muskrat, mink, otter, raccoon, nutria, and ducks. Sport fishing and hunting are popular in areas of this soil.

This soil is not suited to cropland, woodland, pasture, intensive recreation areas, or urban uses. The flooding hazard and the wetness limitation are too severe for these uses. This soil is too fluid and boggy to support livestock grazing. If this soil is drained and protected from flooding, it shrinks, cracks, and subsides. The soil is poorly suited to use as construction materials because of the high content of organic matter and the very fluid nature of the mineral layers. In addition, areas of this soil are susceptible to severe damage from hurricanes.

This Timbalier soil is in capability subclass VIIIw. It is not assigned a woodland group.

Ub—Urban land. This map unit consists of areas where more than 85 percent of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces. Examples are parking lots, oil storage tank farms, industrial parks, and shopping centers. These areas are mainly on the natural levees along the Mississippi River. Slope is less than 1 percent.

Included in mapping are areas that are mostly miscellaneous, artificial fill material.

Examination and identification of soils or soil materials in this map unit are impractical. Careful onsite investigation is needed to determine the potential and limitations for any proposed use.

No capability subclass or woodland group is assigned.

Va—Vacherie silt loam. This mineral soil is level and somewhat poorly drained. It is in intermediate positions where the natural levees of the Mississippi River were breached by past flooding. This soil is protected from river overflow by large earthen levees. Slope is less than 1 percent.

Typically, the surface layer is dark grayish brown and grayish brown silt loam about 12 inches thick. The subsoil is grayish brown silt loam to a depth of 34 inches. The next layer is a buried surface layer about 6 inches thick. It is dark gray clay. The lower part of the subsoil to a depth of about 60 inches is gray clay.

This Vacherie soil has high fertility. Permeability is moderate in the loamy upper part of the profile and very slow in the clayey lower part. Water runs off the surface slowly. A seasonal high water table fluctuates between depths of 1 and 3 feet during the winter and spring.

Included in mapping are a few small areas of Commerce, Convent, Harahan, and Sharkey soils. The Commerce and Convent soils are in landscape positions similar to those of the Vacherie soil, and they are loamy throughout. The Harahan and Sharkey soils are in lower positions and have a clayey subsoil. Also included are small areas of soils that are similar to the Vacherie soil except that they have a thinner layer of loamy material over the clayey subsoil. The included soils make up about 10 percent of the map unit.

Most of the acreage of this map unit is in residential uses, or it is idle land that is reserved for future urban uses. A small acreage is used as woodland, cropland, and pasture.

This soil is poorly suited to urban uses; however, it is firm, has mineral material throughout, and can support the foundations of most low structures without the use of pilings. The main limitations are wetness, the very high shrink-swell potential, low strength, and very slow permeability. Excess water can be removed by using shallow ditches and providing the proper grade for drainage. The high water table and the very slow permeability in the underlying clayey material increase the possibility that septic tank absorption fields will fail. During the rainy season, effluent from onsite sewage disposal systems may seep at points downslope. Designs for roads should offset the limited ability of the soil to support a load.

This soil is poorly suited to intensive recreation areas, such as playgrounds. The main limitations are wetness and the very slow permeability in the lower part of the subsoil. These limitations, however, are more easily overcome in this soil than in most other soils in the parish. Shallow ditches help to remove excess surface water. Plant cover can be maintained by applying fertilizer and controlling traffic.

This soil is well suited to use as pasture. Improved bermudagrass, common bermudagrass, dallisgrass, tall fescue, white clover, arrowleaf clover, vetch, red clover, and ryegrass are the main pasture plants. Shallow surface ditches can help to remove excess water. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture in good condition. Fertility generally is sufficient for sustained production of high quality, nonirrigated pasture.

This soil is well suited to crops, mainly corn, soybeans, and vegetables. The main limitation is wetness, which can delay tillage and planting dates in some years. Excess surface water can be removed by using shallow surface ditches and providing the proper grade for drainage. Using minimum tillage and returning all crop residue to the soil or regularly adding other organic material help to maintain soil tilth and organic matter content.

This soil is well suited to the production of hardwoods. Eastern cottonwood and American sycamore are suitable trees for planting. Soil compaction and restricted use of equipment caused by wetness are the main management concerns. Tree planting and harvesting should be done only during drier periods.

This Vacherie soil is in capability subclass IIw and in woodland group 13W.

Ww—Westwego clay. This mineral soil is level and poorly drained. It is in former swamps that have been drained, and it is protected from most flooding. Slope is less than 1 percent.

Typically, the surface layer is very dark gray, firm clay about 4 inches thick. The subsoil is about 27 inches thick. It is dark gray, firm clay. The subsoil has shrunk and cracked, and it remains cracked when re-wetted. The next layer is about 18 inches thick. It is very dark grayish brown, very fluid muck. Below this, to a depth of about 62 inches, is dark gray, very fluid clay. In places, many logs and stumps are buried in the lower layers. In many of the areas developed for urban uses, the surface layer has been covered with loamy and sandy fill material.

This Westwego soil has been drained by pumps and is protected from flooding by levees. Under normal conditions, the water table is maintained at a depth of about 2 to 3 feet below the surface. After heavy rains, the water table may be within 1 foot of the surface for short periods. In places where the soil has subsided, the water table is near the surface most of the time. Flooding is rare, but it can occur during hurricanes and when water pumps or protection levees fail. Permeability is very slow in the soil material, but water flows rapidly through the network of cracks. Even if the cracks in the surface layer are covered by fill material, the cracks in the subsoil remain open. Water and air move freely through these cracks. The total subsidence potential is medium to high. The shrink-swell potential is high.

Included in mapping are a few small areas of drained Allemands soils and Harahan, Rita, and Sharkey soils. The Allemands soils are in former marshes and are organic soils. The Harahan and Rita soils are in landscape positions similar to those of the Westwego soil. The Harahan soils are clayey throughout. The Rita soils have loamy layers in the substratum. Sharkey soils are slightly higher on the landscape and are clayey throughout. The included soils make up about 5 percent of the map unit.

Most areas of this soil are used as woodland or pasture. A small acreage is in residential areas or idle land that is reserved for future urban uses.

This soil is moderately well suited to use as woodland, pasture, and cropland. Few areas remain, however, that are not in urban uses. Improved bermudagrass, common bermudagrass, dallisgrass, tall fescue, white clover, arrowleaf clover, and ryegrass are the main pasture plants. Maintaining adequate water control is the main management concern. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture and soil in good condition.

This soil is poorly suited to urban uses or intensive recreation areas, mainly because of flooding, wetness, subsidence, low strength, and the high shrink-swell potential. In places, buried stumps and logs cause uneven subsidence.

When this soil is used for dwellings, pilings and specially constructed foundations are needed. Sandy or loamy fill material added to the surface reduces wetness and improves the load-supporting capacity of the soil for buildings and local roads and streets. The effects of shrinking and swelling can be minimized by properly designing buildings and roads. Septic tank absorption fields do not function properly in this soil because of wetness, the very slow permeability, and the cracks in the soil. Community sewage systems are needed to prevent contamination of the water supplies by seepage through the cracks. Adequate water control is needed to reduce wetness and control the rate of subsidence. Drainage ditches and levees are difficult to construct and maintain because when the soil dries, the very fluid mineral and organic materials subside and crack.

This Westwego soil is in capability subclass IVw. It is not assigned a woodland group.

Prime Farmland

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

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 5 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

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

Soils that have limitations, such as a high water table or flooding, may qualify as prime farmland if these limitations are overcome by such measures as drainage or flood control. In the following list, the measures needed to overcome the limitations of a map unit, if any, are shown in parentheses after the map unit name. Onsite evaluation is necessary to determine if the limitations have been overcome by the corrective measures.

The map units that meet the requirements for prime farmland are:

Cm	Commerce silt loam
Co	Commerce silty clay loam
Ct	Convent silt loam
Ha	Harahan clay
Sh	Sharkey silty clay loam (where drained)
Sk	Sharkey clay (where drained)
Va	Vacherie silt loam

Use and Management of the Soils

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

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

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

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

Contractors can use this survey to locate sources of roadfill and topsoil. They can use it to identify areas where wetness or fluid soil layers can cause difficulty in excavation.

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

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

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

Perennial grasses or legumes, or mixtures of these, are grown for pasture and hay. The mixtures generally consist of either a summer or a winter perennial grass and a suitable legume. Excess grass in summer is harvested as hay for the winter.

Common bermudagrass and dallisgrass are the most commonly grown summer perennials. Improved bermudagrass and Pensacola bahiagrass produce good quality forage. Tall fescue, the main winter perennial grass, grows well only on soils that have a favorable moisture content. All of these grasses respond well to fertilizers, particularly nitrogen.

White clover, crimson clover, vetch, and wild winterpeas are the most commonly grown legumes.

Proper grazing is essential for high quality forage, stand survival, and erosion control. Brush and weed control, fertilizer, and pasture renovation are also important.

Fertilization and liming. The soils of Plaquemines Parish are generally alkaline in the upper 20 inches. Soils that are used for crops are mostly moderately low in organic matter content and in available nitrogen.

The cropland consists mostly of vegetable farms and citrus, peach, and pecan orchards (fig. 10). The soils of the parish need small amounts of fertilizer for optimum production. The amount of fertilizer needed depends on the kind of crop, on past cropping history, on the level of yields desired, and on the kind of soil. The amount should be based on soil test results. Information and instructions on collecting and testing soil samples can be obtained from the Cooperative Extension Service.

Figure 10.—Vegetables grow well in Convent silt loam because of adequate natural drainage and high fertility.

Organic matter content. Organic matter is an important source of nitrogen for crop growth. It also increases the rate of water intake, reduces surface crusting, and improves tilth.

Most of the parish soils that are used for crops, especially those with a silt loam or very fine sandy loam surface layer, are moderately low in organic matter content. The content of organic matter can be maintained by growing crops that produce an extensive root system and an abundance of foliage, by leaving plant residue on the surface, by growing perennial grasses and legumes in rotation with other crops, and by adding barnyard manure.

Soil tillage. Soils should be tilled only enough to prepare a seedbed and to control weeds. Excessive tillage destroys soil structure. A compacted layer, generally known as a traffic pan or plowpan, sometimes develops just below the plow layer in loamy soils. This condition can be avoided by not plowing when the soil is wet, by varying the depth of plowing, or by breaking up the plowpan by subsoiling or chiseling. The use of tillage implements that stir the surface and leave crop residue in place protects the soil from beating rains. This helps control erosion, reduces runoff and surface crusting, and increases infiltration.

Drainage. Most of the soils in Plaquemines Parish need surface drainage to make them more suitable for crops. Early drainage methods involved a complex pattern of main ditches, laterals, and surface field ditches. The more recent approach to drainage in the parish is a combination of land smoothing with a minimum of surface ditches. Larger and more uniformly shaped fields are created and are more suited to the use of modern, multirow farm machinery.

Control of erosion. Erosion generally is not a serious problem in Plaquemines Parish mainly because of the level to nearly level gradient; however, loamy soils, such as the Commerce, Convent, and Vacherie soils, are susceptible to erosion when left without plant cover for extended periods. If the surface layer of the soil is eroded away, most of the available plant nutrients and most of the organic matter are also lost.

Soil erosion also results in sedimentation of drainage systems and pollution of streams by sediment, nutrients, and pesticides.

Cropping systems in which a plant cover is maintained on the soil for extended periods reduce soil erosion. Legume or grass cover crops reduce erosion, increase the content of organic matter and nitrogen in the soils, and improve tilth. Minimum tillage, contour farming, and cropping systems that rotate grass or close-growing crops with row crops help to control erosion on cropland and pasture. Constructing water control structures in drainageways to drop water to different levels can help prevent gullying.

Cropping system. A good cropping system includes a legume for nitrogen, a cultivated crop to aid in weed control, a deep-rooted crop to utilize subsoil fertility and maintain subsoil permeability, and a close-growing crop to help maintain organic matter content. The sequence of crops should keep the soil covered as much of the year as possible.

A suitable cropping system varies according to the needs of the farmer and the characteristics of the soil. Producers of livestock, for example, generally use cropping systems that have higher percentages of pasture than the cropping systems of cash-crop farms.

Additional information on erosion control, cropping systems, and drainage practices can be obtained from the local office of the Natural Resources Conservation Service and the Cooperative Extension Service or from the Louisiana Agricultural Experiment Station.

Yields per Acre

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

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

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

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

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

Land Capability Classification

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

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

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

Class I soils have few limitations that restrict their use. There are no Class I soils in Plaquemines Parish.

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

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

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

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

Class VI soils have severe limitations that make them generally unsuitable for cultivation. There are no Class VI soils in Plaquemines Parish.

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

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

Capability subclasses are soil groups within one class. They are designated by adding a small letter to the class numeral, for example, IIw. The letter *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage).

Class V soils are subject to little or no erosion, but they have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation. In Plaquemines Parish, class V contains only the subclass indicated by *w*.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in table 6.

Woodland Management and Productivity

This section discusses the effect of soils on the growth and management of trees.

Originally, the land area in Plaquemines Parish that was not in marshes was in trees. Today, southern hardwood trees are only in small scattered areas, mainly on the Barbary and Fausse soils in the swamps and in frequently flooded areas of Commerce, Convent, and Sharkey soils.

Today, no stands of commercial trees exist in the parish *(26)*. The virgin trees were harvested many years ago, and regeneration has been slow on the flooded Barbary and Fausse soils. In addition, intrusions of salt water have prevented any regeneration in some of the swamps (fig.11). Tree stands are better in woodland areas of Commerce, Convent, and Sharkey soils, but these soils are divided among many owners.

Other woodland uses are as wildlife habitat and for recreation, enjoyment of natural beauty, and the conservation of soil and water.

Soils vary in their ability to produce trees. Fertility, texture, and the available water capacity influence tree growth. Climate determines the kinds of trees that can grow on a site. Available water capacity and depth of the root zone are major influences of tree growth.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to fertilization than others, and some require special efforts to reforest. In the section "Detailed Soil Map Units," each map unit in the survey area suitable for producing timber presents information about productivity, limitations for harvesting timber, and management concerns for producing timber. Table 7 summarizes this forestry information and rates the soils for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of the major soil limitations to be considered in forest management.

The first tree listed for each soil under the column "Common trees" is the indicator species for that soil. An indicator species is a tree that is common in the area and that is generally the most productive on a given soil.

Table 7 lists the *ordination symbol* for each soil. The first part of the ordination symbol, a number, indicates the potential productivity of a soil for the indicator species in cubic meters per hectare. The larger the number, the greater the potential productivity. Potential productivity is based on the site index and the point where mean annual increment is the greatest.

The second part of the ordination symbol, a letter, indicates the major kind of soil limitation for use and management. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation activities or harvesting operations expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions.

Ratings of *equipment limitation* indicate limits on the use of forest management equipment, year-round or seasonal, because of such soil characteristics as wetness or susceptibility of the surface layer to compaction. The rating is *slight* if equipment use is restricted by soil wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if soil wetness restricts equipment use from 2 to 6 months per year or if special equipment is needed to avoid or reduce soil compaction. The rating is *severe* if soil wetness restricts equipment use for more than 6 months per year or if special equipment is needed to avoid or reduce soil compaction. Ratings of *moderate* or *severe* indicate a need to choose the most suitable equipment and to carefully plan the timing of harvesting and other management operations.

Ratings of *seedling mortality* refer to the probability of death of naturally occurring or properly planted seedlings of good stock in periods of normal rainfall as

Figure 11.—In this area of Fausse muck, saline, the native woody vegetation of the swamp is vanishing and salt-tolerant marsh vegetation is becoming dominant.

influenced by kinds of soil or topographic features. *Seedling mortality* is caused primarily by too much water or too little water. The factors used in rating a soil for seedling mortality are texture of the surface layer, depth and duration of the water table, and rooting depth. Mortality generally is greatest on soils that have a sandy or clayey surface layer. The risk is *slight* if, after site preparation, expected mortality is less than 25 percent; *moderate* if expected mortality is between 25 and 50 percent; and *severe* if expected mortality exceeds 50 percent. Ratings of *moderate* or *severe* indicate that it may be necessary to use containerized or larger than usual planting stock or to make special site preparations, such as bedding, furrowing, installing surface drainage, or providing artificial shade for seedlings. Reinforcement planting is often needed if the risk is *moderate* or *severe*.

The potential productivity of *common trees* on a soil is expressed as a *site index*. Common trees are listed in the order of their observed general occurrence. Generally, only two or three tree species dominate.

The soils that are commonly used to produce timber have the yield predicted in cubic feet and board feet. The yield is predicted at the point where mean annual increment culminates. The productivity of the soils in this survey is mainly based on age 30 years for eastern cottonwood, 35 years for American sycamore, and 50 years for all other species *(4, 5, 6, 31)*.

The *site index* is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands.

The *productivity class* represents an expected volume produced by the most important trees, expressed in cubic meters per hectare per year. Cubic meters per hectare can be converted to cubic feet per acre by multiplying by 14.3. It can be converted to board feet by multiplying by a factor of about 71. For example, a productivity class of 8 means the soil can be expected to produce 114 cubic feet per acre per year at the point where mean annual increment culminates, or about 568 board feet per acre per year.

Trees to plant are those that are used for reforestation or, if suitable conditions exist, natural regeneration. They are suited to the soils and will produce a commercial wood crop. Desired product, topographic position (such as a low, wet area), and personal preference are three factors of many that can influence the choice of trees to use for reforestation.

Recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are not wet or subject to flooding during the period of use. The surface absorbs rainfall readily but remains firm and is not dusty when dry.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, and are not subject to flooding during the period of use.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are not wet or subject to flooding during the season of use. The surface is firm after rains and is not dusty when dry.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Billy R. Craft, state staff biologist, Natural Resources Conservation Service, helped prepare this section.

More than 90 percent of Plaquemines Parish consists of coastal marshes. Minor acreages of cropland, hardwood forests, swamps, citrus groves, and pastureland are also present. The land of the parish is mostly a peninsula extending into the Gulf of Mexico. The diverse plant communities of the marshland provide fair to excellent habitat for wildlife. The marshes also contribute significantly to marine and estuarine fisheries production.

Even though Plaquemines Parish is a peninsula extending into a sea of salt water, it has large acreages of freshwater and brackish marshes, primarily because of the volume of fresh water discharged at the mouth of the Mississippi River.

Marshes are generally grouped or categorized on the basis of their vegetation and salinity. The kinds and numbers of wildlife using any given part of the marsh depend, to a great extent, on the plant communities. The location and extent of the soils in each type of marsh are shown on the general soil map. A list of the common native plants in each type of marsh is given in table 9. Most of the freshwater marsh is near the southernmost tip of the parish. The northern extent of this freshwater marsh community is near Boothville. Many species of waterfowl use the marshes of the parish because they are in a major flyway and contain good habitat. Many other species of wildlife thrive in the marshes and swamps. Common plants in the freshwater marshes include bulltongue, maidencane, swamp smartweed, cattail, lizardtail, giant cutgrass, pickerelweed, alligatorweed, water hyacinth, floating pennywort, and common rush.

The brackish marshes are primarily in the northern one-third of the parish. A narrow band of brackish marsh also parallels the river in a southeasterly direction. Salinity in most of the brackish marsh averages 8 ppt (parts per thousand) *(7, 21, 29)*. Muskrat are abundant in the brackish marsh, and raccoon and nutria are also common. During the fall and winter months, large numbers of waterfowl are in the marshes. The mottled duck is a permanent resident. These marshes are also a part of the coastal estuarine complex that significantly supports marine life from the Gulf of Mexico. Common plants in the brackish marshes include marshhay cordgrass, olney bulrush, dwarf spikesedge, saltmarsh bulrush, marsh morningglory, and widgeongrass.

The saline marshes make up a large part of the peninsula. This marsh type is not as productive for wildlife as the freshwater and brackish marshes. The saline marshes are intertidal and are dominated by emergent, persistent plants, such as smooth cordgrass, needlegrass rush, seashore saltgrass, and woody glasswort. Salinity averages about 16 ppt, which is 46 percent sea strength. Saline marshes have a high detrital export and furnish nursery and production habitat for many marine and estuarine fish species.

Other land uses in the parish include citrus orchards, pastureland, and forest land. These uses provide only limited habitat for wildlife. Species of wildlife using these areas include mourning dove, bobwhite quail, cottontail rabbit, mink, opossum, raccoon, otter, and many nongame wildlife species.

Retention and management of the remaining coastal wetlands should be an important resource management concern. Intensified efforts are needed to save this valuable coastal zone area.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, common bermudagrass, clover, and vetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, panicum, and fescue.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness.

Examples of these plants are oak, poplar, sweetgum, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are hawthorn, persimmon, and sumac.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are American beautyberry, American elder, and deciduous holly.

Wetland plants are annual and perennial, wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, and salinity. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water control structures. Soil properties and features affecting shallow water areas are wetness and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

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

Habitat for woodland wildlife consists of areas of deciduous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy, or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and nutria.

Marshland Management

Billy R. Craft, state staff biologist, Natural Resources Conservation Service, helped prepare this section.

General management needed to control the losses of marshlands and to improve marshlands for use as habitat for wetland wildlife are suggested in this section.

Planners of management systems for individual areas should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the staff at the local office of the Natural Resources Conservation Service, the Cooperative Extension Service, or the Louisiana Agricultural Experiment Station.

Marshland loss. The loss of Louisiana's coastal marshlands has reached a crisis level. Plaquemines Parish is within an area that is experiencing the highest rates of marshland losses in Louisiana. Both natural and manmade events are responsible for these losses.

Geologic subsidence of the Gulf Coastal marshes is the main natural cause of marshland loss *(16)*. As the continental shelf and adjoining marshlands slowly subside, some of the marshlands at the lowest elevations become submerged below sea level. Little can be done about the losses caused by these natural events; however, the marshland deterioration caused by human actions can be controlled with better management and restraint. Human activities, such as drainage and the construction of channels for navigation, accelerate the rates of erosion, subsidence, and saltwater intrusion.

Coastal marsh erosion changes areas of marshland to open water areas. In most cases, this is a permanent land loss because the open water areas are too deep to revegetate.

The production of fish and wildlife resources in the marshes of the parish is directly related to the marsh plant community. When the plants are killed by increases in salinity or for other reasons, the other dependent resources are degraded. Each plant species and community requires a definite range of salinity and water levels for growth. The marsh plants are the basic source of energy for dependent animal populations, such as muskrat, and conditions enhancing plant growth serve to benefit the fish and wildlife resources. The fish and wildlife population density and diversity are dependent on the plants; therefore, the need for maintaining the marshland resource base is very important ecologically and economically.

The organic soils of the marshland are very sensitive to increases in salinity. Saltwater intrusions into brackish and freshwater marshes have increased in recent years. The increased salinity causes the loss of surface vegetation. When the plants die, they start decomposing and eventually are carried out of the marshes by tidal action. In a very short time, the surface soil is lost and the areas revert to open water.

This loss is generally permanent along with the associated loss of sustained annual soil productivity.

Management. Many opportunities exist for improving the marshes of Plaquemines Parish for fish, wildlife, and other resources *(16).* The marshland is a delicately balanced ecosystem that requires an interdisciplinary approach to planning and implementing management practices that will improve the habitat for waterfowl, furbearers, and fisheries. Following are some suggested management practices:

Weirs are low level dams placed in marsh water courses to provide better water management capability. Fixed-crest weirs are normally placed so the weir crest is about 6 inches below average marsh level. These water control structures stabilize water levels in the marsh, reduce the turbidity levels of the water, improve plant community condition, and improve trapper and hunter access during the winter months by holding water in the bayous and canals. Weirs with fixed crests are most useful in brackish marshes.

Prescribed or controlled burning is a very useful and economical technique to improve marsh vegetative conditions. Periodic controlled burning helps maintain a good variety of marsh plants, which in turn has a positive impact on furbearers, such as muskrat, and other wildlife species.

Prescribed burning results are best in brackish marshes. Controlled burning done in the fall of the year is the best for wildlife; however, winter burning also has some positive results.

Leveed impoundments can be installed if soils are suitable for construction. Almost every form of marsh wildlife uses the impoundments for feeding, roosting, or cover areas. Landowner objectives, marsh type, and other factors determine the management techniques to use on an impoundment.

Shoreline erosion control is one of the primary concerns for the parish and the entire coastal area. Numerous studies and field trials have been conducted to determine suitable techniques for shoreline erosion. Structural and vegetative approaches or combinations of these are currently being used. Individual site conditions vary and include soils, salinity, amount of boat traffic, and size of the water body.

Smooth cordgrass is one of the most promising plants to use in the tidal zone of saline and brackish areas. It is generally available locally. Smooth cordgrass is easily established in the tidal zone where a large part of the erosion is occurring. It withstands a wide salinity range, expands rapidly in the tidal zone, normally provides shoreline protection in one growing season, and forms dense stands which dissipate wave energy.

Many other plants are available for alleviating shoreline erosion. Specific site information is needed to plan the proper combination of structural and vegetative measures.

Lawns and Gardens

In general the soils in Plaquemines Parish have fertility levels that are adequate for most lawn and garden plants. These soils were subject to flooding by the Mississippi River before the guide levees were constructed. With each flood, additional increments of fertile sediments were added to these soils.

Besides fertility, other important soil properties for growing lawn and garden plants are texture, subsidence potential, wetness, reaction, and flooding hazard.

In this section, use and management of soils in the parish for lawns and gardens are discussed.

Soils on natural levees that are protected from flooding—These soils border the Mississippi River and some of its distributaries. They are firm mineral soils and generally are suited to grow most lawn and garden plants without major modification or treatment. The soils have high fertility, low subsidence potential, and strongly acid to moderately alkaline reaction. They are only slightly or moderately wet and are not flooded for long periods.

The loamy Commerce soils are easily worked, but the more clayey Sharkey soils are hard when dry and sticky when wet. These soils are difficult to cultivate when used as landscape beds or gardens. Soils that have a clay surface layer can be improved for lawns and gardens by adding several inches of loamy fill material to the surface of the soil.

Soils in former marshes and swamps that are drained and protected from flooding—These soils were formerly ponded and frequently flooded. To improve the soils for urban uses, they were drained with pumps and protected from flooding with manmade levees. Drainage resulted in loss of surface elevation (subsidence) because of consolidation, compaction, and oxidation. Because of their low elevation, these soils are wet most of the time. They have high natural fertility, but otherwise have severe limitations for landscaping and gardening. In many of these soils, the surface layer is extremely acid or very strongly acid because of the decomposition of the peat and muck.

The Harahan and Westwego soils are in drained swamps. They have a firm, clayey surface layer and a firm to very fluid, organic or clayey subsoil. In most places, buried logs and stumps cause the soils to subside unevenly, but the logs and stumps are at the surface in some places.

The Allemands soils that have been drained and the Rita soils are in former marshes. The Allemands soils have a thick organic surface layer that subsides and cracks irreversibly. The Rita soils have a mucky clay surface layer and a clayey subsoil that has shrunk and cracked irreversibly as a result of drainage. These soils can be covered with several inches of loamy fill material to improve them for use as lawns and gardens.

Soils in marshes and swamps that are frequently flooded and ponded—Unless these soils are protected from flooding and drained, they are generally not suited to urban uses. After they are drained, they will have continuing limitations similar to those discussed in the previous paragraphs.

Fill material is commonly used to improve the soils for lawns and gardens and to raise their surface elevation. In the following paragraphs the kinds of fill commonly available in the New Orleans and surrounding areas are listed in descending order of suitability for use in lawns and gardens.

Loamy material deposited by the Mississippi River—This material is excavated from areas of Commerce soils along the river in Plaquemines Parish or from areas of Commerce and Convent soils within the Bonnet Carre Floodway in nearby St. Charles Parish. Fill from this material has favorable texture, reaction, and fertility. It compacts easily, but compaction can be controlled or reduced with proper management.

Clayey material deposited by the Mississippi River—This material is excavated from areas of Sharkey soils and has favorable fertility and reaction. The clayey material is sticky when wet and hard when dry, and it becomes cloddy if tilled when too wet or too dry. Soil tilth can be improved by adding organic matter and mixing loamy or sandy material into the surface layer.

Coarse sand (builders sand or beach sand)—This material has very low water holding capability and low nutrient holding capacity. It is loose and easy to work. The suitability for lawns and gardens can be improved by mixing in peat or loamy material from another source.

Organic material—This soil material is typically excavated from the drained swamps and marshes. It has limitations for use in landscaping. It shrinks, subsides, and decomposes over time and becomes extremely acid as it decomposes. Mixing loamy soil material with the organic material and applying lime improves its suitability for use in lawns and gardens.

Trash—This includes solid wastes from construction sites or residences, such as glass, clamshells, broken brick and concrete, trees, leaves, and wood scraps. This material will raise the elevation of the land, but it is not suited to grow lawn or garden plants.

Some soil related problems cannot be eliminated by adding fill material to the soil surface. For example, continuing subsidence causes planters to fail and break away from houses. Borders of flower beds can become uneven because of differential subsidence, especially in the soils that have buried logs and stumps. Some soil related problems can be partly overcome by adding fill material. Large cracks can form on the surface during dry periods. Adding a few inches of loamy fill material to the soil surface annually, or more often as needed, improves the soil for use as lawns and gardens.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, soil wetness, depth to a seasonal high water table, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of earthfill and topsoil; plan drainage systems, irrigation systems, ponds, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by soil texture, fluidity, organic layers, and buried stumps and logs. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to a high water table and flooding affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use, and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use, and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use, and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent and surfacing of effluent, can affect public health. Ground water can be polluted if highly permeable sand and gravel is less than 4 feet below the base of the absorption field or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are permeability, depth to a high water table, flooding, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to a high water table, and flooding affect both types of landfill. Texture, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, and buried stumps and logs affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by a high water table and buried stumps and logs. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* have at least 5 feet of suitable material and low shrink-swell potential. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10 and high shrink-swell potential. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by a water table and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, or soils that have an appreciable amount of soluble salts. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of soluble salts, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant-available nutrients as it decomposes.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for embankments, dikes, and levees and for aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use, and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use, and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage and irrigation.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of organic matter or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. The content of buried stumps and logs affects the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; susceptibility to flooding; and subsidence of organic layers. Excavating and grading and the stability of ditchbanks are affected by the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, and erosion hazard. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year *(30)*. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep and very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist mainly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist mainly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist mainly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional*, or *frequent*. *None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (there is a near 0 to 5 percent chance of flooding in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year). *Frequent* means that flooding occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). *Common* is used when classification as occasional or frequent does not affect interpretations. Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. December-June, for example, means that flooding can occur during the period December through June. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons, which are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table, that is, *apparent;* and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 17.

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

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 17 shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the water table.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severely corrosive environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Urban Development Features

Expansion of the New Orleans metropolitan area into Plaquemines Parish has resulted in the development of parts of the nearby marshes and swamps for urban uses. The organic soils and fluid mineral soils in these marshes and swamps are severely limited for most urban uses because of flooding, wetness, and the low to high subsidence potential. Although wetness and flooding are common problems on many of the soils in the parish, subsidence is a problem unique to the organic soils and the fluid mineral soils in the marshes and swamps.

Subsidence is the loss of surface elevation after an organic soil or a fluid mineral soil is artificially drained. Subsidence on organic soils after drainage is attributed mainly to shrinkage caused by desiccation; consolidation from loss of the buoyant force of ground water or from loading, or both; compaction; and biochemical oxidation.

The problems associated with subsidence in the survey area are mainly in the Allemands muck; Allemands muck, drained; Aquents, dredged, frequently flooded; Barbary muck; Bellpass muck; Clovelly muck; Gentilly muck; Harahan clay; Kenner muck; Lafitte muck; Rita mucky clay; Scatlake muck; Timbalier muck; and Westwego clay detailed soil map units.

Elevation loss caused by shrinkage and consolidation is termed *initial subsidence,* and it is normally completed about 3 years after the water table is lowered. Initial subsidence of organic soils causes about a 50 percent reduction of thickness of the organic materials above the water table. This reduction is accompanied by permanent open cracks that do not close when the soil is re-wet.

After initial subsidence, shrinkage continues at a uniform rate because of the biochemical oxidation and subsequent disintegration of the organic materials. This is termed *continued subsidence,* and it progresses until the mineral material or the permanent water table is reached. The rate of continued subsidence depends on temperature (amount of time per year above 41 degrees Fahrenheit, 5 degrees

Celsius), mineral content, and thickness of the organic layers above the water table. The average rate of continued subsidence in the survey area is about 0.5 inch to 2 inches per year. The total subsidence potential is as much as 144 inches for some soils.

An important feature of organic soils is low bulk density (weight per unit volume). The bulk density, in grams per cubic centimeter, for selected materials is as follows:

Water	1.0
Mineral soil	1.2 to 1.7
Organic soil	0.15 to 0.5

The low bulk density reflects the small volume of mineral matter in organic soil material. The mineral content of organic soil material is about 6 percent on a volume basis compared to about 40 percent for mineral soil. The rest of the volume is organic matter and pore space filled with air and water. This accounts for compressibility under load, volume change on drying, and general instability if used as foundation material.

Fluid mineral soil layers have a potential for initial subsidence caused by loss of water and consolidation after drainage. Each time the water table is lowered and the fluid soil material is drained, a new increment of initial subsidence takes place. Continued subsidence after drainage is minor on soils that have fluid mineral layers.

Additional urbanization on organic soils and fluid mineral soils can lead to increased subsidence if the water table is lowered. Because of the hard surface cover of streets, parking lots, buildings, and other structures, the absorptive capacity of the soil is decreased. This increases runoff; consequently, drainage canal size and pumping capacity are generally increased to accommodate the additional runoff. As a result of the more intensive drainage, the water table is lowered. This is accompanied by a new increment of initial subsidence. With this new depth of drainage ditches, pumping capacity must again be increased to prevent flooding. This cycle will continue until all of the organic material has been oxidized and the mineral layers dewatered; however, this seemingly endless cycle can be interrupted.

Subsidence of organic soils can be effectively controlled by maintaining the water table at the surface. Subsidence can be reduced to some degree by covering the surface with mineral soil material to slow oxidation. It can be further reduced by raising the water table as high as possible to reduce the thickness of organic material between the mineral soil fill material and the water table. In land use decisions, a choice must be made in controlling the water table—

- to use the land without drainage to control subsidence
- to use the land with some drainage, but to tolerate wet conditions and minimum subsidence or
- to provide better drainage and tolerate subsidence at a greater rate.

Subsidence is a very severe limitation for most urban uses in the survey area. Unless pilings are used to support buildings, they tilt and foundations crack. Organic soils around structures built on pilings subside, and periodic filling is needed to maintain a desirable surface elevation. When organic soils subside, foundations are exposed, and unsupported driveways, patios, air conditioner slabs, and sidewalks crack and warp and gradually drop below original levels. Underground utility lines may be damaged.

The concern of homeowners and communities that have subsidence is to find ways to resolve the problems. Some things can be done to minimize the subsidence problems.

Selection of building site—Avoid sites that have organic or fluid mineral soil layers. Table 17 gives the subsidence potential of each soil. The final selection should be based on onsite examination.

Structure design and materials—The recommendations of qualified professionals, such as structural engineers, soil engineers, and architects, should be followed. New or innovative construction techniques and materials can minimize some problems. For example, constructing buildings on piers above ground instead of on concrete slabs on the ground can help overcome some problems. The possibility of gas accumulating under the slabs would be eliminated as well as the need for fill material to cover exposed slabs. The use of small sections of easily moved, unjoined fabricated material or concrete in the construction of sidewalks, driveways, and patios would eliminate cracking and possibly make re-leveling after subsidence easier. Other construction materials, such as brick, shell, gravel, or lightweight aggregate, could be considered for these uses.

Initial site fill practices—Subsidence can be reduced by adding mineral fill material to the organic soil surface (fig. 12). Thin blankets of fill that do not reach the permanent water table will reduce the rate of subsidence. The amount of reduction is related to the amount of oxygen that is excluded from organic layers and the thickness of organic layers above the water table. If the base of the mineral fill material is within the permanent water table, subsidence caused by oxidation of organic materials will be eliminated. Future subsidence (unless the water table is lowered) will be limited to compaction or displacement. Loamy

Figure 12.—Adding sandy or loamy fill material to the surface of Westwego clay reduces wetness and improves the load-supporting capacity of the soil for buildings and local roads and streets.

mineral soil material is generally considered the most desirable fill material. Fill material high in organic content should be avoided.

Maintenance or continual filling practices—Filling is necessary on organic soils to maintain the esthetic value of homesites. Filling helps avoid sunken lawns and exposed foundation footings that result from subsidence. If several inches or more of subsidence occur, adding small amounts or thin layers of fill is generally preferable over adding thick layers. Regularly adding 1 or 2 inches of fill material as needed generally will not permanently harm most lawn grasses and landscape plants. If filling is postponed, however, until several inches to a foot or more of fill is required, the thick layers of fill could result in permanent damage.

Underground utilities—Engineering innovations that allow utility lines to be moved as soil surface elevations change should reduce the number of failures. For example, flexible pipes at joints where pipes are connected to stationary structures could be used rather than rigid pipes.

Water level control—Water level or depth to the continuous water table is an important factor affecting the rate of subsidence. Generally, the nearer to the surface that the water table is maintained, the slower the rate of subsidence. Microdifferences in surface elevation that occur in most urban-developed areas contribute to uneven water table depths and to differences in rates of subsidence. Precision leveling within an area for urban uses would help eliminate the differences in water table depth. Also, a carefully designed and constructed drainage system would make it possible to maintain a desirable, uniform water table throughout the level area. In developed unleveled areas, a system to monitor the level of the water table would provide information needed to determine optimum water table levels.

Site development on organic soils—Generally, this involves first building a levee and a pumping system to lower the water table below the organic layers. Sufficient time (1 to 3 years) is necessary for initial subsidence. The area then could be backfilled hydrologically or by other methods with mineral fill material to a desired level to help reduce possible flooding. The mineral fill material would load and compact the organic layers. Then the water table could be raised to a level where the organic layers would be permanently inundated. By keeping the water table above the organic layers, oxygen would be excluded. Under this condition the organic material would be preserved; therefore, subsidence would be at a minimum, and the soils of the area would be stable for urban use. In addition, a few feet of proper mineral fill material would provide a good environment for utility lines.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(28)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fluvaquents (*Fluv*, meaning composed of recent alluvium, plus *aquent*, the suborder of the Entisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, soil temperature regime, depth of the root zone, consistence, moisture equivalent, slope, reaction, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. An example is the Fausse series, which is a member of the very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(27)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(28)*. Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Allemands Series

The Allemands series consists of poorly drained and very poorly drained, organic soils that are very fluid. These soils are rapidly permeable in the upper part and very slowly permeable in the lower part. They formed in moderately thick accumulations of decomposed herbaceous material over clayey alluvium deposited by the Mississippi River. These soils are in freshwater coastal marshes. Slope is less than 1 percent.

Soils of the Allemands series are clayey, montmorillonitic, euic, thermic Terric Medisaprists.

Allemands soils commonly are near areas of Balize, Barbary, Gentilly, Harahan, Kenner, Larose, Rita, Sharkey, and Westwego soils and are similar to the Clovelly soils. The Balize and Larose soils are in landscape positions similar to those of the Allemands soils, and they are mineral soils. The Barbary, Harahan, Rita, and Westwego soils are in swamps or former swamps and are mineral soils. The Clovelly and Gentilly soils are in nearby brackish marshes and are more saline than the Allemands soils. The Kenner soils are in landscape positions similar to those of the Allemands soils and have a thicker accumulation of organic material. The Sharkey soils are higher on the landscape than Allemands soils and are firm mineral soils.

Typical pedon of Allemands muck; 7 miles south of Belle Chasse, 2.3 miles west of Naomi, 1.8 miles southwest of Gloria, 4,500 feet south of Ollie Canal, 2,000 feet east of Bayou Defleur, 800 feet north of pipeline canal; Spanish Land Grant 32, T. 16 S., R. 24 E.

Oa1—0 to 14 inches; very dark grayish brown (10YR 3/2) muck; about 20 percent fiber, about 10 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); common fine roots; about 40 percent mineral; slightly alkaline; clear smooth boundary.

Oa2—14 to 36 inches; dark grayish brown (10YR 4/2) muck; about 20 percent fiber, less than 5 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); few fine roots; about 50 percent mineral; slightly alkaline; clear smooth boundary.

Cg—36 to 70 inches; dark gray (10YR 4/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); slightly alkaline.

The organic material ranges in thickness from 16 to 51 inches. The underlying mineral material is dominantly clay, but there are thin strata of loamy material in some pedons. Logs and stumps are within the profile of some pedons.

The surface tier (0 to 14 inches) has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. The content of rubbed fiber ranges from 5 to 30 percent. Reaction ranges from strongly acid to slightly alkaline in undrained pedons and from extremely acid to slightly alkaline in drained pedons.

The organic material in the subsurface tier (14 to 36 inches) has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3. The content of fiber ranges from 1 to 15 percent after rubbing. Reaction ranges from slightly acid to moderately alkaline in undrained pedons and from extremely acid to slightly alkaline in drained pedons.

The Cg horizon has hue of 10YR, 5Y, 5G, or 5GY, value of 4 or 5, and chroma of 1 or 2. Reaction ranges from slightly acid to moderately alkaline in undrained pedons and from extremely acid to moderately alkaline in drained pedons.

Balize Series

The Balize series consists of very poorly drained, mineral soils that are slowly permeable and very fluid. These soils are forming in loamy alluvium in areas of active filling by the Mississippi River and its distributaries. They are in freshwater marshes and are ponded or flooded most of the time. Slope is less than 1 percent.

Soils of the Balize series are fine-silty, mixed, nonacid, thermic, Typic Hydraquents.

Balize soils commonly are near areas of Allemands, Aquents, Convent, Kenner, and Larose soils. The Allemands and Kenner soils are in nearby marshes and are organic soils. The Aquents are on spoil banks, and the Convent soils are on ridges. They are both firm mineral soils. The Larose soils are in nearby marshes and have clayey underlying material.

Typical pedon of Balize silt loam, in an area of Balize and Larose soils; 2 miles northeast of Venice, 600 feet south of Baptiste Collette Bayou, 200 feet west of pipeline canal; Spanish Land Grant 25, T. 20 S., R. 18 E.

A—0 to 8 inches, dark gray (10YR 4/1) silt loam; massive; very fluid (flows easily through fingers when squeezed, leaving hand empty); few medium and fine roots; moderately alkaline; clear smooth boundary.

Cg1—8 to 29 inches; dark gray (10YR 4/1) silty clay loam; massive; very fluid (flows easily through fingers when squeezed, leaving hand empty); few thin strata of black (10YR 2/1) muck and mucky silty clay loam; moderately alkaline; clear smooth boundary.

Cg2—29 to 38 inches; gray (5Y 5/1) silty clay loam; massive; very fluid (flows easily through fingers when squeezed, leaving hand empty); few thin strata of silt loam; moderately alkaline; clear smooth boundary.

Cg3—38 to 66 inches; dark gray (10YR 4/1) silt loam; common thin (1-inch) strata of gray (5Y 5/1) silty clay loam and fine sandy loam; massive; slightly fluid (flows with difficulty through fingers when squeezed, leaving large amount of residue in hand); moderately alkaline.

All mineral horizons to a depth of 40 inches or more have an *n* value of 0.7 or more. The O horizon, if present, has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. It is muck or peat. Reaction ranges from slightly acid to moderately alkaline.

The A horizon has hue of 10YR, value of 2 to 5, and chroma of 1 or 2. Reaction ranges from neutral to moderately alkaline.

The Cg horizon has hue of 10YR to 5BG, value of 4 to 6, and chroma of 1 or 2, or it is neutral with values of 4 to 6. Texture is silty clay loam, mucky silty clay loam, silt loam, or very fine sandy loam. Pockets of muck or peat range from none to common. In some pedons, a sandy Cg horizon with an *n* value of less than 0.7 is present below a depth of 40 inches. Reaction ranges from slightly acid to moderately alkaline.

Barbary Series

The Barbary series consists of very poorly drained, mineral soils that are very slowly permeable and very fluid. These soils formed in clayey alluvium. They are in swamps that are flooded or ponded by fresh water most of the time. Slope is less than 1 percent.

Soils of the Barbary series are very-fine, montmorillonitic, nonacid, thermic Typic Hydraquents.

Barbary soils commonly are near areas of Allemands, Clovelly, Kenner, and Sharkey soils and are similar to the Scatlake soils. The Allemands, Clovelly, and Kenner soils are in nearby marshes and are organic soils. The Scatlake soils are in marshes, and they are more saline and contain fewer logs and stumps than the Barbary soils. The Sharkey soils are in higher positions and are firm mineral soils.

Typical pedon of Barbary muck; 6 miles south of Belle Chasse, 1.5 miles west of Sarah, 1.2 miles south of Hero Canal, 3,300 feet east of Bayou Barataria; Spanish Land Grant 73, T. 15 S., R. 24 E.

Oa—0 to 4 inches; very dark grayish brown (10YR 3/2) muck; about 40 percent fiber, about 10 percent rubbed; massive; very fluid; common fine and medium roots; common wood fragments; slightly alkaline; clear smooth boundary.

Cg1—4 to 24 inches; dark gray (10YR 4/1) clay; massive; very fluid; common partially decomposed woody fragments and logs; moderately alkaline; clear smooth boundary.

Cg2—24 to 60 inches; dark gray (5Y 4/1) clay; common medium distinct olive (5Y 5/6) mottles; massive; very fluid; common partially decomposed woody fragments; moderately alkaline.

The *n* value is 0.7 or more in all horizons to a depth of 60 inches or more.

The Oa horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 to 4, and chroma of 1 to 3. Reaction ranges from moderately acid to slightly alkaline.

The Cg horizon has hue of 10YR, 2.5Y, 5Y, 5GY, or 5BG, value of 4 or 5, and chroma of 1. It is very fluid or slightly fluid clay or mucky clay. Buried logs, stumps, and wood fragments range from few to many in the Cg horizon. Reaction ranges from neutral to moderately alkaline.

Bellpass Series

The Bellpass series consists of very poorly drained, organic soils that are very slowly permeable, saline, and very fluid. These soils formed in moderately thick accumulations of decomposed herbaceous material overlying very fluid clayey alluvium. These soils are in saline marshes that are ponded or flooded most of the time. Slope is less than 1 percent.

Soils of the Bellpass series are clayey, montmorillonitic, euic, thermic Terric Medisaprists.

Bellpass soils commonly are near areas of Clovelly, Lafitte, Scatlake, and Timbalier soils. The Clovelly soils are in brackish marshes and are less saline than the Bellpass soils. The Lafitte soils are in brackish marshes and have organic material that is more than 51 inches thick. The Scatlake and Timbalier soils are in landscape positions similar to those of the Bellpass soils. Scatlake soils are very fluid mineral soils. The Timbalier soils have organic material that is more than 51 inches thick.

Typical pedon of Bellpass muck; 6 miles west of Port Sulphur, 1.7 miles east of Bay Batiste, 2,000 feet west of Bay Sansbois, 600 feet south of Bayou Dulac, 300 feet west of pipeline canal; T. 19 S., R. 26 E.

Oa1—0 to 10 inches; dark gray (10YR 4/1) muck; about 20 percent fiber, about 5 percent rubbed; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; clear smooth boundary.

Oa2—10 to 29 inches; very dark grayish brown (10YR 3/2) muck; about 30 percent fiber, about 10 percent rubbed; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; clear smooth boundary.

Cg1—29 to 41 inches; dark gray (5Y 4/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; gradual smooth boundary.

Cg2—41 to 70 inches; gray (5Y 5/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline.

The organic material ranges in thickness from about 16 to 51 inches. The electrical conductivity ranges from 8 to 16 millimhos per centimeter in at least one layer between the surface and a depth of 40 inches.

The Oa horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 or 2. The reaction ranges from neutral to moderately alkaline.

The Abg horizon, if present, is mucky clay or clay. It has hue of 10YR or 5Y, value of 2 to 4, and chroma of 1 or 2. The *n* value ranges from 0.7 to 1.0 or more. Reaction is slightly alkaline or moderately alkaline.

The Cg horizon has hue of 10YR, 5Y, 5BG, 5GY, or 5G, value of 4 to 6, and chroma of 1, or it is neutral with value of 4 to 6. Texture is silty clay or clay. Reaction is slightly alkaline or moderately alkaline. The *n* value to a depth of 60 inches or more ranges from 0.7 to more than 1.0.

Clovelly Series

The Clovelly series consists of very poorly drained, organic soils that are very slowly permeable, slightly saline, and very fluid. These soils formed in moderately thick accumulations of decomposed herbaceous material overlying very fluid, clayey alluvium. These soils are in brackish coastal marshes that are ponded or flooded most of the time. Slope is less than 1 percent.

Soils of the Clovelly series are clayey, montmorillonitic, euic, thermic Terric Medisaprists.

Clovelly soils commonly are near areas of Allemands, Barbary, Bellpass, Gentilly, Lafitte, Scatlake, and Timbalier soils. Allemands soils are in nearby freshwater marshes and are less saline than the Clovelly soils. The Barbary soils are in swamps and are very fluid mineral soils. The Bellpass and Timbalier soils are in nearby marshes and are more saline than the Clovelly soils. The Gentilly and Lafitte soils are in landscape positions similar to those of the Clovelly soils, and the Lafitte soils have organic layers that are more than 51 inches thick.

Typical pedon of Clovelly muck; 9 miles south of Myrtle Grove, 2 miles east of Wilkinson Canal, 2,200 feet north of Upper Wilkinson Bay, 1,800 feet west of Wilkinson Bayou, 1,900 feet south of Raquette Bay; T. 18 S., R. 25 E.

Oa1—0 to 12 inches; very dark gray (10YR 3/1) muck; about 30 percent fiber, about 10 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; gradual smooth boundary.

Oa2—12 to 42 inches; very dark gray (10YR 3/1) muck; about 20 percent fiber, less than 5 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; clear smooth boundary.

Cg—42 to 70 inches; gray (5Y 5/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline.

The organic material ranges in thickness from about 16 to 51 inches. The electrical conductivity ranges from 4 to 8 millimhos per centimeter in at least one layer between the surface and a depth of 40 inches.

The Oa horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 or 2. The mineral content ranges from 40 to 60 percent. Reaction ranges from neutral to moderately alkaline.

Some pedons have an Ab horizon. It is mucky clay, clay, or silty clay. It has hue of 10YR or 5Y, value of 2 to 4, and chroma of 1 or 2. The *n* value ranges from 0.7 to 1.0 or more. Reaction ranges from neutral to moderately alkaline.

The Cg horizon has hue of 10YR, 5Y, 5BG, 5GY, or 5G, value of 4 to 6, and chroma of 1, or it is neutral with value of 4 to 6. The texture is clay, silty clay, or mucky clay. Reaction is slightly alkaline or moderately alkaline. The *n* value to a depth of 60 inches or more ranges from 0.7 to 1.0 or more.

Commerce series

The Commerce series consists of somewhat poorly drained, mineral soils that are moderately slowly permeable and friable. These soils formed in loamy alluvium. They are in high and intermediate positions on the natural levees along the Mississippi River and its distributaries. Slope is less than 1 percent.

Soils of the Commerce series are fine-silty, mixed, nonacid, thermic Aeric Fluvaquents.

Commerce soils commonly are near areas of Convent, Harahan, Sharkey, Vacherie, and Westwego soils. The Convent and Vacherie soils are in landscape positions similar to those of the Commerce soils. Convent soils are coarse-silty and Vacherie soils are coarse-silty over clayey. The Harahan, Sharkey, and Westwego soils are lower on the landscape than Commerce soils, and they have a clayey subsoil.

Typical pedon of Commerce silt loam; 3.3 miles south of Braithwaite, 500 feet south of Belle Chasse ferry landing, 200 feet east of Highway 39; Spanish Land Grant 6, T. 14 S., R. 12 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; few fine roots; neutral; clear smooth boundary.

Bw1—8 to 19 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; slightly alkaline; clear smooth boundary.

Bw2—19 to 28 inches; grayish brown (10YR 5/2) silt loam; many fine prominent brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; slightly alkaline; clear smooth boundary.

BC—28 to 38 inches; gray (10YR 5/1) silty clay loam; many fine distinct brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; slightly alkaline; clear smooth boundary.

C—38 to 60 inches; gray (10YR 5/1) silt loam; common medium prominent brown (7.5YR 4/4) mottles; massive; friable; common black stains; common thin strata of dark gray (5Y 4/1) silty clay loam; moderately alkaline.

The solum ranges in thickness from 20 to 40 inches.

The Ap horizon and the Ab horizon, if it is present, have hue of 10YR, value of 3 to 5, and chroma of 1 to 3. Where values are 3 the Ap horizon is less than 6 inches thick. The Ap and Ab horizons are silt loam or silty clay loam. Thickness of the Ap horizon ranges from 4 to 12 inches. Reaction ranges from moderately acid to moderately alkaline in the Ap horizon. It ranges from slightly acid to moderately alkaline in the Ab horizon.

The Bw and BC horizons have hue of 10YR, value of 4 or 5, and chroma of 1 or 2. Texture is silty clay loam, silt loam, or loam. Reaction ranges from slightly acid to moderately alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam or silt loam. Thin strata of silty clay or very fine sandy loam are in some pedons. Reaction ranges from neutral to moderately alkaline.

Convent Series

The Convent series consists of somewhat poorly drained, mineral soils that are moderately permeable and firm. These soils formed in loamy alluvium. They are in high positions on the natural levees along the Mississippi River and its distributaries. Slope is less than 1 percent.

Soils of the Convent series are coarse-silty, mixed, nonacid, thermic Aeric Fluvaquents.

Convent soils commonly are near areas of Commerce, Harahan, Rita, Sharkey, Vacherie, and Westwego soils. Commerce and Vacherie soils are in landscape positions similar to those of the Convent soils. Commerce soils are fine-silty and Vacherie soils are coarse-silty over clayey. The Harahan, Rita, Sharkey, and Westwego soils are lower in the landscape than the Convent soils, and they are clayey throughout.

Typical pedon of Convent silt loam; 3 miles south of Braithwaite, 1,400 feet north of Belle Chasse ferry landing, 400 feet east of Highway 3137; Spanish Land Grant 4, T. 14 S., R. 12 E.

Ap—0 to 4 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; few fine and medium roots; slightly acid; clear smooth boundary.

C1—4 to 13 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; friable; few fine roots; neutral; clear smooth boundary.

C2—13 to 28 inches; grayish brown (10YR 5/2) silt loam; common fine distinct brown (10YR 4/4) mottles; massive; friable; neutral; clear smooth boundary.

C3—28 to 60 inches; grayish brown (10YR 5/2) silt loam; common medium distinct brown (10YR 4/4) mottles; massive; very friable; thin strata of pale brown and brown silt loam throughout the horizon; moderately alkaline.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Texture is silt loam, very fine sandy loam, or fine sandy loam. Reaction ranges from moderately acid to moderately alkaline.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. Texture is very fine sandy loam or silt loam. Some pedons have thin strata of finer or coarser textured materials. Some pedons have brown strata that comprise as much as 40 percent of the 10- to 40-inch control section. Reaction ranges from slightly acid to moderately alkaline.

The Ab horizon, if present, is silty clay loam, silt loam, loam, very fine sandy loam, fine sandy loam, or loamy very fine sand.

Fausse Series

The Fausse series consists of very poorly drained, mineral soils that are very slowly permeable, saline, and firm. These soils formed in clayey alluvium. They are in swamps that formerly were the natural levees of distributaries of the Mississippi River. These natural levees have subsided to near sea level. These soils are frequently flooded by salt water from storm tides and by fresh water following intense rainstorms. Slope is less than 1 percent.

Soils of the Fausse series are very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents.

Fausse soils commonly are near areas of Bellpass, Clovelly, Gentilly, and Sharkey soils and are similar to Barbary soils. The Barbary soils are very fluid or slightly fluid throughout and are in nearby swamps. The Bellpass, Clovelly, and Gentilly soils are in nearby marshes. Bellpass and Clovelly soils are organic soils and Gentilly soils are very fluid mineral soils. The Sharkey soils are slightly higher on the landscape than the Fausse soils, and they crack to a depth of 20 inches or more in most years.

Typical pedon of Fausse muck, saline; 6 miles north of Pointe a la Hache, 4 miles south of Phoenix, 1.5 miles south of Bayou la Croix, 300 feet north of Back Levee Canal; Spanish Land Grant 48, T. 16 S., R. 13 E.

Oa—0 to 4 inches; very dark gray (10YR 3/1) muck; very fluid; about 10 percent fiber, less than 5 percent rubbed (flows easily between fingers when squeezed, leaving hand empty); few fine roots; slightly alkaline; clear smooth boundary.

A—4 to 12 inches; dark gray (10YR 4/1) clay; few fine faint brown mottles; weak medium subangular blocky structure; firm, very sticky; few fine roots; moderately alkaline; clear smooth boundary.

Bg—12 to 25 inches; dark gray (5Y 4/1) clay; common medium prominent brown (10YR 4/4) mottles; weak coarse subangular blocky structure; firm, very sticky; moderately alkaline; gradual smooth boundary.

Cg—25 to 60 inches; gray (N 5/0) clay; massive; firm, very sticky; slightly alkaline.

The solum ranges in thickness from 25 to 50 inches. The moisture content of the soil is above field capacity continuously in all layers below a depth of 24 inches in most years. The *n* value is variable within 36 inches of the surface but is 0.7 or less in some subhorizons in the 8- to 20-inch section. The *n* value of subhorizons at depths below 36 inches is less than 0.7. Cracks do not form to a depth of 20 inches in most years. Electrical conductivity of the saturation extract ranges from 4 to 16 millimhos per centimeter throughout.

The Oa horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction ranges from neutral to strongly alkaline.

The A horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 or 4, and chroma of 1 or 2. It is clay or mucky clay. Reaction ranges from neutral to strongly alkaline.

The Bg horizon has hue of 10YR, 5Y, or 5GY, value of 4 or 5, and chroma of 1, or it is neutral with values of 4 or 5. Reaction ranges from moderately acid to moderately alkaline.

The Cg horizon has hue of 5Y, 5GY, or 5GB, value of 4 or 5, and chroma of 1, or it is neutral with values of 4 or 5. The texture is clay, silty clay, or silty clay loam. Reaction ranges from moderately acid to moderately alkaline.

Felicity Series

The Felicity series consists of gently sloping, somewhat poorly drained, mineral soils that are very rapidly permeable, saline, and firm. These soils formed in sandy tidal sediments. They are on ridges and barrier islands along the Gulf of Mexico and are frequently flooded by tidal waters during storms. These soils are also unstable because of the continuing erosion caused by wave action. Slope ranges from 1 to 3 percent.

Soils of the Felicity series are mixed, thermic Aquic Udipsamments.

Felicity soils commonly are near areas of Bellpass, Scatlake, and Timbalier soils. The Bellpass and Timbalier soils are in saline marshes and are very fluid organic soils. The Scatlake soils also are in nearby saline marshes, and they are very fluid clayey soils.

Typical pedon of Felicity loamy fine sand, frequently flooded; 12 miles south of Port Sulphur, 3 miles east of Quatre Bayoux Pass, 2 miles west of Robinson Canal, 1,000 feet south of Bay La Mer, 200 feet north of Gulf of Mexico; T. 21 S., R. 26 E.

C1—0 to 16 inches; brown (10YR 5/3) loamy fine sand; single-grained; very friable; common shell fragments; moderately alkaline; clear wavy boundary.

C2—16 to 24 inches; dark brown (10YR 4/3) loamy sand; common medium faint light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; single-grained; very friable; few shell fragments; moderately alkaline; clear wavy boundary.

C3—24 to 32 inches; grayish brown (10YR 5/2) loamy sand; common medium faint yellowish brown (10YR 5/4) mottles; single-grained; very friable;

few shell fragments; moderately alkaline; clear smooth boundary.

Ab—32 to 60 inches; dark gray (5Y 4/1) sand; single-grained; very friable; few shell fragments; moderately alkaline.

Depth to the sandy Ab horizon ranges from 24 to 40 inches. Electrical conductivity ranges from 8 to 16 millimhos per centimeter throughout. Reaction ranges from neutral to moderately alkaline throughout the profile. Shells and fragments of shells range from 0 to 15 percent of the weight of the 10- to 40-inch control section. The texture throughout the profile is sand, loamy sand, or loamy fine sand.

The A horizon, if present, is thin and has hue of 10YR, value of 2 to 4, and chroma of 1 to 3.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Mottles with chroma of 1 or 2 are in the C horizon at a depth of 10 to 40 inches below the surface.

The Ab horizon has hue of 10YR, 2.5Y, or 5Y, value of 2 to 4, and chroma of 1 to 3. Some pedons are underlain by loamy, clayey, or organic materials at a depth of 40 to 60 inches below the surface.

Gentilly Series

The Gentilly series consists of very poorly drained, mineral soils that are slightly saline. These soils formed in thin accumulations of decomposed herbaceous plant material and very fluid clayey alluvium over consolidated clayey deposits. These soils are in brackish marshes. Slope is less than 1 percent.

Soils of the Gentilly series are fine, montmorillonitic, nonacid, thermic Typic Hydraquents.

Gentilly soils commonly are near areas of Clovelly, Fausse, and Lafitte soils. The organic Clovelly and Lafitte soils are slightly lower on the landscape than the Gentilly soils. The Fausse soils are in slightly higher positions and are firm and clayey in the upper part of the profile.

Typical pedon of Gentilly muck; 6 miles south of Myrtle Grove, 3,800 feet west of Lake Judge Perez, 3,000 feet east of Bayou Tambour, 2,200 feet north of Hermitage Bayou; T. 17 S., R. 25 E.

Oa1—0 to 10 inches; very dark gray (10YR 3/1) muck; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); about 30 percent fiber, about 10 percent rubbed; slightly alkaline; abrupt smooth boundary.

Cg1—10 to 24 inches; dark gray (5Y 4/1) clay; common medium prominent dark yellowish brown (10YR 3/2) mottles; massive; slightly fluid (flows with slight difficulty between fingers when squeezed, leaving small residue); slightly alkaline; clear smooth boundary.

Cg2—24 to 60 inches; gray (5Y 5/1) clay; common medium prominent dark olive (5Y 4/4) and yellowish brown (10YR 5/6) mottles; massive; very sticky, very plastic; slightly alkaline.

Soil salinity ranges from low to moderate. The COLE is estimated to be more than 0.09 in mineral horizons, but because the soil is continuously saturated it does not crack to a depth of 20 inches. All layers at depths of 8 to 20 inches below the mineral surface have an *n* value of more than 0.7. The mineral layer within the 10- to 40-inch control section has between 35 and 60 percent clay content.

The Oa horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3. The mineral fraction of the Oa horizon is dominantly clay. Reaction is moderately acid to slightly alkaline.

The Cg horizon has hue of 10YR, 5Y, or 5GY, value of 4 or 5, and chroma of 1, or it is neutral with value of 4 or 5. Texture is clay or silty clay. Reaction is neutral or slightly alkaline. The depth to underlying layers that have *n* values of 0.7 or less ranges from 20 to 40 inches below the mineral surface.

Harahan Series

The Harahan series consists of poorly drained, mineral soils that are very slowly permeable. They are firm in the upper part and slightly fluid or very fluid in the lower part. These soils formed in clayey alluvium. They are in drained former swamps in the lower part of the Mississippi River flood plain and are subject to rare flooding. Slope is less than 1 percent.

Soils of the Harahan series are very-fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Harahan soils commonly are near areas of drained phases of Allemands soils and areas of Commerce, Sharkey, and Westwego soils. The organic Allemands soils are in former marshes. Both the Commerce and Sharkey soils are higher on the landscape than the Harahan soils. Commerce soils are fine-silty, and Sharkey soils have an *n* value of less than 0.7 throughout. The Westwego soils are in landscape positions similar to those of the Harahan soils and have organic layers within the control section.

Typical pedon of Harahan clay; in Pointe a la Hache, 1,100 feet north of Plaquemines Parish courthouse, 600 feet south of Highway 39; Spanish Land Grant 19, T. 17 S., R. 14 E.

A—0 to 5 inches; very dark gray (10YR 3/1) clay; weak medium subangular blocky structure; firm; neutral; clear smooth boundary.

Bg1—5 to 14 inches; gray (10YR 5/1) clay; common medium prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few slickensides that do not intersect; neutral; clear smooth boundary.

Bg2—14 to 22 inches; gray (5Y 5/1) clay; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; firm; neutral; clear smooth boundary.

Cg1—22 to 40 inches; dark gray (5Y 4/1) clay; massive; slightly fluid (flows with difficulty between fingers when squeezed, leaving a small residue in hand); moderately alkaline; gradual smooth boundary.

Cg2—40 to 65 inches; gray (5Y 5/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline.

The solum ranges in thickness from 20 to 40 inches. Depth to layers with an *n* value greater than 0.7 ranges from 20 to 40 inches. Cracks as wide as 1.5 inches form and extend from the soil surface to a depth of 20 inches or more during dry periods in most years.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2, or it is neutral and has value of 2 to 4. Reaction ranges from strongly acid to neutral.

The Bg horizon has hue of 10YR, 2.5Y, 5Y, 5GY, or 5BG, value of 3 to 5, and chroma of 1 or 2, or it is neutral and has value of 3 to 5. Texture is clay or silty clay. Reaction ranges from strongly acid to neutral.

Some pedons have an Ab horizon. It has hue of 10YR, value of 2 to 4, and chroma of 1 or 2, or it is neutral and has value of 2 to 4. Texture is clay, silty clay, or mucky clay. Reaction ranges from strongly acid to neutral.

The Cg horizon has hue of 10YR, 2.5Y, 5Y, 5BG, 5GY, or 5G, value of 2 to 5, and chroma of 1 or 2, or it is neutral and has value of 2 to 5. Texture is clay, silty clay, or mucky clay. Reaction ranges from neutral to moderately alkaline. In places, buried stumps and logs are in the underlying material.

Kenner Series

The Kenner series consists of very poorly drained, organic soils that are very slowly permeable and very fluid. These soils formed in herbaceous plant material in freshwater marshes, and they are ponded or flooded most of the time. Slope is less than 1 percent.

Soils of the Kenner series are euic, thermic Fluvaquentic Medisaprists.

Kenner soils commonly are near areas of Allemands, Balize, Barbary, Clovelly, Gentilly, and Lafitte soils. The Allemands soils are in landscape positions similar to those of Kenner soil, and they have clayey underlying material within a depth of less than 51 inches. The Balize and Gentilly soils are in nearby marshes and are mineral soils. The Barbary soils are in nearby swamps and are clayey throughout. The Clovelly and Lafitte soils are in nearby marshes and are more saline throughout than the Kenner soils.

Typical pedon of Kenner muck; 7 miles south of Belle Chasse, 2.5 miles west of Live Oak, 3,800 feet south of Bayou Barataria, 1,400 feet east of the Jefferson-Plaquemines Parish line; Spanish Land Grant 28, T. 15 S., R. 24 E.

Oa1—0 to 14 inches; dark brown (10YR 4/3) muck; about 50 percent fiber, about 10 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving a small residue in hand); slightly alkaline; clear smooth boundary.

Oa2—14 to 24 inches; black (10YR 2/1) muck; about 30 percent fiber, less than 5 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); slightly alkaline; clear smooth boundary.

Cg—24 to 27 inches; dark gray (5Y 4/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); slightly alkaline; clear smooth boundary.

O´a—27 to 38 inches; very dark gray (10YR 3/1) muck; about 30 percent fiber, less than 5 percent rubbed; very fluid (flows easily between fingers when squeezed, leaving hand empty); slightly alkaline; clear smooth boundary.

C´g—38 to 41 inches; dark gray (5Y 4/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); slightly alkaline; clear smooth boundary.

O´´a—41 to 68 inches; black (10YR 2/1) muck; about 20 percent fiber, about 5 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving a small residue in hand); slightly alkaline.

The organic material that has thin mineral layers ranges in thickness from 51 to more than 100 inches. The depth to thin mineral strata ranges from 12 to 51 inches. Reaction ranges from moderately acid to slightly alkaline throughout.

The organic material in the surface tier (0 to 14 inches) has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 or 2. The rubbed fiber content ranges from 5 to 60 percent, and the mineral content ranges from 40 to 70 percent.

The organic material in the subsurface and bottom tiers (14 to 51 inches) has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The rubbed fiber content ranges from less than 1 percent to 8 percent.

Thickness of mineral strata (Cg horizons) within the subsurface and bottom tiers ranges from 1 centimeter to 25 centimeters. The Cg and C´g horizons have hue of 5Y, 5GY, or 10YR, value of 2 to 5, and chroma of 1. The Cg horizon is clay, silty clay, or mucky clay.

Lafitte Series

The Lafitte series consists of very poorly drained, organic soils that are slightly saline and very fluid. These soils are moderately rapidly permeable in the organic layers and very slowly permeable in the mineral layers. They formed in decomposed herbaceous plant material. These soils are in the brackish Gulf Coast marshes, and they are ponded or flooded most of the time. Slope is less than 1 percent.

Soils of the Lafitte series are euic, thermic Typic Medisaprists.

Lafitte soils commonly are near areas of Bellpass, Clovelly, Scatlake, and Timbalier soils. The Bellpass, Scatlake, and Timbalier soils are in saline marshes, and they are more saline throughout than the Lafitte soils. Clovelly soils are in landscape positions similar to those of the Lafitte soils, and they have a thinner organic layer over the mineral material than the Lafitte soils.

Typical pedon of Lafitte muck; 5 miles south of Myrtle Grove, 1.7 miles west of Wilkinson Canal, 4,600 feet north of Round Lake, 400 feet east of Bayou Dupont; T. 17 S., R. 25 E.

Oa1—0 to 6 inches; very dark grayish brown (10YR 3/2) muck; about 30 percent fiber, about 10 percent rubbed; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; clear smooth boundary.

Oa2—6 to 22 inches; very dark gray (10YR 3/1) muck; about 20 percent fiber, about 5 percent rubbed; very fluid (flows easily between fingers when squeezed, leaving hand empty); few wood fragments; moderately alkaline; clear smooth boundary.

Oa3—22 to 35 inches; very dark grayish brown (10YR 3/2) muck; about 50 percent fiber, less than 5 percent rubbed; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; clear smooth boundary.

Oa4—35 to 60 inches; very dark gray (10YR 3/1) muck; about 20 percent fiber, less than 10 percent rubbed; very fluid (flows easily between fingers when squeezed, leaving hand empty); few wood fragments; moderately alkaline.

Depth to mineral layers ranges from 51 inches to more than 100 inches.

The Oa horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 to 3. Fiber content after rubbing is generally less than 10 percent, but thin strata of hemic or fibric material are common. The mineral content ranges from 40 to 60 percent. Reaction in the surface tier (0 to 12 inches) ranges from slightly acid to moderately alkaline. Reaction in the subsurface tier (12 to 36 inches) and the bottom tier (36 to 51 inches) ranges from slightly acid to moderately alkaline. The average conductivity of the saturation extract ranges from 4 to 8 millimhos per centimeter throughout the Oa horizon.

The Agb and the Cg horizons, where present, have hue of 5Y or 5GY, value of 3 to 5, and chroma of 1, or they are neutral and have value of 3 to 5. They are stratified clay, silty clay, or mucky clay. Reaction ranges from neutral to moderately alkaline.

Larose Series

The Larose series consists of very poorly drained, mineral soils that are very slowly permeable and very fluid. These soils formed in clayey alluvium in freshwater marshes. They are ponded and flooded most of the time. Slope is less than 1 percent.

Soils of the Larose series are very-fine, montmorillonitic, nonacid, thermic Typic Hydraquents.

Larose soils commonly are near areas of Allemands, Aquents, Balize, Barbary, Clovelly, Convent, Kenner, and Lafitte soils. The Allemands, Clovelly, Convent, Kenner, and Lafitte soils are in nearby marshes. Aquents are the spoil banks along canals. Balize soils are in nearby marshes and are fine-silty. Barbary soils are in swamps and have logs and stumps in the lower layers.

Typical pedon of Larose muck in an area of Balize and Larose soils, 8 miles east of Venice, 900 feet northwest of Main Pass, 500 feet east of Romere Pass; SW1/4SW1/4 sec. 26, T. 20 S., R. 19 E.

Oa—0 to 6 inches; very dark grayish brown (7.5YR 3/2) muck; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); about 40 percent fiber, about 10 percent rubbed; common fine roots; neutral; clear smooth boundary.

Ag—6 to 17 inches; dark gray (5Y 4/1) mucky clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); common fine roots; neutral; clear smooth boundary.

Cg1—17 to 38 inches; dark gray (10YR 4/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; gradual smooth boundary.

Cg2—38 to 60 inches; gray (10YR 5/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline.

All of the mineral horizons above a depth of 60 inches have an *n* value of 1 or more. The reaction ranges from moderately acid to slightly alkaline in the Oa horizon and from slightly acid to moderately alkaline in the Ag and Cg horizons.

The Oa horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2.

The Ag horizon has hue of 10YR, 2.5Y, or 5Y, value of 2 to 4, and chroma of 1 or 2. It is clay, silty clay, or mucky clay.

The Cg horizon has hue of 10YR to 5BG, value of 3 to 5, and chroma of 1 or 2. It is clay, silty clay, or mucky clay.

Rita Series

The Rita series consists of poorly drained, mineral soils that are very slowly permeable and firm. They have a subsoil that is permanently cracked in the upper part. These soils formed in thin herbaceous material over clayey alluvium. They are in former freshwater marshes that have been drained and protected from flooding. Slope is less than 1 percent.

Soils of the Rita series are very-fine, montmorillonitic, nonacid, thermic, cracked Typic Fluvaquents.

Rita soils commonly are near areas of drained phases of Allemands soils and areas of Commerce, Harahan, Sharkey, and Westwego soils. The organic Allemands soils are in slightly lower positions. The Commerce and Sharkey soils are in slightly higher positions. Commerce soils are fine-silty and Sharkey soils are clayey throughout. The Harahan and Westwego soils are in landscape positions similar to those of the Rita soils. Harahan soils are clayey throughout, and Westwego soils have a buried organic layer that is more than 8 inches thick.

Typical pedon of Rita mucky clay; 5 miles south of Belle Chasse, 1.3 miles west of Highway 23, 900 feet north of Hero Canal, 200 feet west of pipeline right-of-way; Spanish Land Grant 4, T. 15 S., R. 24 E.

A—0 to 5 inches; very dark gray (10YR 3/1) mucky clay; moderate fine and medium granular structure; friable; slightly acid; clear wavy boundary.

Bg1—5 to 19 inches; dark gray (10YR 4/1) clay; moderate medium subangular blocky structure; firm; few vertical cracks about 1 centimeter wide filled with black muck; strongly acid; clear wavy boundary.

Bg2—19 to 32 inches; very dark gray (5Y 3/1) clay; common medium distinct strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; polygonal network of cracks about 2 centimeters wide throughout horizon; neutral; clear wavy boundary.

Cg1—32 to 40 inches; gray (5Y 5/1) silty clay loam; massive; slightly fluid (flows with difficulty between fingers when squeezed, leaving small residue in hand); slightly alkaline; gradual wavy boundary.

2Cg2—40 to 60 inches; olive gray (5Y 5/2) silt loam; massive; nonsticky; slightly alkaline.

The solum ranges in thickness from 20 to 40 inches. The depth to a loamy or sandy Cg or 2Cg horizon ranges from 30 to 60 inches. The depth to layers with *n* value of more than 0.7 ranges from 18 to 36 inches.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. It is muck, mucky clay, or clay. Reaction ranges from extremely acid to slightly acid.

The Bg horizon has hue of 10YR, 5Y, 5BG, 5GY, or 5G, value of 3 to 5, and chroma of 1, or it is neutral and has value of 3 to 5. Texture is clay or silty clay. Some subhorizons of the Bg horizon have vertical cracks that do not close when the soil is wet. Reaction ranges from extremely acid to neutral.

The Cg horizon has a color range similar to that of the Bg horizon. It is clay, silty clay, or silty clay loam. Reaction ranges from neutral to moderately alkaline.

The 2Cg horizon has hue of 10YR, 5Y, 5BG, 5GY, or 5G, value of 3 to 5, and chroma of 1 or 2, or it is neutral with value of 3 to 5. Texture is silt loam, very fine sandy loam, fine sandy loam, or loamy very fine sand. Reaction ranges from neutral to moderately alkaline.

Scatlake Series

The Scatlake series consists of very poorly drained, mineral soils that are very slowly permeable, saline, and very fluid. These soils formed mainly in clayey alluvium. They are in saline marshes that are ponded or flooded most of the time. Slope is less than 1 percent.

Soils of the Scatlake series are very-fine, montmorillonitic, nonacid, thermic Typic Hydraquents.

Scatlake soils are commonly near areas of Bellpass and Timbalier soils. Bellpass and Timbalier soils are organic soils in landscape positions similar to those of the Scatlake soils.

Typical pedon of Scatlake muck; 8 miles south of Empire, 1 mile east of Bastian Bay, 1,100 feet north of Shell Island Bay; sec. 21, T. 21 S., R. 28 E.

Oa—0 to 7 inches; very dark gray (10YR 3/1) muck; massive; about 10 percent fiber, less than 5 percent rubbed; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; abrupt smooth boundary.

Ag—7 to 13 inches; dark gray (10YR 4/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; clear smooth boundary.

Cg1—13 to 22 inches; gray (N 5/0) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; clear smooth boundary.

Cg2—22 to 70 inches; gray (5Y 5/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline.

Depth to firm mineral material is more than 40 inches. In more than half of the upper 20 inches of the profile, the electrical conductivity ranges from 8 to 16 millimhos per centimeter. The *n* value of all mineral layers above a depth of 40 inches is 1 or more. Reaction ranges from neutral to moderately alkaline throughout.

The Ag horizon has a hue of 10YR or 5Y, value of 2 to 5, and chroma of 1, or it is neutral and has value of 2 to 5.

The Cg horizon has hue of 10YR, 5Y, 5BG, or 5GY, value of 4 to 6, and chroma of 1, or it is neutral and has value of 4 to 6. It is slightly fluid or very fluid clay, mucky clay, or mucky silty clay loam. In some pedons, thin layers of muck are in the Cg horizon.

Sharkey Series

The Sharkey series consists of poorly drained, mineral soils that are very slowly permeable and firm. These soils formed in clayey alluvium. They are in intermediate and low positions on natural levees and in backswamps on the Mississippi River flood plain. Slope is less than 1 percent.

Soils of the Sharkey series are very-fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Sharkey soils commonly are near areas of Barbary, Commerce, Convent, Harahan, Rita, Vacherie, and Westwego soils. The Barbary soils are in swamps and have an *n* value of more than 0.7. The Commerce and Convent soils are in higher positions and are loamy throughout. The Harahan, Rita, and Westwego soils are slightly lower on the landscape than the Sharkey soils. Harahan soils have underlying material that is slightly fluid. Rita and Westwego soils have a subsoil that is permanently cracked in the upper part. The Vacherie soils are in slightly higher positions and are coarse-silty over clayey.

Typical pedon of Sharkey clay; 2 miles north of Belle Chasse, 1.6 miles east of Highway 406, 4,000 feet southeast of Planters Canal, 700 feet northwest of Mississippi River Levee; Spanish Land Grant 8, T. 14 S., R. 25 E.

Ap—0 to 4 inches; very dark gray (10YR 3/1) clay; weak medium subangular blocky structure; firm, plastic; few common roots; slightly acid; clear smooth boundary.

Bg1—4 to 14 inches; dark gray (10YR 4/1) clay; few fine distinct brown mottles; moderate medium subangular blocky structure; firm, plastic; few black stains; few slickensides that do not intersect; slightly acid; clear smooth boundary.

Bg2—14 to 24 inches; gray (5Y 5/1) clay; common medium distinct yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm, plastic; few slickensides that do not intersect; slightly acid; gradual smooth boundary.

BCg—24 to 40 inches; dark gray (5Y 4/1) clay; moderate medium distinct dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm, plastic; neutral; gradual smooth boundary.

Cg—40 to 65 inches; gray (10YR 5/1) clay; moderate medium distinct dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm, plastic; slightly alkaline.

The solum ranges in thickness from 36 to 60 inches. Cracks as wide as 1.5 inches form and extend from the soil surface to a depth of 20 inches or more during dry periods in most years.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. Texture is clay, silty clay loam, or silt loam. Where value is 3, the horizon is less than 10 inches thick. Reaction ranges from strongly acid to moderately alkaline.

The Bg and BCg horizons have hue of 10YR or 5Y, value of 4 or 5, and chroma of 1, or they are neutral and have value of 4 or 5. The texture typically is clay, but some pedons have thin subhorizons of silty clay or silty clay loam. The average clay content ranges from 60 to 90 percent. Reaction ranges from moderately acid to moderately alkaline.

The Cg horizon has the same range in colors as the Bg horizon. Typically, it is clay or silty clay, but thin strata of silty clay loam are in some pedons. Reaction ranges from neutral to moderately alkaline.

Timbalier Series

The Timbalier series consists of very poorly drained, organic soils that are very slowly permeable and very fluid. These soils formed in thick accumulations of herbaceous plant material. They are in saline marshes and are ponded or flooded most of the time. Slope is less than 1 percent.

Soils of the Timbalier series are euic, thermic Typic Medisaprists.

Timbalier soils are similar to Lafitte soils and commonly are near areas of Bellpass and Scatlake soils. The Bellpass and Scatlake soils are in landscape positions similar to those of the Timbalier soils. Bellpass soils have mineral material within 51 inches of the soil surface. Scatlake soils are very fluid, mineral soils. The Lafitte soils are in brackish marshes and are not as saline as Timbalier soils.

Typical pedon of Timbalier muck; 6 miles west of Port Sulphur, 2 miles west of Bay Sansbois, 1 mile east of Bay Batiste, 4,200 feet north of Bayou Dulac, 1,800 feet northwest of pipeline canal; T. 19 S., R. 26 E.

Oa1—0 to 8 inches; dark gray (10YR 4/1) muck; about 40 percent fiber, about 15 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline; gradual smooth boundary.

Oa2—8 to 32 inches; very dark gray (10YR 3/1) muck; about 40 percent fiber, about 10 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline.

Oa3—32 to 60 inches; black (10YR 2/1) muck; about 10 percent fiber, less than 5 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); moderately alkaline.

Depth to clayey mineral material ranges from 51 to more than 100 inches. Conductivity of the saturation extract ranges from 8 to 16 millimhos per centimeter in some layers within a depth of 40 inches. Mineral content in the Oa horizon ranges from 30 to 70 percent.

The surface tier (0 to 12 inches) has hue of 10YR or 7.5YR, value of 2 to 4, and chroma or 1 to 3. The rubbed content of fiber ranges from 1 to 35 percent. Reaction ranges from neutral to moderately alkaline.

The subsurface tier (12 to 36 inches) and bottom tier (36 to 51 inches) have hue of 7.5YR or 10YR, value of 1 to 3, and chroma of 1, or they are neutral and have value of 1 to 3. The rubbed content of fiber ranges from 1 to 10 percent of the volume. Reaction ranges from slightly acid to moderately alkaline.

The Cg horizon, where present, has hue of 5Y, 5BG, 5G, or 5GY, value of 4 to 6, and chroma of 1, or it is neutral with value of 4 to 6. It is very fluid clay or silty clay. Reaction ranges from slightly acid to moderately alkaline.

Vacherie Series

The Vacherie series consists of somewhat poorly drained, mineral soils that are moderately permeable in the upper part and very slowly permeable in the lower part. These soils formed in loamy alluvium over clayey alluvium. They are in intermediate positions where the natural levees of the Mississippi River were breached by former floods. Slope is 0 to 1 percent.

Soils of the Vacherie series are coarse-silty over clayey, mixed, nonacid, thermic Aeric Fluvaquents.

Vacherie soils commonly are near areas of Commerce, Convent, Harahan, and Sharkey soils. The Commerce and Convent soils are in landscape positions similar to those of Vacherie soils, and they are loamy throughout. The Harahan soils are in drained swamps, and they are clayey throughout. The Sharkey soils are in low positions on natural levees and are clayey throughout.

Typical pedon of Vacherie silt loam; 2 miles west of Braithwaite, in English Turn, 2,100 feet west of Highway 39, 2,000 feet east of Parish Highway 3137; Spanish Land Grant 6, T. 13 S., R. 12 E.

Ap1—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; few fine roots; slightly alkaline; clear smooth boundary.

Ap2—5 to 12 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; friable; common fine roots; slightly alkaline; clear wavy boundary.

Bg—12 to 34 inches; grayish brown (10YR 5/2) silt loam; common medium prominent strong brown

(7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; moderately alkaline; abrupt smooth boundary.

2Agb—34 to 40 inches; dark gray (10YR 4/1) clay; moderate medium subangular blocky structure; firm; few fine roots; slightly alkaline; clear smooth boundary.

2Bgb—40 to 60 inches; gray (10YR 5/1) clay; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm, plastic; moderately alkaline.

The loamy part of the solum ranges in thickness from 15 to 36 inches.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3, or it is neutral and has value of 4. The reaction ranges from moderately acid to moderately alkaline.

The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. Texture is silt loam or very fine sandy loam. The content of fine sand and coarser sand ranges from 3 to 15 percent. Clay content ranges from 10 to 18 percent. Reaction ranges from slightly acid to moderately alkaline.

The 2Agb and 2Bgb horizons have hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2, or they are neutral and have value of 4 or 5. Texture is clay or silty clay. Reaction ranges from neutral to moderately alkaline.

Westwego Series

The Westwego series consists of poorly drained, mineral soils that are very slowly permeable. These soils formed in fluid, clayey alluvium and in organic material that has dried and shrunk irreversibly in the upper part as the result of artificial drainage. These soils are in broad, drained, former swamps in the delta of the Mississippi River. They are protected from flooding by a system of levees and are artificially drained by pumps. Slope is less than 1 percent.

Soils of the Westwego series are very-fine, montmorillonitic, nonacid, thermic, cracked Thapto-Histic Fluvaquents.

Westwego soils commonly are near areas of drained phases of Allemands soils and areas of Commerce, Harahan, Rita, and Sharkey soils. The organic Allemands soils are in former marshes. The Commerce and Sharkey soils are in higher positions on the landscape than Westwego soils and have an *n* value of less than 0.7 throughout. The Harahan and Rita soils are in landscape positions similar to those of the Westwego soils, and they do not have thick organic layers within the control section.

Typical pedon of Westwego clay; 2 miles north of Belle Chasse, 2,500 feet north of Planters Canal, 500 feet south of Highway 406; Spanish Land Grant 21, T. 14 S., R. 25 E.

A—0 to 4 inches; very dark gray (10YR 3/1) clay; weak fine subangular blocky structure; friable; moderately acid; clear smooth boundary.

Bg1—4 to 16 inches; dark gray (10YR 4/1) clay; common fine distinct brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; common cracks as wide as 1 centimeter; root channels coated with very dark gray muck; moderately acid; abrupt wavy boundary.

Bg2—16 to 31 inches; dark gray (10YR 4/1) clay; weak coarse subangular blocky structure; firm; root channels stained with dark brown; common cracks as wide as 1 centimeter between prisms; moderately acid; abrupt wavy boundary.

2Oa—31 to 49 inches; very dark grayish brown (10YR 3/2) muck; about 10 percent fiber, about 5 percent rubbed; massive; very fluid (flows easily between fingers when squeezed, leaving a small residue in hand); few logs and wood fragments; strongly acid; clear smooth boundary.

3Cg—49 to 62 inches; dark gray (5Y 4/1) clay; massive; very fluid (flows easily between fingers when squeezed, leaving hand empty); few wood fragments; neutral.

Depth to the fluid layers ranges from 28 to 40 inches. The depth to an organic layer more than 8 inches thick ranges from 20 to 40 inches. Reaction of the A, Bg, and 2Oa horizons ranges from very strongly acid to slightly acid. Reaction of the 3Cg horizon ranges from neutral to moderately alkaline.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2, or it is neutral and has value of 2 to 4. Texture is clay, silty clay, mucky clay, or muck.

The Bg horizon has hue of 10YR, 2.5Y, 5Y, 5BG, 5GY, or 5G, value of 2 to 5, and chroma of 1, or it is neutral and has value of 2 to 5. Texture is clay, silty clay, or mucky clay.

The Ag horizon, if present, has hue of 10YR or 5Y, value of 2 or 3, and chroma of 1, or it is neutral and has value of 2 to 5. Texture is clay or mucky clay.

The 2Oa horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2, or it is neutral and has value of 2 or 3. It consists of sapric, hemic, or fibric material.

The 3Cg horizon has hue of 10YR, 2.5Y, 5Y, 5BG, 5GY, or 5G, value of 2 to 5, and chroma of 1 or 2. Texture is clay or mucky clay.

Formation of the Soils

Dr. Bobby J. Miller, Department of Agronomy, Agricultural Experiment Station, Louisiana State University, prepared this section.

This section explains the factors and processes of soil formation and relates them to the soils in the survey area. Landforms and surface geology are also discussed.

Factors of Soil Formation

Soil is a natural, three-dimensional body that forms on the earth's surface. It has properties resulting from the integrated effect of climate and living matter acting on parent material, as conditioned by relief over time. Considered individually, the five factors of soil formation are parent material, climate, living organisms, relief, and time.

Interaction of the five main factors influences the processes of soil formation and results in differences among the soils. The climate during formation of the soil material from the parent material; the physical and chemical composition of the original parent material; the kinds of plants and other organisms living in and on the soil; the relief of the land and its effect on runoff and erosion; and the length of time the soil has had to form all have an effect on what types of properties will be expressed in soils at any given site.

The effect of any one factor can differ from place to place, but the interaction of all the factors will determine the kind of soil that forms. Many of the differences in soils cannot be attributed to differences in only one factor. For example, the organic matter content in the soils of Plaquemines Parish is influenced by several of the factors, including relief, parent material, and living organisms. In the following paragraphs, the factors of soil formation are described individually as they relate to soils in the survey area.

Parent material

Parent material is the initial material from which soil forms. It affects the chemical and mineralogical composition of the soils. It also influences the degree of leaching, the reaction, texture, permeability, drainage, and the kind and color of the surface and subsoil layers. Relative percentages of sand, silt, and clay in the parent material affect the rate that water moves into and through the soil, and also affect the soil's ability to hold humus, air, and soil nutrients in the rooting zone. In general, soils that form in loamy and sandy parent material have a lower nutrient-holding capacity than those that form in clay. The soils in Plaquemines Parish formed mainly in loamy and clayey alluvial sediments, and many have accumulations of organic material in the upper part. Some are organic throughout, and some soils nearer to the coast formed in marine sediments.

The alluvium came from distributary streams of present and former deltas of the Mississippi River *(22)*. Bordering the stream channels are low ridges called natural levees. These levees are highest next to the channels and slope gradually into backswamps further from the channels. The levees are shaped by waters that overspread the streambanks. When the water slows, it first drops sand, then silt, and finally clay particles. Thus, the soils on the highest parts of natural levees generally formed in more loamy parent materials. These soils are generally lighter in color, more permeable, and better drained than the soils on the lower part of the natural levees and in the backswamps. Commerce, Convent, and Vacherie soils mostly are on mid to upper parts of the natural levees. The soils on the lower part of the natural levees and in the backswamps beyond the natural levees generally formed in more clayey parent materials that were deposited by slowly moving water or stagnant backwater. The Sharkey, Fausse, and Barbary soils formed in these types of parent materials. The Larose and Scatlake soils also formed in clayey alluvium, but they contain some marine sediments in the lower parts. The Rita, Harahan, and Westwego soils formed in drained backswamps beyond the natural levees (fig. 13). The Balize soils formed in loamy alluvium on the present delta of the Mississippi River. The Felicity soils formed in sandy marine sediments and are on former beach ridges that were built by wave action.

Organic material accumulates in areas that are continuously saturated or flooded. Water prevents the complete oxidation and decomposition of the plant residue. Water, vegetation, and time, coupled with a rise in sea level and land subsidence *(16)*, created

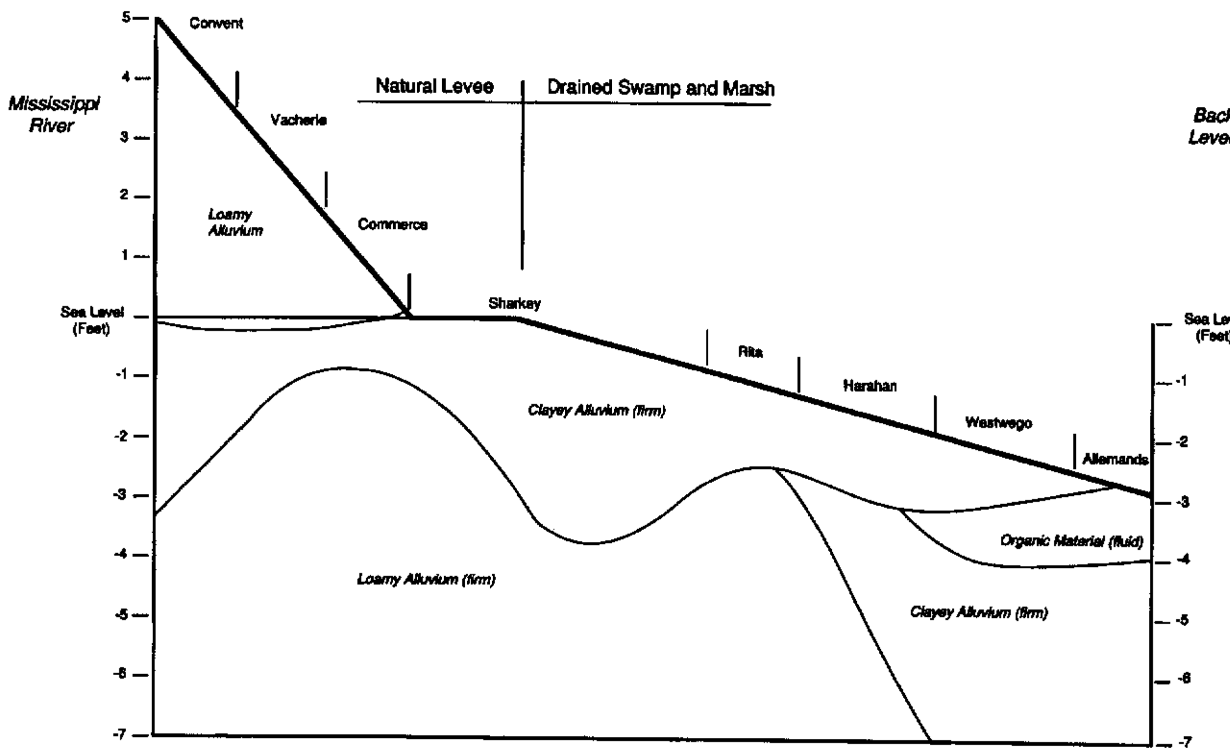


Figure 13.—Relationship of the soils, landscape, and parent materials of the natural levee of the Mississippi River and the drained swamp and marsh in Plaquemines Parish.

conditions where thick layers of organic material accumulated in the marshes of Plaquemines Parish. Until recent time, the buildup of organic material kept pace with land subsidence and sea level rise. The Kenner, Lafitte, and Timbalier soils formed in thick accumulations of organic material from herbaceous hydrophytic plant remains. The Allemands, Bellpass, and Clovelly soils formed in moderately thick accumulations of organic material from herbaceous hydrophytic plant remains over clayey alluvium.

Climate

Plaquemines Parish has a humid subtropical climate characteristic of areas near the Gulf of Mexico. The warm, moist climate promotes rapid soil formation. Only slight variations in rainfall and temperature occur throughout the parish. The minor climatic differences within the parish are not considered enough to create significant soil differences. The seasonal variations in the air temperature affect the soil temperature within the rooting zone. Because of a relatively high average winter air temperature, the soils in the parish generally have a mean annual temperature in the rooting zone that is more than 72 degrees F. More specific information about the climate of Plaquemines Parish is given in the section "General Nature of the Parish."

Living organisms

Living organisms include plants, bacteria, fungi, animals, and man and are important in the formation of soils. Among the chemical and physical changes they cause are gains in content of plant nutrients and changes in structure and porosity. Plant roots force openings into the soil and help to increase porosity. As plant roots grow, they break up and rearrange the soil particles. Soil nutrients move from within the soil to plant tissues above the surface layer, and when they die, these plant tissues are deposited on the surface of the soil. That organic matter slowly releases the nutrients back into the upper part of the soil. Bacteria and other micro-organisms decompose organic matter into humus compounds that help improve the physical condition of the soil. The native plants and their associated complex communities of bacteria and fungi generally have a significant influence on soil formation in Plaquemines Parish. Animals, such as crawfish and earthworms, also influence soil formation by mixing the soil. When animals die, they too decompose and enrich the soil with organic matter and nutrients. The activities of humans, such as cultivating crops, channel construction, burning, draining, diking, flooding, paving, and land smoothing, affect the soil. Some soils in Plaquemines Parish, such as Harahan and Westwego, have been changed drastically through artificial drainage that de-watered and made firm the formerly semifluid clay layers in those soils.

The soils of the natural levees along streams formed under bottom-land hardwood forest vegetation. Natural levees make up about 8 percent of the land area in the parish. Soils of the Sharkey-Commerce and the Convent-Commerce-Sharkey general soil map units are on natural levees.

Soils of the marsh formed under grass and sedge vegetation, and soils of the swamps formed under woody and herbaceous vegetation *(7, 29)* (fig. 14). The organic layers present in soils in the hardwood swamps and freshwater marshes formed in organic material from freshwater woody and herbaceous hydrophytic plants. Areas of freshwater marshes and former swamps make up about 31 percent of the parish. Soils of the Balize-Larose, Kenner-Allemands, and Harahan-Westwego-Rita general soil map units are in these areas. Areas of the coastal marsh that now are brackish actually formed under freshwater vegetation, but due to subsidence of the land and encroachment of seawater *(16)* the vegetation has changed to more saline tolerant grass and sedge types of vegetation. Vegetation in these areas now typically consists of marshhay cordgrass, coastal waterhyssop, dwarf spikerush, olney bulrush, and saltmarsh bulrush. Examples of soils in the brackish marsh are the Clovelly and Lafitte soils. Brackish marshes make up about 29 percent of Plaquemines Parish. Soils of the Clovelly-Lafitte-Gentilly general soil map unit are in brackish marsh. Areas of the coastal marsh closer to the Gulf coast are under saline marsh-type vegetation. Saltwort, needlegrass rush, smooth cordgrass, and woody glasswort are some of the plants of the saline marsh. The Timbalier soils are in areas of saline marsh. Saline marshes make up about 26 percent of Plaquemines Parish. Soils of the Bellpass-Timbalier and the Scatlake general soil map units are in saline marshes.

Relief

Relief and other physiographic features influence soil formation processes mainly by affecting internal soil drainage, runoff, erosion and deposition, salinity levels, and exposure to the sun and wind.

In Plaquemines Parish, sediment accumulated at a much faster rate than the erosion that took place. This accumulation of sediment has occurred at a faster rate than many of the processes of soil formation. This is evident in the distinct stratification in lower horizons of some soils. Levee construction and other water control measures may have reversed this trend, however, for such soils as the Commerce soils. Slope and rate of runoff are low enough that erosion is not a major problem in the parish.

The land surface of the parish is level or nearly level. The slope is dominantly less than 1 percent, except on a few sandy and loamy ridges where the slope is as much as 3 percent. Relief and the landscape position have influenced formation of the different soils. Characteristically, the slopes are long. They extend from the highest elevation on natural levees along the Mississippi River and bayous or distributary channels to an elevation that is several feet lower in the swamps and marshes.

Differences in the Commerce, Sharkey, and Allemands soils illustrate the influence of relief on the

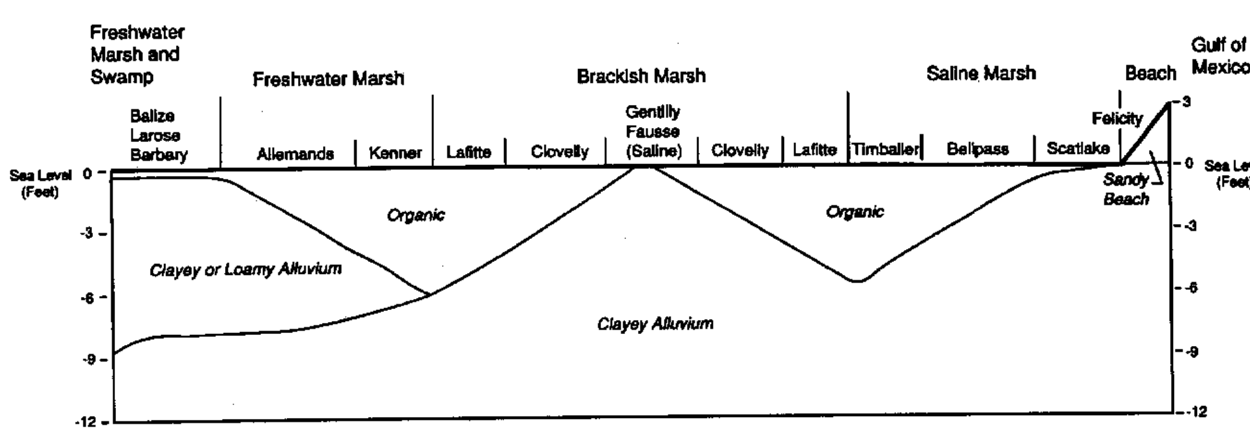


Figure 14.—Relationship of the soils, landscape, parent materials, and marsh types of the Gulf Coastal Marshes in Plaquemines Parish.

soils in the parish. Commerce soils are on the highest elevation, contain the least amount of clay, and have the best natural drainage. Sharkey soils are on the lower parts of the natural levees, have a high content of clay, and are poorly drained. Allemands soils are in the lower positions, are very poorly drained, and are ponded most of the time unless they are artificially drained. Allemands soils have a thick organic surface layer over clayey underlying material. Areas of Allemands soils that are protected by levees and drained now are at elevations as low as 3 feet below sea level because of subsidence. The Rita soils are an example of an area of former marsh that has been drained.

The soils on the lower positions on the landscape receive runoff from those on higher positions, and the soils remain saturated nearer the surface for longer periods. In many areas, suitable outlets do not exist to allow the water to move out of these areas readily. Differences in the content of organic matter in the soils are related to the length of time the soils remain saturated and, consequently, to relief. The content of organic matter generally increases as the length of time the soil remains saturated increases, and at some point, a layer of partially decomposed organic matter will begin to accumulate on the surface. Soils on higher positions on the landscape, such as the Convent and Commerce soils, have better surface runoff, internal drainage, and aeration. This allows for more rapid and complete oxidation of organic matter to take place.

The overall surface elevation in Plaquemines Parish relative to sea level is slowly changing. This is because the soils are on a low-lying, slowly subsiding landmass. Geologic investigations indicate that the overall area is very slowly decreasing in elevation *(7, 16)*. The present elevation of the undrained areas ranges from sea level to a maximum of about 12 feet above sea level. Subsidence of the land mass is attributed in part to the continued accumulation in the Gulf of Mexico of sediments from the Mississippi River and lesser sources. The added weight of this sediment results in a continuous downwarping of the adjoining landmass. This process causes a general lowering of the landmass and a slight increase in the regional gulfward slope. In addition, post-depositional sediment compaction can result in some subsidence, and local deposition of sediment can contribute to similar but more localized changes.

Some possible effects of this natural geologic subsidence are apparent. For example, some soils that were subject only to intermittent flooding are now flooded more frequently and are covered with deeper water for longer periods. Some of the soils on natural levees along distributary channels have subsided to an elevation below sea level and are now covered with water most of the time. As the soils subside, sea water moves landward with each increment of subsidence. Consequently, some soils that were formerly in freshwater marshes are now in brackish or saline marshes. In time, scouring and additional deposition from floodwaters and rising tides may alter former relief and landscape positions in some of the most affected areas. In many areas, natural and accelerated subsidence have lowered the elevation to such an extent that only lakes and ponds exist where land was once visible.

Time

Time influences the kinds of horizons and their degree of development. Long periods are generally required for prominent horizons to form.

In general, the soils of Plaquemines Parish are young, and time has been too short for distinct horizons to develop. Soils, such as Convent, Commerce, and Vacherie on the natural levees of streams, have been influenced by soil-forming processes longest but have developed only faintly differentiated horizons. Horizonation is evident mainly by development of structural aggregates and some illuviation of clay into the subsoil layer. Stratification that was present in the upper parts of the soil when the sediments were first deposited is no longer evident, and organic carbon has become more evenly distributed throughout the subsoil and substratum layers. These soils developed in alluvium that is about 2,000 years old *(22)*.

The youngest soils in the parish have little or no profile development. For example, in Balize and Felicity soils, recent sediments have been deposited to the extent that little organic material has accumulated on the surface, the underlying material still shows evidence of stratification, and no structural aggregates have developed.

Processes of Soil Formation

The processes of soil formation influence the kind and degree of development of soil horizons. Important soil-forming processes are those that result in additions of organic, mineral, and gaseous materials to the soil; losses of these same materials from the soil; translocation of materials from one point to another within the soil; and physical and chemical transformation of mineral and organic material within the soil *(23)*.

Many processes occur simultaneously. Examples in the survey area include accumulation of organic matter, the development of soil structure, and the leaching of bases from some soil horizons. The contribution of a particular process can change with time. Drainage and water control systems, for example, can change the length of time some soils are flooded or saturated with water. Some important processes that have contributed to the formation of the soils in Plaquemines Parish are discussed in the following paragraphs.

Organic matter has accumulated, has partly decomposed, and has been incorporated into all the soils. The organic accumulations range from the humus in mineral horizons of the Commerce and Sharkey soils, to the organic horizons of the Clovelly and Barbary soils in the marshes and swamps. Because most of the organic matter is produced in and above the surface layer, the surface layer generally is higher in content of organic matter than the deeper horizons. Living organisms decompose, incorporate, and mix organic residue into the soil. Some of the more stable products, such as humus, contribute to darker colors and increased water-holding and cation-exchange capacities, and they promote granulation of the soil.

Processes that result in development of soil structure have occurred in most of the mineral soils. Plant roots and other organisms contribute to the rearrangement of soil material into secondary aggregates. The decomposition products of organic residue and the secretions of organisms serve as cementing agents that help stabilize structural aggregates. Alternate wetting and drying, as well as shrinking and swelling, contribute to the development of structural aggregates and are particularly effective in soils that have appreciable amounts of clay. Consequently, soil structure is typically most pronounced in the surface horizon, which contains the most organic matter, and in clayey horizons that alternately undergo wetting and drying.

Most of the soils mapped in the parish have horizons in which reduction of iron and manganese compounds is an important process. Reducing conditions prevail for long periods in poorly aerated horizons. Consequently, the relatively soluble reduced forms of iron and manganese predominate over the less soluble oxidized forms. The reduced compounds of these elements produce the gray colors in the Bg and Cg horizons that are characteristic of many of the soils. In the more soluble reduced form, appreciable amounts of iron and manganese can be removed from the soils or translocated by water from one position to another within the soil. Reduced forms of iron and manganese not removed can be reoxidized upon development of oxidizing conditions in the soil. The presence of gray and yellowish or reddish masses indicates alternating oxidizing and reducing conditions in many of the soils.

Water moving through the soil has leached many soluble components from the upper horizon of some of the mineral soils in the parish. The components include any free carbonates that may have been present initially. The carbonates and other more readily soluble salts have been mostly leached from the soil or moved to lower horizons in the better drained, loamy soils, such as the Commerce soils. In general, the permanently wet soils of the marshes and swamps have rarely been leached.

Landforms and Surface Geology

Joann Mossa, geologist, Louisiana Geological Survey, prepared this section.

The land area in Plaquemines Parish occupies about 985 square miles of the Mississippi River delta plain in southeastern Louisiana. The Mississippi River is the largest river on the North American continent and drains 1.24 million square miles. It flows through the center of Plaquemines Parish and forms a delta at the southern end. The delta has several active and abandoned distributaries in Plaquemines Parish. The major active distributaries include Southwest Pass, South Pass, Pass A Loutre, and Main Pass.

Plaquemines Parish is bordered along most of its perimeter by the Gulf of Mexico. Several large bodies of water, Breton Sound, Barataria Bay, and numerous smaller water bodies including bays, lakes, and bayous, are within the boundaries of the parish. At its southern end, the Mississippi River delta is very irregular and resembles a bird's foot, a shape characteristic of a delta that is building out into deep water. Numerous marshy islands are isolated remnants of former broad areas of marsh. These islands provide evidence of extensive deterioration of the marshes. Sandy barrier shorelines and islands at the seaward edge of the parish and in the Gulf of Mexico have linear or curvilinear forms because of the effects of marine reworking.

Elevations in Plaquemines Parish range from 12 feet on natural levees in the northern part of the parish to below sea level in backswamps and marshes throughout the parish. In places, elevations of swamps and marshes have decreased because of oxidation, de-watering, and subsidence caused by artificial drainage.

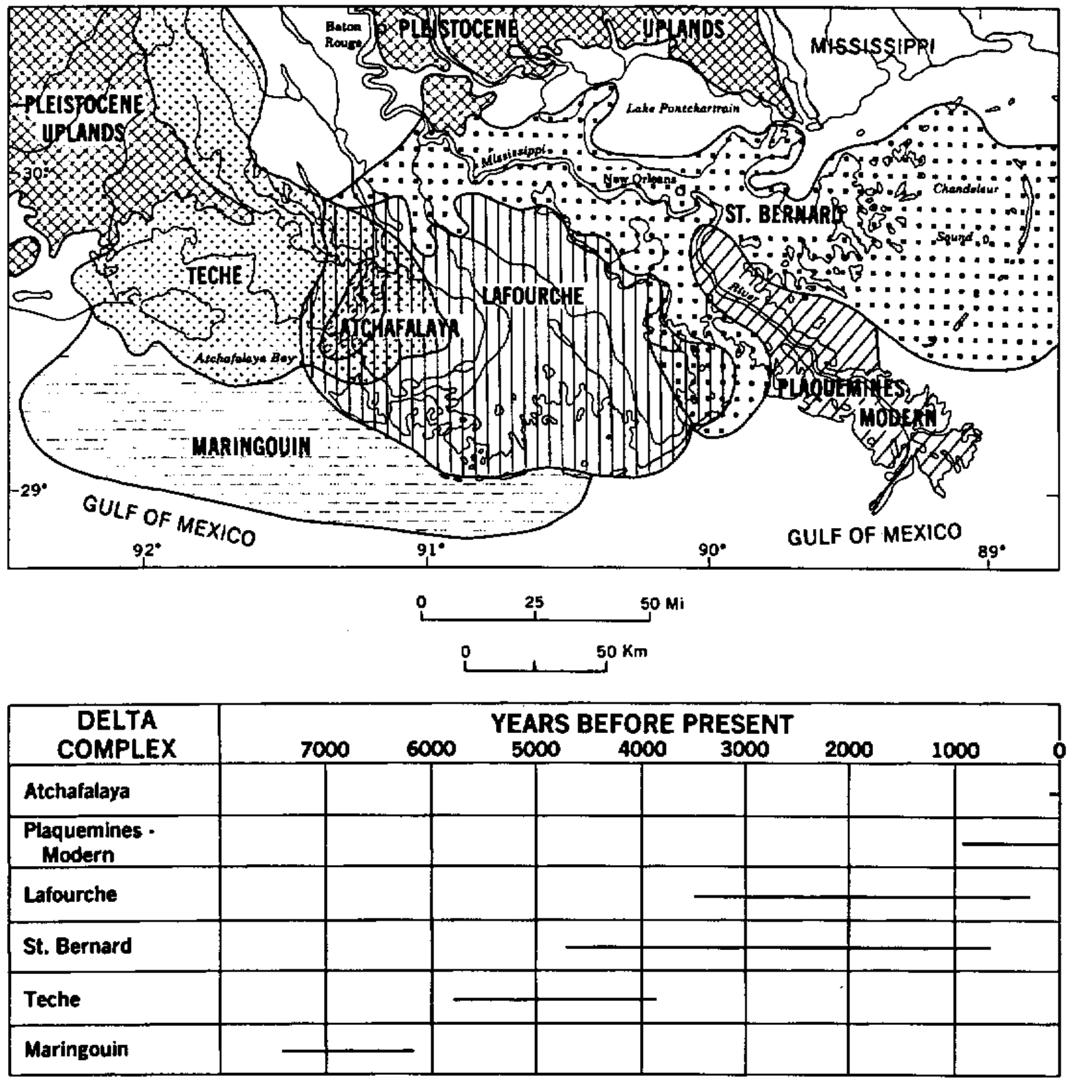


Figure 15.—Generalized geology and delta plain chronology of South Louisiana (modified from Frazier, 1967).

Geologic Development of the Mississippi River Delta Plain

The Mississippi River began constructing deltas about 8,000 years ago when the rate of rise in sea level began to decrease following the latest Pleistocene (Wisconsinian) deglaciation. During the Holocene Epoch, the river shifted its position several times in response to the extension of the delta into the Gulf of Mexico and the resulting decrease in gradient of the river channel. As the gradient decreased, the river sought a new channel with a steeper gradient.

The delta plain consists of six major Holocene delta complexes. Each of the complexes initially experienced a constructive phase and then underwent a destructive phase. Four of these complexes are in various stages of deterioration, and the other two, the Plaquemines-Modern and the Atchafalaya complexes, are actively prograding or outbuilding (fig. 15).

The constructive phase begins when a platform is developed as sediment is dispersed at the mouth of a river and deposited onto the inner continental shelf. The platform is thickest adjacent to the channel or distributary. Fine sand and silt accumulate mainly on natural levees flanking the channels and distributaries, and in crevasse splays that form when levees are breached during floods. Baptiste Collette Bayou is an example of a crevasse splay. In Plaquemines Parish, natural levees have formed along the Mississippi River and its former distributary channels. Areas of natural levees make up about 8 percent of the land in the parish. Natural levees generally are the highest elevations in the parish. Soils of the Sharkey-Commerce and the Convent-Commerce-Sharkey general soil map units are on natural levees. As the natural levees are built, they confine increasingly greater amounts of water until only high floods are capable of overtopping the levees. These natural levees cause the flood plain to become more stabilized, and they allow for distinct backswamp areas to form.

The natural levees afford some protection to the backswamp areas from higher velocity channel flooding, yet slowly moving water can still back-flow into backswamp areas through breaches in the natural levees, and may remain stagnant there for long periods afterwards. This situation facilitates soil building by allowing clays to settle out and organic matter to accumulate more rapidly in the backswamp areas.

When the supply of sediment from floodwater decreases, the rate of subsidence outpaces sediment buildup and the destructive phase of the delta complex is initiated. Land loss is a serious problem in Plaquemines Parish now because of the high rates of relative sea level rise (the combination of subsidence and eustatic sea level rise), the low supply of sediment, and the impact of frequent storms and human actions. Relative sea level rise in Plaquemines Parish averaged about 0.35 inch per year from 1962 to 1982 and ranged from about 0.2 to more than 0.8 inch per year during that period *(20)*. The supply of sediment to the area has diminished, mainly because of the construction of artificial levees along the Mississippi River which direct most of the sediments into the Gulf *(10)*. The rate of land loss in the parish is estimated to be about 14 square miles per year *(9)*. As the sea encroaches, marine processes begin to rework the seaward edge of the abandoned delta complex and concentrate the sand-size sediments into a transgressive barrier shoreline *(12, 18, 19)*. The transgressive barrier shoreline consists of an erosional headland of barrier beaches and marginal spits that are typically flanked by barrier islands. Shell Island and vicinity is an example. When subsidence and erosion increase in the backbarrier region, the barrier shorelines can become disconnected from the headland to form barrier islands. The southern Chandeleur Islands are examples. These island chains can ultimately become submerged and form inner shelf shoals. Shoreline erosion is largely related to the impact of storms and ranges from 15 to 50 feet per year along much of the coast of Plaquemines Parish *(18)*. Barrier shorelines and barrier islands make up about 1 percent of the parish. Soils of the Felicity general soil map unit are on these areas.

Geologic History of Plaquemines Parish

Plaquemines Parish consists of at least two thick, partially overlapping delta complexes, the St. Bernard and the Plaquemines-Modern complexes. They are underlain by Pleistocene strata at a depth of 100 to 700 feet. Depth to Pleistocene surfaces increases toward the modern delta *(11)*. Delta lobes of the St. Bernard Delta complex were initially deposited in shallow water about 4,500 years ago *(8)*. Several lobes were deposited, and periods of progradation and abandonment recurred until about 650 years ago. Deposition of the Plaquemines lobe, which was the early distribution system of the Plaquemines-Modern Delta complex, began about 950 years ago. The Balize Delta lobe, which was the second and present distributary system of the Plaquemines-Modern Delta complex, consists of several sub-deltas that have a much better defined chronology than the earlier complexes *(15)*. The Balize Delta lobe is the only deepwater delta lobe of the Mississippi River, and thus has an unusual bird's-foot morphology.

References

(1) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vols.

(2) American Society for Testing and Materials. 1986. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Beek, Van, project director. 1986. Long-term management and protection of Plaquemines Parish. Coastal Environments, Inc., pp. 2-55.

(4) Broadfoot, Walter M., and R.M. Krinard. 1959. Guide for evaluating sweetgum sites. U.S. Dep. Agric., Forest Serv., South. Forest Exp. Stn. Occas. Pap. 176.

(5) Broadfoot, Walter M. 1960. Field guide for evaluating cottonwood sites. U.S. Dep. Agric., Forest Serv., South. Forest Exp. Stn. Occas. Pap. 178.

(6) Broadfoot, Walter M. 1963. Guide for evaluating water oak sites. U.S. Dep. Agric., Forest Serv., South. Forest Exp. Stn. Res. Pap. SO-1.

(7) Charbreck, Robert H. 1972. Vegetation, water and soil characteristics of Louisiana. La. Agr. Exp. Stn. Bull. 664.

(8) Frazier, D.E. 1967. Recent deltaic deposits of the Mississippi River: Their chronology and development. Trans. Gulf Coast Assoc. Geol. Soc. 17: 287-315.

(9) Gagliano, S.M., K.J. Meyer-Arendt, and K.M. Wicker. 1981. Land loss in the Mississippi River deltaic plain. Trans. Gulf Coast Assoc. Geol. Soc. 31: 295-300.

(10) Keown, M.P., E.A. Dardeau, Jr., and E.M. Causey. 1986. Historic trends in the sediment flow regime of the Mississippi River. Water Resources Res. 22: 1555-1564.

(11) Kolb, C.R. 1962. Distribution and engineering significance of sediments bordering the Mississippi from Donaldsonville to the gulf. Ph.D. diss., La. State Univ.

(12) Kwon, H.J. 1969. Barrier islands of the northern Gulf of Mexico coast. Coastal Studies Series, no. 25, La. State Univ.

(13) Meyers, J. Ben, Sr. 1975. Railroads of the delta. Plaquemines Parish Library, Belle Chasse, La., pp. 20-23.

(14) Meyers, J. Ben, Sr. 1981. Plaquemines: The empire parish, pp. 76-84.

(15) Morgan, D.J. 1977. The Mississippi River delta, legal-geomorphic evaluation of historic shoreline changes: Geoscience and Man. Sch. Geosci. La. State Univ., vol. 16.

(16) Morgan, James P. 1972. Impact of subsidence and erosion on Louisiana coastal marshes and estuaries. Dep. Geol. La. State Univ.

(17) Palmisano, A.W., and Robert H. Charbreck. 1972. The relationship of plant communities and soils of the Louisiana coastal marshes. Proc. 13th annual meeting, La. Assoc. Agron.

(18) Penland, S.P., and R. Boyd. 1981. Shoreline changes on the Louisiana barrier coast. Oceans '81, MTS/IEEE, pp. 209-219.

(19) Penland, S.P., R. Boyd, D. Nummedal, and H.H. Roberts. 1981. Deltaic barrier development on the Louisiana coast. Suppl. to Trans. Gulf Coast Assoc. Geol. Soc. 31: 471-476.

(20) Ramsey, K.E., and T.F. Moslow. 1987. A numerical analysis of subsidence and sea level rise in Louisiana. Coastal Sediments '87, ASCE, pp. 1673-1688.

(21) Rollo, J.R. 1962. Ground water in Plaquemines Parish, Louisiana. U.S. Dep. Interior, Geol. Surv., Water Resources Div., pp. 1-4.

(22) Saucier, Roger T. 1974. Quaternary geology of the Lower Mississippi Valley. Arkansas Archaeol. Surv., Res. Ser. 6, Univ. Arkansas.

(23) Simonson, Roy W. 1959. Outline of a generalized theory of soil genesis. Soil Sci. Soc. Am. Proc. 23: 152-156.

(24) Templett, Dr. Paul. 1982. St. Bernard Parish coastal management program document. Coastal Environments, Inc., Baton Rouge, La.

(25) The Federal Writers Program of the Works Progress Administration of the State of Louisiana. 1941. Louisiana—A guide to the state, pp. 487-493.

(26) United States Department of Agriculture, Forest Service. 1980. Louisiana mid-cycle survey shows change in forest resource trends. C.E. Thomas and C.V. Bylin, South. Forest Exp. Stn.

(27) United States Department of Agriculture, Soil Conservation Service. 1951 (being revised). Soil survey manual. U.S. Dep. Agric. Handb. 18. (Supplements replacing pp. 173-188 issued May 1962.)

(28) United States Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436.

(29) United States Department of Agriculture. Soil Conservation Service. 1976. Gulf coast wetlands handbook. Soil Conserv. Serv. La.

(30) United States Department of Agriculture, Soil Conservation Service. 1978. Predicting rainfall erosion losses—A guide to conservation planning. U.S. Dep. Agric. Handb. 537.

(31) United States Department of Agriculture, Soil Conservation Service. 1985. Site index and yield of second growth baldcypress. Soil Conserv. Serv. Tech. Note No. 5.

(32) United States Department of Interior, Geological Survey. 1966. Ground water resources of the Greater New Orleans area. J.R. Rollo, La. Dep. Pub. Works.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

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

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess sulphur (in tables). Excessive amount of sulphur in the soil. The sulphur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A, O, or E horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

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

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

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

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

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

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

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

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

Low strength. The soil is not strong enough to support loads.

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

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

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

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

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR $^6/_4$ is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

N-value. The relationship between the percentage of water under field conditions and the percentages of inorganic clay and of humus.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Very slow	less than .06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

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

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

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

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

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

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

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

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

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

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

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

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

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

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

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

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

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell (in tables). 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. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

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 water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Water leveling. A method of smoothing or leveling fields that will be planted to rice. The fields are flooded to a shallow depth by irrigation water; then the soil surface is scraped and stirred up to create a soil-water suspension. As the soil particles settle out of the suspension, the land surface is smoothed.

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

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1961-90 at Boothville, Louisiana)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	60.7	45.4	53.0	77	24	172	4.88	2.31	7.09	7	0.0
February----	62.8	47.8	55.3	78	31	188	4.66	2.08	6.87	6	0.0
March-------	69.3	54.2	61.8	81	35	373	5.00	2.63	7.09	5	0.0
April-------	76.2	61.5	68.9	86	46	565	3.17	0.90	5.00	3	0.0
May---------	82.1	68.4	75.2	90	58	783	4.03	1.78	5.95	4	0.0
June--------	87.7	74.0	80.8	93	64	925	4.05	1.65	6.07	5	0.0
July--------	89.2	75.6	82.4	95	69	1004	6.38	3.41	9.00	9	0.0
August------	88.8	75.6	82.2	95	69	992	6.91	4.24	9.31	10	0.0
September---	85.7	73.3	79.5	93	60	878	6.07	3.51	8.36	7	0.0
October-----	78.6	65.3	72.0	89	50	681	3.36	1.42	5.32	3	0.0
November----	70.9	57.1	64.0	84	39	424	4.23	1.66	6.39	5	0.0
December----	64.8	49.9	57.3	80	29	263	5.42	2.53	7.91	6	0.0
Yearly:											
Average---	76.4	62.3	69.4	---	---	---	---	---	---	---	---
Extreme---	97	15	---	96	23	---	---	---	---	---	---
Total-----	---	---	---	---	---	7248	58.17	41.18	64.22	70	0.0

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F)

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1961-90 at Boothville, Louisiana)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	January 14	February 3	February 23
2 years in 10 later than--	January 2	January 21	February 14
5 years in 10 later than--	-----------	------------	January 26
First freezing temperature in fall:			
1 year in 10 earlier than--	January 10	January 1	December 21
2 years in 10 earlier than--	January 26	January 14	December 27
5 years in 10 earlier than--	-----------	-----------	January 7

TABLE 3.--GROWING SEASON

(Recorded in the period 1961-90 at Boothville, Louisiana)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	365	349	306
8 years in 10	365	365	321
5 years in 10	365	365	360
2 years in 10	365	365	365
1 year in 10	365	365	365

TABLE 4.--SUITABILITY AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Percent of area	Cultivated crops	Pasture	Woodland	Urban uses	Intensive recreation areas
	Pct					
1. Sharkey-Commerce	4.0	Moderately well suited: wetness, poor tilth.	Well suited	Well suited	Poorly suited: wetness, flooding, moderately slow and very slow permeability, shrink-swell, low strength.	Poorly suited: wetness, flooding, moderately slow and very slow permeability, clayey surface layer.
2. Convent-Commerce-Sharkey	4.0	Not suited: flooding.	Poorly suited: flooding, wetness.	Moderately well suited: flooding, wetness, clayey surface layer.	Not suited: flooding.	Not suited: flooding.
3. Balize-Larose	22.0	Not suited: flooding, ponding.	Not suited: flooding, ponding, boggy.	Not suited: flooding, ponding, boggy.	Not suited: flooding, ponding, low strength, subsidence.	Not suited: flooding, ponding, low strength, subsidence.
4. Kenner-Allemands	2.5	Not suited: flooding, ponding.	Not suited: flooding, ponding, boggy.	Not suited: flooding, ponding, boggy.	Not suited: flooding, ponding, low strength, subsidence.	Not suited: flooding, ponding, low strength, subsidence.
5. Clovelly-Lafitte-Gentilly	29.0	Not suited: flooding, ponding, salinity.	Not suited: flooding, ponding, salinity, boggy.	Not suited: flooding, ponding, salinity, boggy.	Not suited: flooding, ponding, low strength, subsidence.	Not suited: flooding, ponding, low strength, subsidence.
6. Bellpass-Timbalier	18.5	Not suited: flooding, ponding, salinity.	Not suited: flooding, ponding, salinity, boggy.	Not suited: flooding, ponding, salinity, boggy.	Not suited: flooding, ponding, low strength, subsidence.	Not suited: flooding, ponding, low strength, subsidence.
7. Scatlake	7.5	Not suited: flooding, ponding, salinity.	Not suited: flooding, ponding, salinity, boggy.	Not suited: flooding, ponding, salinity, boggy.	Not suited: flooding, ponding, low strength, subsidence.	Not suited: flooding, ponding, low strength, subsidence.
8. Harahan-Westwego-Rita	6.0	Moderately well suited: wetness, poor tilth, buried stumps and logs, subsidence.	Moderately well suited: wetness, subsidence, buried stumps and logs.	Moderately well suited: wetness, clayey surface layer.	Poorly suited: wetness, flooding, subsidence, low strength, shrink-well, very slow permeability, buried stumps and logs.	Poorly suited: wetness, flooding, subsidence, low strength, buried stumps and logs.

TABLE 4.--SUITABILITY AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP--Continued

Map unit	Percent of area	Cultivated crops	Pasture	Woodland	Urban uses	Intensive recreation areas
	Pct					
9. Aquents------------	5.5	Not suited: flooding, wetness, poor tilth, subsidence, salinity.	Poorly suited: wetness, subsidence, salinity.	Not suited: flooding, wetness, salinity.	Not suited: flooding, wetness, salinity, low strength, subsidence.	Not suited: flooding, wetness, salinity, low strength, subsidence.
10. Felicity-----------	1.0	Not suited: flooding, salinity.	Not suited: flooding, salinity.	Not suited: flooding, salinity.	Not suited: flooding, wetness, salinity, seepage.	Not suited: flooding, salinity.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AD	Allemands muck	4,405	0.5
Ae	Allemands muck, drained	605	*
AN	Aquents, dredged	495	*
AT	Aquents, dredged, frequently flooded	33,420	3.7
BA	Balize and Larose soils	136,190	15.1
BB	Barbary muck	1,880	0.2
BE	Bellpass muck	62,370	6.9
CE	Clovelly muck	97,850	10.9
Cm	Commerce silt loam	3,615	0.4
Co	Commerce silty clay loam	8,160	0.9
Ct	Convent silt loam	760	0.1
CV	Convent, Commerce, and Sharkey soils, frequently flooded	20,680	2.3
Dp	Dumps	175	*
FA	Fausse muck, saline	3,510	0.4
FE	Felicity loamy fine sand, frequently flooded	3,660	0.4
GE	Gentilly muck	19,565	2.2
Ha	Harahan clay	15,470	1.7
KE	Kenner muck	9,160	1.0
LF	Lafitte muck	73,315	8.1
Ra	Rita mucky clay	9,580	1.1
SC	Scatlake muck	5,300	0.6
Sh	Sharkey silty clay loam	1,720	0.2
Sk	Sharkey clay	13,355	1.5
TM	Timbalier muck	53,690	6.0
Ub	Urban land	905	0.1
Va	Vacherie silt loam	510	0.1
Ww	Westwego clay	9,815	1.1
	Large water areas	271,657	30.1
	Small water areas	40,000	4.4
	Total	901,817	100.0

* Less than 0.1 percent.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Corn	Soybeans	Common bermudagrass	Improved bermudagrass	Tall fescue	Dallisgrass
		Bu	Bu	AUM*	AUM*	AUM*	AUM*
AD------------------------- Allemands	VIIIw	---	---	---	---	---	---
Ae------------------------- Allemands	IVw	---	---	11.5	---	10.0	9.5
AN, AT** Aquents							
BA**----------------------- Balize and Larose	VIIIw	---	---	---	---	---	---
BB------------------------- Barbary	VIIw	---	---	---	---	---	---
BE------------------------- Bellpass	VIIIw	---	---	---	---	---	---
CE------------------------- Clovelly	VIIIw	---	---	---	---	---	---
Cm------------------------- Commerce	IIw	95	40	9.5	15.5	10.0	9.0
Co------------------------- Commerce	IIw	85	40	9.0	15.0	9.5	8.5
Ct------------------------- Convent	IIw	95	40	9.5	15.5	10.0	9.0
CV**----------------------- Convent, Commerce, and Sharkey	Vw	---	---	5.0	---	---	---
Dp** Dumps							
FA------------------------- Fausse	VIIw	---	---	---	---	---	---
FE------------------------- Felicity	VIIw	---	---	---	---	---	---
GE------------------------- Gentilly	VIIw	---	---	---	---	---	---
Ha------------------------- Harahan	IIIw	---	30	10.0	12.0	10.5	9.0
KE------------------------- Kenner	VIIIw	---	---	---	---	---	---
LF------------------------- Lafitte	VIIIw	---	---	---	---	---	---
Ra------------------------- Rita	IIIw	---	30	8.5	7.5	9.5	10.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Common bermudagrass	Improved bermudagrass	Tall fescue	Dallisgrass
		Bu	Bu	AUM*	AUM*	AUM*	AUM*
SC------------------------- Scatlake	VIIIw	---	---	---	---	---	---
Sh, Sk--------------------- Sharkey	IIIw	---	35	8.0	10.0	9.0	10.5
TM------------------------- Timbalier	VIIIw	---	---	---	---	---	---
Ub** Urban land							
Va------------------------- Vacherie	IIw	85	40	9.5	15.0	9.5	9.0
Ww------------------------- Westwego	IVw	---	25	8.5	10.3	9.0	10.0

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

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Map symbol and soil name	Ordi- nation symbol	Management concerns: Erosion hazard	Management concerns: Equip- ment limita- tion	Management concerns: Seedling mortal- ity	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Produc- tivity class*	Trees to plant
BB: Barbary	4W	Slight	Severe	Severe	Baldcypress	80	4	Baldcypress.
					Water tupelo	60	6	
					Black willow	---	--	
Cm, Co: Commerce	13W	Slight	Moderate	Slight	Eastern cottonwood	120	13	Eastern cottonwood, American sycamore.
					Green ash	120	13	
					Nuttall oak	90	--	
					Water oak	110	8	
					Pecan	---	--	
					American sycamore	---	--	
					Willow oak	---	--	
Ct: Convent	13W	Slight	Moderate	Slight	Eastern cottonwood	120	13	Eastern cottonwood, American sycamore.
					Green ash	80	4	
					Sweetgum	110	12	
					American sycamore	---	--	
					Nuttall oak	90	--	
					Water oak	---	--	
					Pecan	---	--	
CV**:								
Convent	10W	Slight	Moderate	Moderate	Eastern cottonwood	105	10	Eastern cottonwood, American sycamore.
					Nuttall oak	---	--	
					Overcup oak	---	--	
					Water hickory	---	--	
					Sugarberry	---	--	
Commerce	12W	Slight	Moderate	Severe	Eastern cottonwood	113	12	Eastern cottonwood, American sycamore.
					Nuttall oak	---	--	
					Overcup oak	---	--	
					Water hickory	---	--	
					Sugarberry	---	--	
Sharkey	6W	Slight	Severe	Severe	Green ash	98	6	Baldcypress.
					Water hickory	---	--	
					Overcup oak	---	--	
					Baldcypress	---	--	
					Black willow	---	--	
Ha: Harahan	5W	Slight	Severe	Severe	Nuttall oak	75	5	Green ash, Nuttall oak, American sycamore.
Sh, Sk: Sharkey	7W	Slight	Severe	Moderate	Sweetgum	90	7	American sycamore, sweetgum.
					Willow oak	100	7	
					Water oak	90	6	
					Nuttall oak	90	--	
					Sugarberry	---	--	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
Va----------------- Vacherie	13W	Slight	Moderate	Slight	Eastern cottonwood---	120	13	Eastern cottonwood, American sycamore.
					Sweetgum-------------	110	12	
					Green ash------------	---	--	
					American sycamore----	---	--	
					Water oak------------	---	--	
					Pecan----------------	---	--	

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AD-------------------- Allemands	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess humus, percs slowly.	Severe: flooding, excess humus, ponding.	Severe: ponding, excess humus.	Severe: flooding, ponding, excess humus.
Ae-------------------- Allemands	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess humus.	Severe: excess humus, wetness.	Severe: wetness, excess humus.	Severe: wetness.
AN, AT* Aquents					
BA*:					
Balize---------------	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Larose---------------	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess humus, percs slowly.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: flooding, ponding, excess humus.
BB-------------------- Barbary	Severe: flooding, ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
BE-------------------- Bellpass	Severe: ponding, percs slowly, flooding.	Severe: ponding, excess humus, excess salt.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, excess humus, excess salt.
CE-------------------- Clovelly	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess humus, percs slowly.	Severe: flooding, excess humus, ponding.	Severe: ponding, excess humus.	Severe: flooding, ponding, excess humus.
Cm, Co---------------- Commerce	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Ct-------------------- Convent	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
CV*:					
Convent--------------	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.
Commerce-------------	Severe: flooding.	Moderate: flooding, wetness, percs slowly.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CV*:					
Sharkey	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Dp* Dumps					
FA Fausse	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess salt.	Severe: ponding, flooding.	Severe: ponding.	Severe: excess salt, ponding, flooding.
FE Felicity	Severe: flooding, too sandy, excess salt.	Severe: too sandy, excess salt.	Severe: too sandy, excess salt, flooding.	Severe: too sandy.	Severe: excess salt, flooding, droughty.
GE Gentilly	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess humus, percs slowly.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
Ha Harahan	Severe: flooding, wetness, percs slowly.	Severe: too clayey, excess humus, percs slowly.	Severe: too clayey, excess humus, wetness.	Severe: too clayey, excess humus.	Severe: too clayey.
KE Kenner	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess humus, percs slowly.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: flooding, ponding, excess humus.
LF Lafitte	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus, wetness.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.
Ra Rita	Severe: flooding, wetness, percs slowly.	Severe: percs slowly, too clayey.	Severe: wetness, percs slowly, too clayey.	Severe: too clayey.	Severe: too clayey.
SC Scatlake	Severe: flooding, ponding, percs slowly.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: excess salt, ponding, flooding.
Sh Sharkey	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Sk Sharkey	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
TM-------------------- Timbalier	Severe: ponding, excess humus, flooding.	Severe: ponding, excess humus, excess salt.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: excess salt, ponding, flooding.
Ub* Urban land					
Va-------------------- Vacherie	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, droughty.
Ww-------------------- Westwego	Severe: flooding, wetness, percs slowly.	Severe: too clayey, percs slowly, excess humus.	Severe: wetness, too clayey, excess humus.	Severe: too clayey, excess humus.	Severe: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--NATIVE PLANTS ON SELECTED SOILS IN MARSHES

Soil series	Type of marsh	Scientific name	Common name
Bellpass	Saline	Avicennia nitida	Black mangrove
Scatlake		Batis maritima	Maritime saltwort
Timbalier		Borrichia frutescens	Bushy sea-oxeye
		Croton punctatus	Gulf croton
		Distichlis spicata	*Seashore saltgrass
		Ipomocea stolonifera	Beach morningglory
		Iva frutescens	Bigleaf sumpweed
		Juncus roemerianus	*Needlegrass rush
		Salicornia virginica	*Woody glasswort
		Spartina alterniflora	*Smooth cordgrass
		Spartina patens	Marshhay cordgrass
Clovelly	Brackish	Aster tenuifolius	Saline aster
Gentilly		Bacopa monnieri	Coastal waterhyssop
Lafitte		Cuscuta indecora	Showy dodder
		Cyperus odoratus	Fragrant flatsedge
		Echinochloa walteri	Coast cockspur
		Eleocharis parvula	*Dwarf spikesedge
		Eleocharis sp.	Spikesedge
		Heliotropium curassavicum	Salt heliotrope
		Hibiscus lasiocarpos	Wooly rosemallow
		Ipomoea sagittata	*Marsh morningglory
		Kosteletzkya virginica	Virginia saltmarsh mallow
		Myriophyllum spicatum	Eurasian watermilfoil
		Panicum amarulum	Shoredune panicum
		Paspalum vaginatum	Seashore paspalum
		Phragmites communis	Common reed
		Pluchea camphorata	Camphor pluchea
		Ruppia maritima	*Widgeongrass
		Scirpus olneyi	*Olney bulrush
		Scripus robustus	*Saltmarsh bulrush
		Sesbania exaltata	Hemp sesbania
		Spartina cynosuroides	Big cordgrass
		Spartina patens	*Marshhay cordgrass
		Vigna repens	Hairypod cowpea
Allemands	Freshwater	Acer drummondii	Drummond maple
Balize		Alternanthera philoxeroides	*Alligatorweed
Kenner		Baccharis halimifolia	Eastern baccharis
Larose		Bacopa caroliniana	Carolina waterhyssop
		Carex sp.	Sedge
		Cephalanthus occidentalis	Common buttonbush
		Cladium jamaicense	Jamaica sawgrass
		Colocasia antiquorum	Elephant's ear
		Cyperus iria	Ricefield flatsedge
		Daubentonia texana	Rattlebox
		Decodon verticillatus	Swamp loosestrife
		Dryopteris thelypteris	Marshfern
		Echinochloa crusgalli	Barnyardgrass
		Eichhornia crassipes	*Water hyacinth
		Hydrocotyle ranunculoides	*Floating pennywort
		Hypericum virginicum	Virginia St. Johnswort
		Hyptis alata	Bushmint
		Iva annua	Seacoast sumpweed
		Juncus effusus	*Common rush
		Lemna minor	Common duckweed
		Magnolia virginiana	Sweetbay
		Myrica cerifera	Southern waxmyrtle
		Nymphaea mexicana	Yellow waterlily

See footnote at end of table.

TABLE 9.--NATIVE PLANTS ON SELECTED SOILS IN MARSHES--Continued

Soil series	Type of marsh	Scientific name	Common name
	Freshwater	Nymphaea odorata	American waterlily
		Osmunda regalis	Royal fern
		Panicum hemitomon	*Maidencane
		Panicum repens	Broadleaf panicum
		Panicum virgatum	Dogtooth grass
		Paspalum fluitans	Switchgrass
		Paspalum vaginatum	Water paspalum
		Bragmites communis	Jointgrass
		Polygonum hydropiperoides	Common reed
		Pontederia cordata	*Swamp smartweed
		Sabal louisiana	*Pickerelweed
		Sacciolepis striata	Louisiana palmetto
		Sagittaria falcata	American cupscale
		Sagittaria latfolia	*Bulltongue
		Sagittaria sp.	Duckpotato
		Sagittaria platyphylla	Arrowhead
		Salix nigra	Delta duckpotato
		Saururus cernuus	Black willow
		Scirpus californicus	*Lizards tail
		Scirpus deltarum	California bulrush
		Scirpus validus	Delta threesquare
		Sesbania exaltata	Softstem bulrush
		Setaria geniculata	Hemp sesbania
		Setaria magna	Knotroot bristlegrass
		Typha sp.	Giant bristlegrass
		Zizaniopsis miliacea	*Cattail
			*Giant cutgrass

* Most common plants in each type of marsh.

TABLE 10.--WILDLIFE HABITAT

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

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life
AD------------------ Allemands	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Very poor.	Very poor.	Very poor.	Good.
Ae------------------ Allemands	Poor	Fair	Fair	Fair	Fair	Good	Very poor.	Fair	Fair	Good.
AN, AT* Aquents										
BA*:										
Balize-------------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Larose-------------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
BB------------------ Barbary	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Fair.
BE------------------ Bellpass	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
CE------------------ Clovelly	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Cm, Co-------------- Commerce	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ct------------------ Convent	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CV*:										
Convent------------	Poor	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair.
Commerce-----------	Poor	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair.
Sharkey------------	Poor	Poor	Fair	Good	Poor	Fair	Fair	Poor	Fair	Fair.
Dp* Dumps										
FA------------------ Fausse	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Fair	Good	Poor	Poor	Good.
FE------------------ Felicity	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
GE------------------ Gentilly	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Fair.
Ha------------------ Harahan	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
KE------------------ Kenner	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Very poor.	Very poor.	Very poor.	Good.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
LF: Lafitte	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Very poor.	Very poor.	Very poor.	Good.
Ra: Rita	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
SC: Scatlake	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Sh, Sk: Sharkey	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
TM: Timbalier	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Ub*: Urban land										
Va: Vacherie	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ww: Westwego	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AD----------------- Allemands	Severe: excess humus, ponding.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, excess humus.
Ae----------------- Allemands	Severe: excess humus, wetness.	Severe: flooding, subsides, wetness.	Severe: flooding, subsides, wetness.	Severe: wetness, subsides.	Severe: wetness.
AN, AT* Aquents					
BA*:					
Balize-----------	Severe: ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
Larose-----------	Severe: excess humus, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: flooding, ponding, excess humus.
BB----------------- Barbary	Severe: excess humus, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding.	Severe: ponding, flooding.
BE----------------- Bellpass	Severe: excess humus, ponding.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, subsides.	Severe: flooding, subsides, ponding.	Severe: ponding, excess humus, excess salt.
CE----------------- Clovelly	Severe: excess humus, ponding.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, excess humus.
Cm, Co------------- Commerce	Severe: wetness.	Moderate: wetness, shrink-swell.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: wetness.
Ct----------------- Convent	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
CV*:					
Convent-----------	Severe: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Commerce----------	Severe: wetness.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CV*:					
Sharkey	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Dp* Dumps					
FA Fausse	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding.	Severe: excess salt, ponding, flooding.
FE Felicity	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: excess salt, flooding, droughty.
GE Gentilly	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding, excess humus.
Ha Harahan	Severe: excess humus, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
KE Kenner	Severe: excess humus, ponding.	Severe: flooding, low strength, ponding.	Severe: flooding, low strength, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding, excess humus.
LF Lafitte	Severe: excess humus, ponding.	Severe: flooding, ponding, subsides.	Severe: flooding, ponding, subsides.	Severe: subsides, ponding, flooding.	Severe: excess humus, ponding, flooding.
Ra Rita	Severe: cutbanks cave, wetness, too clayey.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
SC Scatlake	Severe: excess humus, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: excess salt, ponding, flooding.
Sh Sharkey	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Sk Sharkey	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
TM---------------- Timbalier	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: ponding, flooding.	Severe: excess salt, ponding, flooding.
Ub* Urban land					
Va---------------- Vacherie	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness, droughty.
Ww---------------- Westwego	Severe: excess humus, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell.	Severe: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AD------------------ Allemands	Severe: flooding, ponding, percs slowly.	Severe: flooding, seepage, excess humus.	Severe: flooding, ponding, excess humus.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
Ae------------------ Allemands	Severe: percs slowly, wetness.	Severe: seepage, excess humus.	Severe: excess humus, wetness.	Severe: seepage, wetness.	Poor: excess humus, wetness.
AN, AT* Aquents					
BA*:					
Balize-------------	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: hard to pack, ponding.
Larose-------------	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding, excess humus.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, ponding, hard to pack.
BB------------------ Barbary	Severe: flooding, ponding, percs slowly.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
BE------------------ Bellpass	Severe: flooding, ponding, percs slowly.	Severe: ponding, seepage, excess humus.	Severe: ponding, too clayey, excess humus.	Severe: flooding, seepage, ponding.	Poor: too clayey, ponding, excess humus.
CE------------------ Clovelly	Severe: flooding, ponding, percs slowly.	Severe: flooding, seepage, excess humus.	Severe: ponding, flooding, excess humus.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
Cm, Co-------------- Commerce	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Ct------------------ Convent	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
CV*:					
Convent------------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Commerce-----------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CV*:					
Sharkey	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Dp* Dumps					
FA Fausse	Severe: flooding, ponding, percs slowly.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
FE Felicity	Severe: flooding, poor filter, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness, seepage.	Poor: seepage.
GE Gentilly	Severe: flooding, ponding, percs slowly.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
Ha Harahan	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey, excess humus.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
KE Kenner	Severe: flooding, percs slowly.	Severe: flooding, seepage, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
LF Lafitte	Severe: flooding, ponding, subsides.	Severe: seepage, flooding, excess humus.	Severe: flooding, ponding, seepage.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
Ra Rita	Severe: wetness, percs slowly.	Severe: excess humus, seepage.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: wetness, too clayey, hard to pack.
SC Scatlake	Severe: flooding, ponding, percs slowly.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
Sh, Sk Sharkey	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
TM Timbalier	Severe: flooding, ponding, poor filter.	Severe: flooding, seepage, excess humus.	Severe: ponding, excess humus, flooding.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ub* Urban land					
Va----------------- Vacherie	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Ww----------------- Westwego	Severe: wetness, percs slowly.	Severe: flooding, seepage, excess humus.	Severe: wetness, too clayey, excess humus.	Severe: seepage, wetness.	Poor: wetness, too clayey, hard to pack.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Topsoil
AD: Allemands	Poor: wetness.	Poor: excess humus, wetness.
Ae: Allemands	Poor: thin layer, wetness.	Poor: excess humus, wetness.
AN, AT*: Aquents		
BA*:		
Balize	Poor: low strength, wetness.	Poor: wetness.
Larose	Poor: low strength, wetness.	Poor: excess humus, wetness.
BB: Barbary	Poor: low strength, wetness, shrink-swell.	Poor: too clayey, wetness.
BE: Bellpass	Poor: low strength, wetness, shrink-swell.	Poor: excess humus, wetness, excess salt.
CE: Clovelly	Poor: wetness.	Poor: excess humus, wetness.
Cm, Co: Commerce	Poor: low strength.	Fair: too clayey, thin layer.
Ct: Convent	Fair: wetness.	Good.
CV*:		
Convent	Fair: wetness.	Good.
Commerce	Poor: low strength.	Fair: too clayey, thin layer.
CV*:		
Sharkey	Poor: low strength, wetness shrink-swell.	Poor: wetness.
Dp*: Dumps		
FA: Fausse	Poor: low strength, wetness shrink-swell.	Poor: too clayey, excess salt, wetness.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Topsoil
FE: Felicity	Fair: wetness.	Poor: excess salt.
GE: Gentilly	Poor: low strength, wetness, shrink-swell.	Poor: excess humus, wetness.
Ha: Harahan	Poor: low strength, shrink-swell.	Poor: too clayey.
KE: Kenner	Poor: wetness.	Poor: excess humus, wetness.
LF: Lafitte	Poor: excess humus, wetness	Poor: excess humus, wetness.
Ra: Rita	Fair: shrink-swell, wetness	Poor: too clayey.
SC: Scatlake	Poor: low strength, wetness, shrink-swell.	Poor: excess humus, excess salt, wetness.
Sh: Sharkey	Poor: low strength, wetness, shrink-swell.	Poor: wetness.
Sk: Sharkey	Poor: low strength, wetness, shrink-swell.	Poor: too clayey, wetness.
TM: Timbalier	Poor: low strength, wetness.	Poor: excess humus, excess salt, wetness.
Ub*: Urban land		
Va: Vacherie	Poor: shrink-swell, low strength.	Fair: thin layer.
Ww: Westwego	Poor: low strength.	Poor: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for--		Features affecting--	
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation
AD: Allemands	Severe: excess humus, ponding.	Slight	Flooding, percs slowly, ponding.	Flooding, ponding, percs slowly.
Ae: Allemands	Severe: excess humus, wetness.	Severe: slow refill.	Percs slowly, subsides.	Percs slowly, wetness.
AN, AT*: Aquents				
BA*:				
Balize	Severe: piping, ponding.	Moderate: slow refill.	Ponding, flooding, subsides.	Ponding, flooding.
Larose	Severe: excess humus, hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, percs slowly, flooding.
BB: Barbary	Severe: excess humus, hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, percs slowly.
BE: Bellpass	Severe: ponding, excess humus, hard to pack.	Severe: salty water.	Ponding, percs slowly, subsides.	Flooding, percs slowly, excess salt.
CE: Clovelly	Severe: ponding, excess humus.	Slight	Flooding, percs slowly, subsides.	Flooding, ponding, percs slowly.
Cm, Co: Commerce	Severe: thin layer, wetness.	Severe: slow refill.	Favorable	Wetness, erodes easily.
Ct: Convent	Severe: piping, wetness.	Moderate: slow refill.	Favorable	Wetness, erodes easily.
CV*:				
Convent	Severe: piping, wetness.	Moderate: slow refill.	Flooding	Wetness, erodes easily, flooding.
Commerce	Severe: thin layer, wetness.	Severe: slow refill.	Flooding	Wetness, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--	
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation
CV*:				
Sharkey	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly.
Dp* Dumps				
FA Fausse	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, percs slowly.
FE Felicity	Severe: seepage.	Severe: salty water, cutbanks cave.	Flooding, cutbanks cave, excess salt.	Wetness, fast intake, droughty.
GE Gentilly	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, percs slowly, flooding.
Ha Harahan	Severe: excess humus, hard to pack, wetness.	Severe: slow refill.	Percs slowly, subsides.	Wetness, slow intake, percs slowly.
KE Kenner	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Flooding, ponding, percs slowly.
LF Lafitte	Severe: excess humus, ponding.	Slight	Ponding, flooding, subsides.	Ponding, flooding, excess salt.
Ra Rita	Severe: wetness, hard to pack.	Severe: slow refill, cutbanks cave.	Percs slowly, subsides.	Wetness, fast intake.
SC Scatlake	Severe: excess humus, hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, percs slowly.
Sh Sharkey	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.
Sk Sharkey	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, slow intake, percs slowly.
TM Timbalier	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, flooding.	Ponding, flooding, excess salt.
Ub* Urban land				
Va Vacherie	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly, droughty.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--	
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation
Ww---------------- Westwego	Severe: wetness, hard to pack, excess humus.	Severe: slow refill.	Subsides, percs slowly.	Wetness, slow intake, percs slowly.

See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than. Absence of an entry indicates that data were not estimated. Some soils may have Unified classification and USDA textures in addition to those shown. In general, the dominant classifications and textures are shown)

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In								Pct	
AD: Allemands	0-14	Muck	PT	A-8	---	---	---	---	---	---
	14-36	Muck	PT	A-8	---	---	---	---	---	---
	36-70	Clay, mucky clay	MH, OH	A-7-5	100	100	95-100	80-100	65-90	30-50
Ae: Allemands	0-14	Muck	PT	A-8	---	---	---	---	---	---
	14-36	Muck	PT	A-8	---	---	---	---	---	---
	36-60	Clay, mucky clay	MH, OH	A-7-5	100	100	95-100	80-100	65-90	30-50
AN, AT*: Aquents										
BA*:										
Balize	0-8	Silt loam	CL-ML, CL, ML	A-4, A-6	100	100	95-100	80-95	10-20	4-12
	8-38	Silt loam, silty clay loam, mucky silty clay loam.	CL, ML, OL	A-6, A-4, A-7-6	100	100	90-100	80-95	20-45	5-25
	38-66	Silt loam, silty clay loam, very fine sandy loam.	ML, CL	A-4, A-6, A-7-6	100	100	90-100	75-95	10-45	NP-25
Larose	0-6	Muck	PT	A-8	---	---	---	---	---	---
	6-17	Clay, silty clay, mucky clay.	CH	A-7-5	100	100	100	90-100	60-87	30-52
	17-60	Clay, silty clay, mucky clay.	CH	A-7-5	100	100	100	90-100	60-87	30-52
BB: Barbary	0-4	Muck	PT	A-8	---	---	---	---	---	---
	4-60	Mucky clay, clay	OH, MH	A-7-5, A-8	100	100	100	95-100	70-90	35-45
BE: Bellpass	0-29	Muck	PT	A-8	---	---	---	---	---	---
	29-70	Clay, silty clay	CH, CL	A-7-6, A-7-5	100	100	100	90-100	47-87	30-52
CE: Clovelly	0-42	Muck	PT	A-8	---	---	---	---	---	---
	42-70	Clay, silty clay, mucky clay.	CH, CL, MH, ML	A-7-6, A-7-5	100	100	95-100	85-95	47-87	25-45
Cm: Commerce	0-8	Silt loam	CL-ML, CL, ML	A-4	100	100	100	75-100	<30	NP-10
	8-38	Silty clay loam, silt loam, loam.	CL	A-6, A-7-6	100	100	100	85-100	32-45	11-23
	38-60	Stratified very fine sandy loam to silty clay.	CL-ML, CL, ML	A-4, A-6, A-7-6	100	100	100	75-100	23-45	3-23
Co: Commerce	0-4	Silty clay loam	CL	A-6, A-7-6	100	100	100	90-100	32-50	11-25
	4-30	Silty clay loam, silt loam, loam.	CL	A-6, A-7-6	100	100	100	85-100	32-45	11-23
	30-60	Stratified very fine sandy loam to silty clay.	CL-ML, CL, ML	A-4, A-6, A-7-6	100	100	100	75-100	23-45	3-23

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In								Pct	
Ct---------------- Convent	0-4	Silt loam--------	ML, CL-ML	A-4	100	100	95-100	85-100	<27	NP-7
	4-28	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	100	100	95-100	75-100	<27	NP-7
	28-60	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	100	100	95-100	75-100	<27	NP-7
CV*: Convent----------	0-8	Silt loam--------	ML, CL-ML	A-4	100	100	95-100	85-100	<27	NP-7
	8-30	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	100	100	95-100	75-100	<27	NP-7
	30-60	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	100	100	95-100	75-100	<27	NP-7
Commerce---------	0-11	Silt loam--------	CL-ML, CL, ML	A-4	100	100	100	75-100	<30	NP-10
	11-21	Silty clay loam, silt loam, loam.	CL	A-6, A-7-6	100	100	100	85-100	32-45	11-23
	21-60	Stratified very fine sandy loam to silty clay.	CL-ML, CL, ML	A-4, A-6, A-7-6	100	100	100	75-100	23-45	3-23
Sharkey----------	0-10	Silt loam--------	ML, CL-ML, CL	A-4	100	100	100	95-100	<27	NP-10
	10-43	Clay--------------	CH	A-7-6, A-7-5	100	100	100	95-100	56-85	30-50
	43-60	Clay, silty clay loam, silt loam.	CL, CH	A-6, A-7-6, A-7-5	100	100	100	95-100	32-85	11-50
Dp* Dumps										
FA---------------- Fausse	0-4	Muck--------------	PT	A-8	---	---	---	---	---	---
	4-25	Clay--------------	CH	A-7-6	100	100	100	95-100	60-100	31-71
	25-60	Clay, silty clay, silty clay loam.	CH, MH, CL, ML	A-7-6	100	100	100	95-100	45-100	16-71
FE---------------- Felicity	0-60	Loamy fine sand	SP-SM, SM	A-2, A-3	85-100	75-100	51-80	5-30	<20	NP-4
GE---------------- Gentilly	0-10	Muck--------------	PT	A-8	---	---	---	---	---	---
	10-24	Clay, silty clay	CH	A-7-6	100	100	100	85-100	50-81	27-55
	24-60	Clay, silty clay	CH	A-7-6	100	100	100	85-100	50-81	27-55
Ha---------------- Harahan	0-5	Clay--------------	OH, MH, CH	A-7-5, A-8, A-7-6	100	100	100	95-100	60-90	35-50
	5-22	Clay, silty clay	CH, MH	A-7-6, A-7-5	100	100	100	95-100	60-90	35-50
	22-65	Clay, silty clay, mucky clay.	OH, MH, CH	A-7-5, A-8, A-7-6	100	100	100	95-100	60-90	35-50

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	4	10	40	200		
	In								Pct	
KE---------------- Kenner	0-24	Muck--------------	PT	A-8	---	---	---	---	---	---
	24-27	Clay, silty clay, mucky clay.	MH, OH	A-7-5	100	100	100	95-100	70-100	30-55
	27-38	Muck--------------	PT	A-8	---	---	---	---	---	---
	38-41	Clay, silty clay, mucky clay.	MH, OH	A-7-5	100	100	100	95-100	70-100	30-55
	41-68	Muck--------------	PT	A-8	---	---	---	---	---	---
LF---------------- Lafitte	0-60	Muck--------------	PT	A-8	---	---	---	---	---	---
Ra---------------- Rita	0-5	Mucky clay--------	OH, MH	A-7-5	100	100	100	95-100	55-90	15-45
	5-32	Clay, silty clay	CH	A-7-6, A-7-5	100	100	100	95-100	60-90	35-55
	32-40	Clay, silty clay, silty clay loam.	CH, MH	A-7-6, A-7-5	100	100	100	95-100	55-85	28-52
	40-60	Silt loam, fine sandy loam, loamy very fine sand.	ML, CL, SM, SC	A-4, A-6	100	100	70-95	40-90	<38	NP-20
SC---------------- Scatlake	0-7	Muck--------------	PT	A-8	---	---	---	---	---	---
	7-13	Mucky clay, clay, mucky silty clay loam.	OH, MH	A-7-5	100	100	100	95-100	55-90	15-45
	13-70	Clay--------------	MH, OH	A-7-5	100	100	100	95-100	70-90	35-45
Sh---------------- Sharkey	0-5	Silty clay loam	CL	A-6, A-7-6	100	100	100	95-100	32-50	11-25
	5-41	Clay--------------	CH	A-7-6, A-7-5	100	100	100	95-100	56-85	30-50
	41-60	Clay, silty clay loam.	CL, CH	A-6, A-7-6, A-7-5	100	100	100	95-100	32-85	11-50
Sk---------------- Sharkey	0-4	Clay--------------	CH, CL	A-7-6, A-7-5	100	100	100	95-100	46-85	22-50
	4-40	Clay--------------	CH	A-7-6, A-7-5	100	100	100	95-100	56-85	30-50
	40-65	Clay, silty clay loam.	CL, CH	A-6, A-7-6, A-7-5	100	100	100	95-100	32-85	11-50
TM---------------- Timbalier	0-60	Muck--------------	PT	A-8	---	---	---	---	---	---
Ub* Urban land										
Va---------------- Vacherie	0-12	Silt loam---------	ML, CL-ML	A-4	100	100	95-100	80-95	10-27	NP-7
	12-34	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	100	100	95-100	65-90	10-27	NP-7
	34-60	Clay, silty clay	CH	A-7-6	100	100	100	95-100	51-75	26-45
Ww---------------- Westwego	0-31	Clay--------------	CH	A-8, A-7-6	100	100	100	95-100	50-81	35-60
	31-49	Muck, peat--------	PT	A-8	---	---	---	---	---	---
	49-62	Clay, mucky clay	CH	A-8, A-7-6	100	100	100	95-100	50-82	35-60

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	Mmho/cm				Pct
AD---------------- Allemands	0-14	---	0.05-0.25	>2.0	0.20-0.50	5.1-7.8	<4	Low----------	----	---	30-85
	14-36	---	0.05-0.25	>2.0	0.20-0.50	6.1-8.4	<4	Low----------	----		
	36-70	60-95	0.15-1.00	<0.06	0.14-0.18	6.1-8.4	<4	Low*---------	0.32		
Ae---------------- Allemands	0-14	---	0.05-0.25	>2.0	0.20-0.50	3.6-7.8	<4	Low----------	----	---	30-85
	14-36	---	0.05-0.25	>2.0	0.20-0.50	3.6-7.8	<4	Low----------	----		
	36-60	60-95	0.15-1.00	<0.06	0.14-0.18	3.6-8.4	<4	Very high*	0.32		
AN, AT*** Aquents											
BA***:											
Balize----------	0-8	5-25	0.25-1.00	0.6-2.0	0.15-0.25	6.1-8.4	2-4	Low----------	0.43	---	---
	8-38	15-40	0.25-1.00	0.6-2.0	0.15-0.25	6.6-8.4	<2	Low**--------	0.43		
	38-66	10-30	0.25-1.00	0.6-2.0	0.15-0.20	6.6-8.4	<2	Low**--------	0.37		
Larose----------	0-6	---	0.05-0.25	>2.0	0.20-0.50	5.6-7.8	<4	Low----------	----	---	---
	6-17	50-80	0.15-1.00	<0.06	0.14-0.18	5.6-7.8	<4	Low*---------	0.28		
	17-60	50-80	0.15-1.00	<0.06	0.14-0.18	6.1-8.4	<4	Low*---------	0.28		
BB---------------- Barbary	0-4	---	0.05-0.25	2.0-6.0	0.20-0.50	5.6-7.8	<2	Low----------	----	---	30-70
	4-60	60-95	0.60-1.50	<0.06	0.18-0.20	6.6-8.4	<2	Low*---------	0.32		
BE---------------- Bellpass	0-29	---	0.15-0.50	>2.0	0.20-0.50	6.6-8.4	8-16	Low----------	----	---	30-60
	29-70	50-90	0.25-1.00	<0.06	0.14-0.22	7.4-8.4	4-16	Low*---------	0.28		
CE---------------- Clovelly	0-42	---	0.05-0.25	>2.0	0.10-0.45	6.6-8.4	4-8	Low----------	----	---	30-60
	42-70	50-90	0.15-1.00	<0.06	0.11-0.18	7.4-8.4	4-8	Low*---------	0.28		
Cm---------------- Commerce	0-8	14-27	1.35-1.65	0.6-2.0	0.21-0.23	5.6-8.4	<2	Low----------	0.43	5	.5-4
	8-38	14-39	1.35-1.65	0.2-0.6	0.20-0.22	6.1-8.4	<2	Moderate-----	0.32		
	38-60	14-39	1.35-1.65	0.2-2.0	0.20-0.23	6.6-8.4	<2	Low----------	0.37		
Co---------------- Commerce	0-4	27-39	1.45-1.70	0.2-0.6	0.20-0.22	5.6-8.4	<2	Moderate-----	0.37	5	.5-4
	4-30	14-39	1.35-1.65	0.2-0.6	0.20-0.22	6.1-8.4	<2	Moderate-----	0.32		
	30-60	14-39	1.35-1.65	0.2-2.0	0.20-0.23	6.6-8.4	<2	Low----------	0.37		
Ct---------------- Convent	0-4	0-18	1.30-1.65	0.6-2.0	0.18-0.23	5.6-8.4	<2	Low----------	0.43	5	.5-2
	4-28	0-18	1.30-1.65	0.6-2.0	0.20-0.23	6.1-8.4	<2	Low----------	0.37		
	28-60	0-18	1.30-1.65	0.6-2.0	0.20-0.23	6.1-8.4	<2	Low----------	0.37		
CV***:											
Convent---------	0-8	0-18	1.30-1.65	0.6-2.0	0.18-0.23	5.6-8.4	<2	Low----------	0.43	5	.5-2
	8-30	0-18	1.30-1.65	0.6-2.0	0.20-0.23	6.1-8.4	<2	Low----------	0.37		
	30-60	0-18	1.30-1.65	0.6-2.0	0.20-0.23	6.1-8.4	<2	Low----------	0.37		
Commerce--------	0-11	14-27	1.35-1.65	0.6-2.0	0.21-0.23	5.6-8.4	<2	Low----------	0.43	5	.5-4
	11-21	14-39	1.35-1.65	0.2-0.6	0.20-0.22	6.1-8.4	<2	Moderate-----	0.32		
	21-60	14-39	1.35-1.65	0.2-2.0	0.20-0.23	6.6-8.4	<2	Low----------	0.37		
Sharkey---------	0-10	10-27	1.30-1.65	0.6-2.0	0.21-0.23	5.1-8.4	<2	Low----------	0.43	5	.5-4
	10-43	60-90	1.20-1.50	<0.06	0.12-0.18	5.6-8.4	<2	Very high	0.28		
	43-60	25-90	1.20-1.65	0.06-0.2	0.12-0.18	6.6-8.4	<2	High---------	0.28		
Dp*** Dumps											

See footnotes at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	Mmho/cm				Pct
FA---------------- Fausse	0-4	45-90	0.15-0.50	2.0-6.0	0.20-0.50	6.6-9.0	4-16	Low----------	----	---	30-70
	4-25	60-95	1.10-1.45	<0.06	0.18-0.20	5.6-8.4	4-16	Low*---------	0.24		
	25-60	35-95	1.10-1.45	<0.2	0.18-0.22	5.6-8.4	4-16	Low*---------	0.24		
FE---------------- Felicity	0-60	3-10	1.50-1.70	>20	0.03-0.06	6.6-8.4	8-16	Low----------	0.15	5	<.5
GE---------------- Gentilly	0-10	---	0.15-0.60	>2.0	0.20-0.50	5.6-7.8	2-8	Low----------	----	---	30-70
	10-24	60-95	0.25-1.20	<0.06	0.12-0.15	6.6-7.8	2-8	Low*---------	0.37		
	24-60	60-95	1.25-1.45	<0.06	0.12-0.15	6.6-7.8	2-8	Low*---------	0.37		
Ha---------------- Harahan	0-5	50-95	0.50-1.50	<0.06	0.11-0.30	5.1-7.3	<2	Very high---	0.37	5	2-25
	5-22	60-95	1.20-1.50	<0.06	0.11-0.20	5.1-7.3	<2	Very high---	0.37		
	22-65	60-95	1.20-1.50	<0.06	0.11-0.30	6.6-8.4	<2	Very high*--	0.37		
KE---------------- Kenner	0-24	---	0.05-0.25	6.0-20	0.20-0.50	5.6-7.8	<4	Low----------	----	---	30-60
	24-27	45-85	0.15-1.00	<0.06	0.12-0.18	5.6-7.8	<4	Low*---------	0.32		
	27-38	---	0.05-0.50	>6.0	0.20-0.50	5.6-7.8	<4	Low----------	----		
	38-41	45-85	0.15-1.00	<0.06	0.12-0.18	5.6-7.8	<4	Low*---------	0.32		
	41-68	---	0.05-0.50	>6.0	0.20-0.50	5.6-7.8	<4	Low----------	----		
LF---------------- Lafitte	0-60	---	0.05-0.25	2.0-6.0	0.18-0.45	6.1-8.4	4-8	Low----------	----	---	30-70
Ra---------------- Rita	0-5	22-60	1.20-1.50	<0.06	0.15-0.20	3.6-6.5	<4	High---------	0.32	5	2-25
	5-32	60-95	1.20-1.45	<0.06	0.11-0.18	3.6-7.3	<4	High*--------	0.37		
	32-40	60-95	0.25-1.00	<0.06	0.15-0.30	6.6-8.4	<4	High---------	0.37		
	40-60	5-27	0.25-1.00	0.2-2.0	0.11-0.30	6.6-8.4	<4	Low----------	0.32		
SC---------------- Scatlake	0-7	---	0.05-0.25	>2.0	0.20-0.50	6.6-8.4	8-16	-------------	----	---	30-70
	7-13	27-60	0.25-1.00	<0.2	0.05-0.15	6.6-8.4	8-16	Low*---------	0.24		
	13-70	60-85	0.25-1.00	<0.06	0.05-0.15	6.6-8.4	8-16	Low*---------	0.28		
Sh---------------- Sharkey	0-5	27-35	1.40-1.70	0.2-0.6	0.20-0.22	5.1-8.4	<2	Moderate-----	0.37	5	.5-4
	5-41	60-90	1.20-1.50	<0.06	0.12-0.18	5.6-8.4	<2	Very high---	0.28		
	41-60	27-90	1.20-1.70	0.06-0.2	0.12-0.22	6.6-8.4	<2	High---------	0.28		
Sk---------------- Sharkey	0-4	40-60	1.20-1.50	<0.06	0.12-0.18	5.1-8.4	<2	Very high---	0.32	5	.5-4
	4-40	60-90	1.20-1.50	<0.06	0.12-0.18	5.6-8.4	<2	Very high---	0.28		
	40-65	27-90	1.20-1.70	0.06-0.2	0.12-0.22	6.6-8.4	<2	High---------	0.28		
TM---------------- Timbalier	0-60	---	0.05-0.25	>2.0	0.20-0.50	6.1-8.4	8-16	Low----------	----	---	30-70
Ub*** Urban land											
Va---------------- Vacherie	0-12	10-18	1.35-1.70	0.6-2.0	0.11-0.24	5.6-8.4	<2	Low----------	0.43	5	.5-2
	12-34	10-18	1.35-1.70	0.6-2.0	0.11-0.24	6.1-8.4	<2	Low----------	0.43		
	34-60	40-65	1.20-1.60	<0.06	0.08-0.19	6.6-8.4	<2	Very high	0.32		
Ww---------------- Westwego	0-31	50-95	0.50-1.50	<0.06	0.11-0.30	4.5-6.5	<2	High---------	0.37	5	2-25
	31-49	---	0.15-0.50	2.0-6.0	0.20-0.50	4.5-6.5	<2	Low----------	----		
	49-62	60-95	0.25-1.00	<0.06	0.11-0.30	6.6-8.4	<2	Low----------	0.37		

* While the soil is continuously saturated, the shrink-well potential is low. If the soil is drained, the shrink-well potential will be high or very high.

** While the soil is continuously saturated, the shrink-well potential is low. If the soil is drained, the shrink-well potential will be moderate.

*** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Initial	Total	Uncoated steel	Concrete
					Ft			In	In		
AD: Allemands	D	Frequent	Very long.	Jan-Dec	+1-0.5	Apparent	Jan-Dec	8-25	16-51	High	Moderate.
Ae: Allemands	D	Rare	---	---	0.5-4.0	Apparent	Jan-Dec	8-25	16-51	High	Moderate.
AN, AT*: Aquents											
BA*:											
Balize	D	Frequent	Very long.	Jan-Dec	+3-1.0	Apparent	Jan-Dec	2-6	6-15	High	Moderate.
Larose	D	Frequent	Very long.	Jan-Dec	+2-0.5	Apparent	Jan-Dec	2-8	5-15	High	Moderate.
BB: Barbary	D	Frequent	Very long.	Jan-Dec	+1-0.5	Apparent	Jan-Dec	3-12	6-15	High	Moderate.
BE: Bellpass	D	Frequent	Very long.	Jan-Dec	+1-0.5	Apparent	Jan-Dec	8-25	16-51	High	Low.
CE: Clovelly	D	Frequent	Very long.	Jan-Dec	+1-0.5	Apparent	Jan-Dec	8-20	16-51	High	Low.
Cm, Co: Commerce	C	None	---	---	1.5-4.0	Apparent	Dec-Apr	---	---	High	Low.
Ct: Convent	C	None	---	---	1.5-4.0	Apparent	Dec-Apr	---	---	High	Low.
CV*:											
Convent	C	Frequent	Brief to long.	Dec-Jul	1.5-4.0	Apparent	Dec-Apr	---	---	High	Low.
Commerce	C	Frequent	Brief to long.	Dec-Jun	1.5-4.0	Apparent	Dec-Apr	---	---	High	Low.
Sharkey	D	Frequent	Brief to very long.	Dec-Jul	0-2.0	Apparent	Dec-Apr	---	---	High	Low.
Dp*: Dumps											
FA: Fausse	D	Frequent	Brief to very long.	Jan-Dec	+1-1.5	Apparent	Jan-Dec	---	---	High	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Subsidence: Initial	Subsidence: Total	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In	In		
FE: Felicity	A	Frequent	Brief	Jan-Dec	2.0-3.0	Apparent	Jan-Dec	---	---	High	Moderate.
GE: Gentilly	D	Frequent	Very long.	Jan-Dec	+1-0.5	Apparent	Jan-Dec	3-6	10-15	High	Low.
Ha: Harahan	D	Rare	---	---	1.0-3.0	Apparent	Jan-Dec	2-5	4-10	High	Moderate.
KE: Kenner	D	Frequent	Very long.	Jan-Dec	+1-0.5	Apparent	Jan-Dec	15-30	>51	High	Moderate.
LF: Lafitte	D	Frequent	Very long.	Jan-Dec	+1-0.5	Apparent	Jan-Dec	15-30	>51	High	Moderate.
Ra: Rita	D	Rare	---	---	1.0-3.0	Apparent	Jan-Dec	1-5	4-10	High	Moderate.
SC: Scatlake	D	Frequent	Very long.	Jan-Dec	+1-0.5	Apparent	Jan-Dec	---	6-12	High	Moderate.
Sh, Sk: Sharkey	D	Rare	---	---	0-2.0	Apparent	Dec-Apr	---	---	High	Low.
TM: Timbalier	D	Frequent	Brief to very long.	Jan-Dec	+1-0.5	Apparent	Jan-Dec	25-45	51-99	High	Low.
Ub*: Urban land											
Va: Vacherie	C	None	---	---	1.0-3.0	Apparent	Dec-Apr	---	---	High	Low.
Ww: Westwego	D	Rare	---	---	1.0-3.0	Apparent	Jan-Dec	3-8	6-20	High	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allemands	Clayey, montmorillonitic, euic, thermic Terric Medisaprists
Balize	Fine-silty, mixed, nonacid, thermic Typic Hydraquents
Barbary	Very-fine, montmorillonitic, nonacid, thermic Typic Hydraquents
Bellpass	Clayey, montmorillonitic, euic, thermic Terric Medisaprists
Clovelly	Clayey, montmorillonitic, euic, thermic Terric Medisaprists
Commerce	Fine-silty, mixed, nonacid, thermic Aeric Fluvaquents
Convent	Coarse-silty, mixed, nonacid, thermic Aeric Fluvaquents
Fausse	Very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents
Felicity	Mixed, thermic Aquic Udipsamments
Gentilly	Fine, montmorillonitic, nonacid, thermic Typic Hydraquents
Harahan	Very-fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts
Kenner	Euic, thermic Fluvaquentic Medisaprists
Lafitte	Euic, thermic Typic Medisaprists
Larose	Very-fine, montmorillonitic, nonacid, thermic Typic Hydraquents
Rita	Very-fine, montmorillonitic, nonacid, thermic, cracked Typic Fluvaquents
Scatlake	Very-fine, montmorillonitic, nonacid, thermic Typic Hydraquents
Sharkey	Very-fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts
Timbalier	Euic, thermic Typic Medisaprists
Vacherie	Coarse-silty over clayey, mixed, nonacid, thermic Aeric Fluvaquents
Westwego	Very-fine, montmorillonitic, nonacid, thermic, cracked Thapto-Histic Fluvaquents

NRCS Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.