United States
Department of
Agriculture

Soil
Conservation
Service

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

Soil Survey of Orleans Parish, Louisiana

How To Use This Soil Survey

General Soil Map

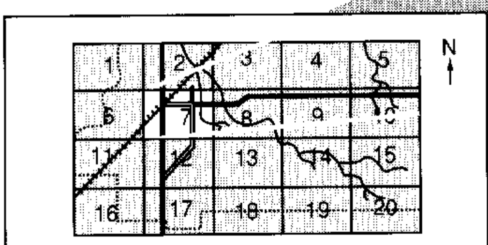
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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.

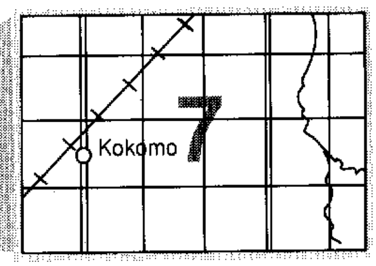
Detailed Soil Maps

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.

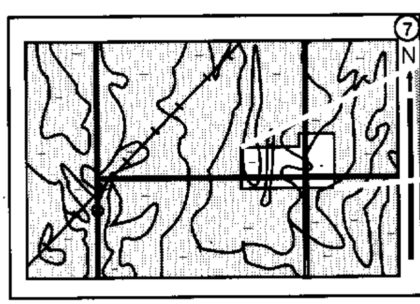


INDEX TO MAP SHEETS



MAP SHEET

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



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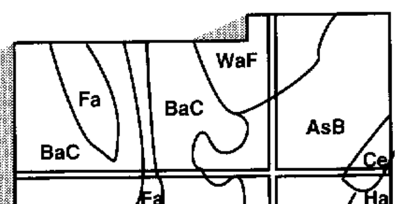

AREA OF INTEREST

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

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1986. Soil names and descriptions were approved in 1987. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This soil survey was made cooperatively by the Soil Conservation Service, the Louisiana Agricultural Experiment Station, and the Louisiana Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Crescent Soil and Water Conservation District.

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

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

Cover: St. Louis Cathedral is one of many historical landmarks in Jackson Square in the city of New Orleans. The cathedral is in an area of Urban land.

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Issued September 1989

Index to Map Units

Summary of Tables

Foreword

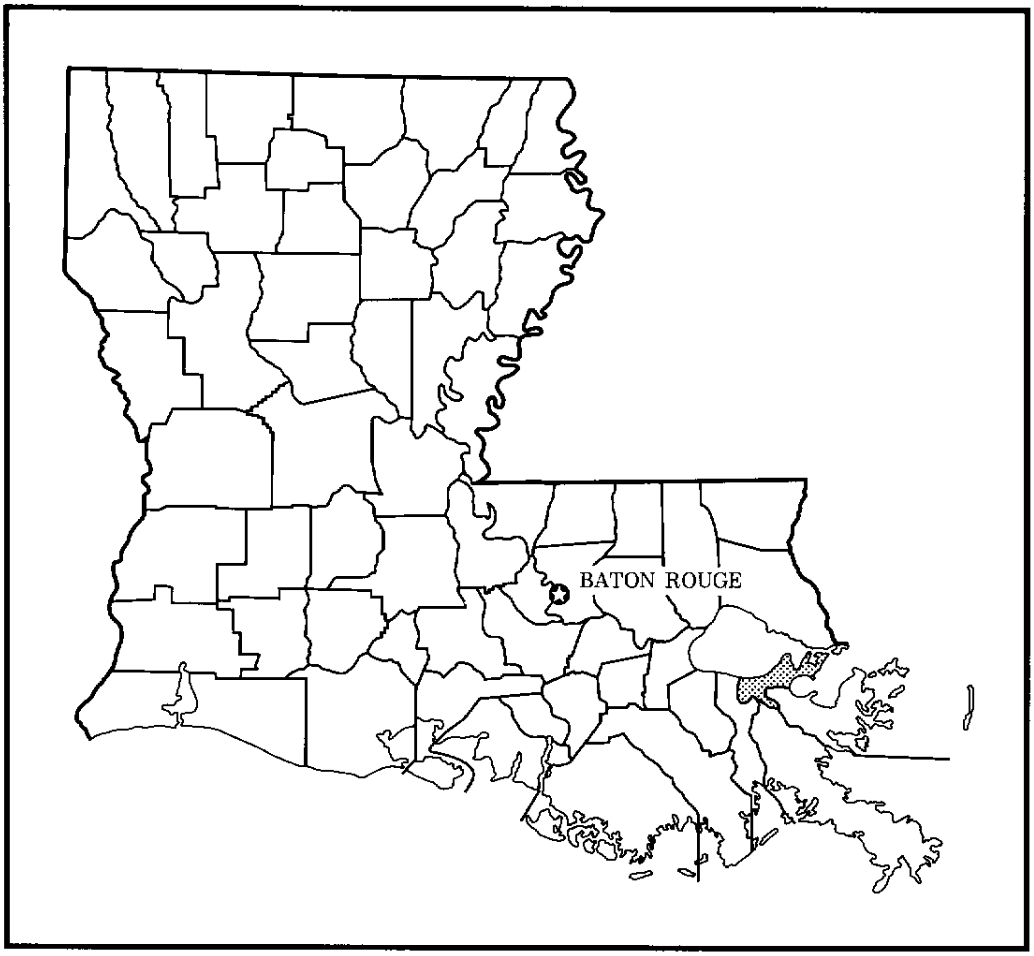
This soil survey contains information that can be used in land-planning programs in Orleans Parish. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact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

This soil survey is designed for many different users. Farmers, 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 insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

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

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

Horace J. Austin
State Conservationist
Soil Conservation Service



Location of Orleans Parish in Louisiana.

Soil Survey of
Orleans Parish, Louisiana

By Larry J. Trahan, Soil Conservation Service

Fieldwork by Lyfon Morris, Jeanette J. Bradley, and Clyde L. Butler, Soil Conservation Service, and Pam S. Porter, Louisiana Soil and Water Conservation Committee

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

ORLEANS PARISH, in southeastern Louisiana, has a total area of 223,686 acres, of which 127,360 acres is land and 96,326 acres is large water areas. This parish is bordered by St. Tammany Parish on the north, St. Bernard Parish on the east, Jefferson Parish on the west, and Plaquemines Parish on the south. According to the 1980 census, the population of the parish was 557,927. The parish is chiefly urban, except for the coastal marshes in the eastern part and the area of woodlands on the west bank of the Mississippi River that is known as the Lower Coast. The current trend indicates that urban areas are expanding rapidly and areas of marshes and swamps are decreasing.

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-third of the total land area of the parish and are developed almost entirely for urban uses. An extensive system of manmade levees protects these soils from flooding.

The other two-thirds of the land area of the parish consists of soils formed in marshes and swamps. Most of the area has been protected from flooding by a system of levees and pumps. The unprotected areas are subject to frequent flooding and have a water table at or above the soil surface most of the time. These areas are used as habitat for wetland wildlife and for recreation. Areas protected from flooding are in urban and industrial uses or are being planned and developed for these uses. Elevation ranges 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. The undrained marshes and swamps, however, mostly range in elevation from sea level to about 1 foot above sea level.

The first soil survey of parts of Orleans Parish was published in 1903, and another survey for parts of Orleans Parish was published in 1970 *(21)*. This survey updates the earlier surveys and provides additional information.

General Nature of the Parish

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

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at New Orleans, Louisiana, in the period 1955 to 1977. 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 54 degrees F, and the average daily minimum temperature is 44 degrees. The lowest temperature on record, which occurred at New Orleans on January 24, 1963, is 14 degrees. In summer the average temperature is 81 degrees, and the average daily maximum temperature is 90 degrees. The highest recorded temperature, which occurred at New Orleans on June 27, 1967, is 98 degrees.

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

The total annual precipitation is 59 inches. Of this, 33 inches, or 56 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 26 inches. The heaviest 1-day rainfall during the period of record was 9.8 inches at New Orleans on May 31, 1959. Thunderstorms occur on about 70 days each year, and most occur in summer.

The average relative humidity in midafternoon is about 65 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 60 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the southeast. Average windspeed is highest, 10 miles per hour, in spring. Every few years, a hurricane crosses the parish.

Transportation

Orleans Parish is served by the New Orleans International Airport, a major air transport center. This airport is in neighboring Jefferson Parish. A minor air transport center, the Lakefront Airport on Lake Pontchartrain, also serves the parish *(11, 19)*.

The parish is served by six major railroads that connect to every major railroad system in the United States. Numerous motor freight carriers also serve the parish *(9)*.

New Orleans is the southern terminus of two national highways, U.S. Highway 51 and U.S. Highway 61, and it is also served by the east-west U.S. Highway 90. Interstate 10 connects the parish with other federal and state highways. The Greater New Orleans Bridge and ferries connect New Orleans with the west side of the Mississippi River *(11)*.

The Mississippi River and the Intracoastal Waterway pass through the parish. These waterways are part of a 19,000-mile water transportation system that serves much of the central United States as well as the Gulf Coastal area *(9)*.

Water Resources

Surface Water.—The hydrologic regime of Orleans Parish involves the movement of freshwater and salt water masses through the region as a result of the interaction among the Mississippi River discharge, regional precipitation, winds, and tides. The 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 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 and before human influence, the Mississippi River flowed through the wetlands to the Gulf via distributary channels. Rainfall and Mississippi River floodwaters 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 freshwater 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 have greatly altered the natural hydrologic regime. Leveeing of the Mississippi River halted the annual overbank flooding, and the 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. Deepwater canals and spoil banks appeared as a result of logging activity, drainage, navigation improvements, and later, for oil and gas well drilling access and pipelines. These and other modifications allowed surplus freshwater to pass more quickly from 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. Major intrusions of saltwater in the Mississippi River generally do not extend as far north as Orleans Parish, but intrusions through canals and other channels reach other surface waters in most parts of the parish.

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, salinity values, and sediment transfers and deposition *(18)*.

In Orleans Parish, all of the water used for public consumption and industrial use is taken from the Mississippi River. The quality of this water is closely monitored by federal and state government agencies. The quality of the water varies somewhat with the volume of flow in the river, but it is considered suitable for public consumption in Orleans Parish.

Ground Water.—Ground water is available in four aquifers in Orleans Parish. The major aquifers are the Gramercy 200-foot sand aquifer, the Norco 400-foot sand aquifer, the Gonzales 700-foot sand aquifer, and the 1,200-foot sand aquifer. The Gramercy and Norco aquifers are too brackish for municipal or industrial use. Some industrial use is made of the Gonzales aquifer. The 1,200 foot sand aquifer contains too much salt for most uses *(26, 27)*.

History

In 1804, the Territory of Orleans was established as a governmental unit within the region acquired by the Louisiana Purchase. In 1806, the Territorial legislature divided the Territory of Orleans into nineteen parishes, including Orleans Parish.

New Orleans was founded about 1718 by Jean Baptiste Lemoyne Sieur de Bienville. Bienville, along with engineers Le Blond de la Tour and Adrien de Pauger, cleared the land and plotted the city along a curve of the Mississippi River at a point where the river flowed nearest Bayou St. John and Lake Pontchartrain. Bienville named his new capital Nouvelle-Orleans, in honor of Louis Phillipe, Duke of Orleans and Prince Regent of France *(8)*.

The site selected by Bienville was a forbidding place to build a city, but New Orleans became a mercantile center, founded on small trade and commercial enterprise. The main products of the countryside around the city were rice, sugar, indigo, tobacco, and cotton. Plantation sawmills supplied the West Indies with cypress, cedar, and maple boards and shingles.

Indians fished and farmed the swamps in the area of Orleans Parish for at least 10,000 years before the Europeans arrived. Settlements built by the Choctaw Indians were evident in and around present-day New Orleans before the French arrived. Other Indian tribes were the Houmas (Tchouchoumas), Calapissa, Chickasaw, and Biloxi. Later, the French, Germans, Spaniards, Acadians, Americans, and Irish migrated to the area. The slave trade also brought in many negroes. These groups arrived before New Orleans became an American city through the Louisiana Purchase in 1803 *(12)*.

Urban areas grew, and today urban expansion has eliminated most agricultural land in the parish. The city of New Orleans sprawls over most of Orleans Parish.

New Orleans Industry

New Orleans is a major seaport and a trade center with an established tourist industry and an established oil and gas industry. The manufacturing base is relatively small. The Port of New Orleans is one of the largest industries in New Orleans and Louisiana. The port complex includes shipping lines, barge and tug operations, freight forwarders, customhouse brokers, export and import firms, ship suppliers, and ship service industries.

The port consists of more than 60 miles of public, private, and military facilities on the Mississippi River, the 76-mile Mississippi River Gulf Outlet, and the Industrial Canal. According to U.S. Army Corps of Engineers figures for 1985, the Port of New Orleans was the busiest port in the nation, handling 156 million tons of cargo. The main commodities passing through the port are corn, soybeans, crude petroleum, residual fuel oil, coal, lignite, and wheat.

An industrial park is in the eastern part of New Orleans north of the Intracoastal Waterway. It is home to part of the NASA space program.

New Orleans serves as the business, administrative, and financial center for the offshore oil and gas industry. The city specifically serves the needs of offshore operators and is close to the major offshore producing area. Oil companies that have offshore operations in the gulf, as well as most major offshore equipment suppliers and fabricators, maintain corporate offices in New Orleans. The oil and gas industry provides about 26,000 jobs in the New Orleans area, even though no oil and gas is refined in Orleans Parish.

More than 38 percent of this employment is based in downtown New Orleans in the offices of major oil companies *(10)*.

New Orleans is internationally recognized as a major tourist and convention center. The city attracts about seven million visitors from many countries annually. From 1977 to 1981, the number of foreign tourists visiting New Orleans increased by about 200,000, or 110 percent. Its internationally renowned French cuisine, "New Orleans Jazz," seasonal events, such as the Mardi Gras and the mid-winter Sugar Bowl at the Louisiana Superdome, and historical sites, such as the French Quarter and the Garden District, are among the major attractions in the city. In addition, Lake Pontchartrain provides sports fishing and recreation.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; and the kinds of crops and 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 profile extends from the surface down into the unconsolidated material from which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

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

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

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

While a soil survey is in progress, samples of some of the soils in the area are generally collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists.

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 state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

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

Map Unit Composition

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

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed, and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

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

General Soil Map Units

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

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

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

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 used to grow improved grasses and legumes for pasture or hay. 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 general soil map units in this survey have been grouped into four general landscapes. Descriptions of each of the broad groups and the map units in each group follow.

Soils on Natural Levees That Are Protected From Flooding

This group consists mainly of level, poorly drained and somewhat poorly drained, clayey and loamy soils that are on the natural levees of the Mississippi River and its distributaries. Large earthen levees protect these soils from flooding by the Mississippi River.

This group makes up about 26 percent of the land area of the parish. Most of these soils are in urban uses. Wetness, flooding from backwaters, and the shrinking and swelling of the subsoil are the main limitations affecting urban uses.

1. Sharkey-Commerce

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

The soils in this map unit are on natural levees of the Mississippi River and its distributaries. Elevation ranges from sea level to 15 feet above sea level. Slopes are long and smooth and less than 1 percent.

This map unit makes up about 26 percent of the land area of the parish. It is about 70 percent Sharkey soils, 21 percent Commerce soils, and 9 percent soils of minor extent.

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

Of minor extent are the Harahan soils in low positions. In addition, small, narrow areas of Sharkey and Commerce soils are between the Mississippi River and protection levees; these soils are frequently flooded. In areas where more than 85 percent of the ground is covered by concrete, buildings, and other impervious materials, the areas have been designated as "Urban land."

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

These soils are poorly suited to building site development, sanitary facilities, and intensively used 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.

The soils in this map unit are well suited to pasture and moderately well suited to woodland and cultivated crops. A good drainage system is needed for optimum crop and forage production. The soils have a high potential to produce hardwood trees; however, wetness can limit the use of equipment.

Soils in Marshes That Are Frequently Flooded and Ponded

The map unit in this group consists mainly of level, very poorly drained, mucky soils that are in marshes. These soils are flooded or ponded most of the time.

This group makes up about 37 percent of the land area of the parish. Most of the soils are in native vegetation and are used for recreation and as habitat for wetland wildlife.

2. Clovelly-Lafitte-Gentilly

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

The soils in 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. Slopes are less than 1 percent.

This map unit makes up about 37 percent of the land area of the parish. It is about 55 percent Clovelly soils, 32 percent Lafitte soils, 8 percent Gentilly soils, and 5 percent soils of minor extent.

The Clovelly soils have a moderately thick surface layer of very fluid, slightly saline muck and underlying material of very fluid, slightly saline mucky clay and clay.

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

The Gentilly soils have a thin surface layer of very fluid, slightly saline muck overlying fluid and very fluid clay. The underlying material is firm clay.

Of minor extent are the poorly drained Sharkey soils in adjacent areas of natural levees along streams. Many small ponds and perennial streams are in most areas.

Most of the soils in this map 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 habitat for wetland wildlife. They provide suitable habitat for species of wetland wildlife. Hunting, fishing, and other outdoor activities are popular in areas of this map unit. This map unit is part of the estuary that helps support marine life in the Gulf of Mexico.

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

Soils in Former Swamps That Are Drained and Protected From Flooding

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 map unit makes up about 15 percent of the land area of the parish. Most of the area is developed for urban uses or is idle land reserved for future urban uses. Wetness, low strength, subsidence, and the shrinking and swelling of the underlying material are the main limitations if the soils are used for urban development. Also, flooding is a hazard.

3. Harahan-Westwego

Level, poorly drained soils that are clayey throughout

The soils in 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. Slopes are less than 1 percent.

This map unit makes up about 15 percent of the land area of the parish. It is about 69 percent Harahan soils, 25 percent Westwego soils, and 6 percent soils of minor extent.

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

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

Of minor extent are the somewhat poorly drained Commerce soils and the poorly drained Sharkey soils on narrow ridges.

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

These soils are poorly suited to most urban and intensive recreation uses. Wetness, low strength, very slow permeability, and the shrinking and swelling of the subsoil are the main limitations, and flooding is a hazard. 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.

4. Allemands, Drained-Kenner, Drained

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

The soils in this map unit are in former marshes that are protected from most floods by levees and drained by pumps. Flooding is rare, but it can occur during hurricanes or when levees fail. Elevation ranges from sea level to about 5 feet below sea level. Slopes are less than 1 percent.

This map unit makes up about 9 percent of the land area of the parish. It is about 50 percent Allemands, drained, soils; 38 percent Kenner, drained, soils; and 12 percent soils of minor extent.

The Kenner, drained, soils are in broad, interlevee basins. They have a thick surface layer of muck and underlying material of very fluid muck. The surface layer and underlying layers contain thin strata of clay.

The Allemands, drained, soils are in low positions near the natural levees of streams. They have a moderately thick surface layer of muck and underlying material of slightly fluid and very fluid clay.

Of minor extent are the poorly drained Harahan and Westwego soils in slightly higher positions.

Most of the soils in this map unit are developed for urban uses. A small acreage is in pasture or in idle land that has been reserved for future urban uses.

These soils are poorly suited to most urban uses. Wetness, low strength, and subsidence are the main limitations, and flooding is a hazard. Adequately controlling the water table and the rate of subsidence is difficult. Foundations for buildings need to be specially designed and placed on pilings.

Soils in Spoil Areas That Are Rarely or Frequently Flooded

This group consists mainly of level, poorly drained, variable textured soils on spoil banks. Some areas are subject to frequent flooding by high storm tides.

The map unit in this group makes up about 13 percent of the land area of the parish. Most of the area is in native vegetation and is used for recreation and as habitat for wetland wildlife. A few areas have been developed for commercial uses. Wetness and salinity are the main limitations affecting urban uses, and flooding is a hazard.

5. Aquents

Level, poorly drained soils that are stratified and clayey to mucky throughout

The soils in this map unit are in areas of hydraulic fill dredged from nearby waterways, swamps, and marshes. The largest area of this map unit is the spoil area along the Intracoastal Waterway. The soils in this map unit are rarely or frequently flooded by high tides during storms. Elevation ranges from sea level to about 5 feet above sea level. Slopes are 0 to 1 percent.

This map unit makes up about 13 percent of the land area of the parish. It is about 94 percent Aquents and 6 percent soils of minor extent.

The poorly drained Aquents are stratified with layers of clayey, loamy, mucky, and sandy materials. The soils are slightly saline to saline throughout.

Of minor extent are the Allemands, Harahan, and Westwego soils in slightly lower positions on the landscape.

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

These soils are well suited to habitat for wetland wildlife. They provide habitat for many species of wetland wildlife. Hunting and other outdoor activities are popular in areas of this map unit.

These soils are severely limited for most urban and intensive recreation uses. Subsidence, wetness, salinity, low strength, and the shrinking and swelling of the soil material are the main limitations, and flooding is a hazard.

Detailed Soil Map Units

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

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

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

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

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

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

An *undifferentiated group* is made up of two or more soils 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 in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Commerce and Sharkey soils, frequently flooded, is an undifferentiated group in this survey area.

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

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Dumps is an example. Miscellaneous areas are shown on the soil maps.

All of the soils in Orleans Parish were mapped at the same level of detail, except for those areas within the marshes and those areas between the protection levees and the Mississippi River. Poor accessibility limited the number of observations that could be made in most of these 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 importance 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.

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 potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Ae—Allemands muck, drained. This poorly drained, organic soil is in former freshwater marshes that have been drained and are protected from most flooding. The soil is mainly in urban areas. Slope is less than 1 percent.

Where undisturbed, this soil typically has a surface layer of muck that is about 30 inches thick. It is very dark gray in the upper part, black in the middle part, and very dark grayish brown in the lower part. The underlying material to a depth of about 60 inches is gray, slightly fluid clay. The organic material shrinks and cracks and remains cracked when it is wet. Buried logs and stumps are in the underlying material in places. In most developed areas, the surface layer has been covered with 1 foot to 3 feet of mineral material.

This Allemands soil is drained by pumps and protected from most floods by levees. Flooding is rare, but it can occur during hurricanes and when water pumps or protection levees fail. The water table usually is 2 to 4 feet below the surface. After prolonged high intensity rains, the water table is near the surface for short periods. Permeability is rapid in the organic surface layer and very slow in the clayey underlying material. Even where the surface is covered with mineral fill material, the cracks in the organic material remain open and extend into the underlying material. Water and air move freely through these cracks. Natural fertility is high. The content of organic matter is very high, and the available water capacity is very high. The Allemands soil has high subsidence potential and very high shrink-swell potential.

Included with this soil in mapping are a few small areas of Harahan, Kenner, and Westwego soils. Harahan and Westwego soils are in slightly higher positions on the landscape and Kenner soils are in slightly lower positions. Also included are a few small areas of Allemands muck, drained, that have severely subsided and the water table is at the surface most of the time. The included soils make up about 15 percent of the map unit.

Most of the acreage of this soil is in urban and residential areas. Houses, streets, buildings, and parking lots cover 25 to 70 percent of most areas. Some areas are 85 percent covered. The open areas are mostly lawns, vacant lots, playgrounds, or vegetable gardens. A small acreage is in pasture or idle land that is reserved for future urban uses.

This soil is poorly suited to urban uses and intensive forms of recreation. Wetness, subsidence, low strength for roads and streets, and the very high shrink-swell potential are the main limitations, and flooding is a hazard. If the water table is lowered, the organic matter oxidizes and slowly subsides. Buried logs and stumps cause uneven subsidence in places. If dry, the organic matter is subject to burning.

If this soil is used for dwellings, pilings and specially constructed foundations are needed (fig. 1). 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 slightly fluid nature of the underlying mineral material and the subsidence of the organic material.

This soil is moderately well suited to pasture. Suitable pasture plants are common bermudagrass, Dallisgrass, white clover, and tall fescue. Wetness is the main limitation. Adequate water control is needed. Grazing cattle can have problems walking if the surface layer becomes soft and boggy for short periods after heavy rains.

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

An—Aquents, dredged. This map unit consists of poorly drained soils forming in hydraulically deposited fill material dredged from nearby marshes and swamps during the construction and maintenance of waterways. Areas extend 0.25 to 1 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, the soil is firm in the upper part and slightly fluid or very fluid in the lower part. In places, the soil layers contain small to large quantities of oyster and clam shells. The reaction of the surface layer ranges from very strongly acid to moderately alkaline. The reaction in the underlying material ranges from strongly acid to moderately alkaline.

These soils are subject to rare flooding by high tides for short periods during storms. The seasonal high water table ranges from the soil surface to a depth of 3 feet. The soil has 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 are a few long, narrow areas of Aquents that have slopes of 1 to 5 percent. The included soils make up about 10 percent of the map unit.

Most of the acreage is used as habitat for wildlife. A small acreage is developed for docks and other shipping facilities.

Natural vegetation consists mainly of eastern baccharis, giant reed, goldenrod, marshhay cordgrass, rattlebox, waxmyrtle, willow, hackberry, and sumpweed.

These soils are well suited to extensive forms of recreation, such as hunting, and to habitat for upland

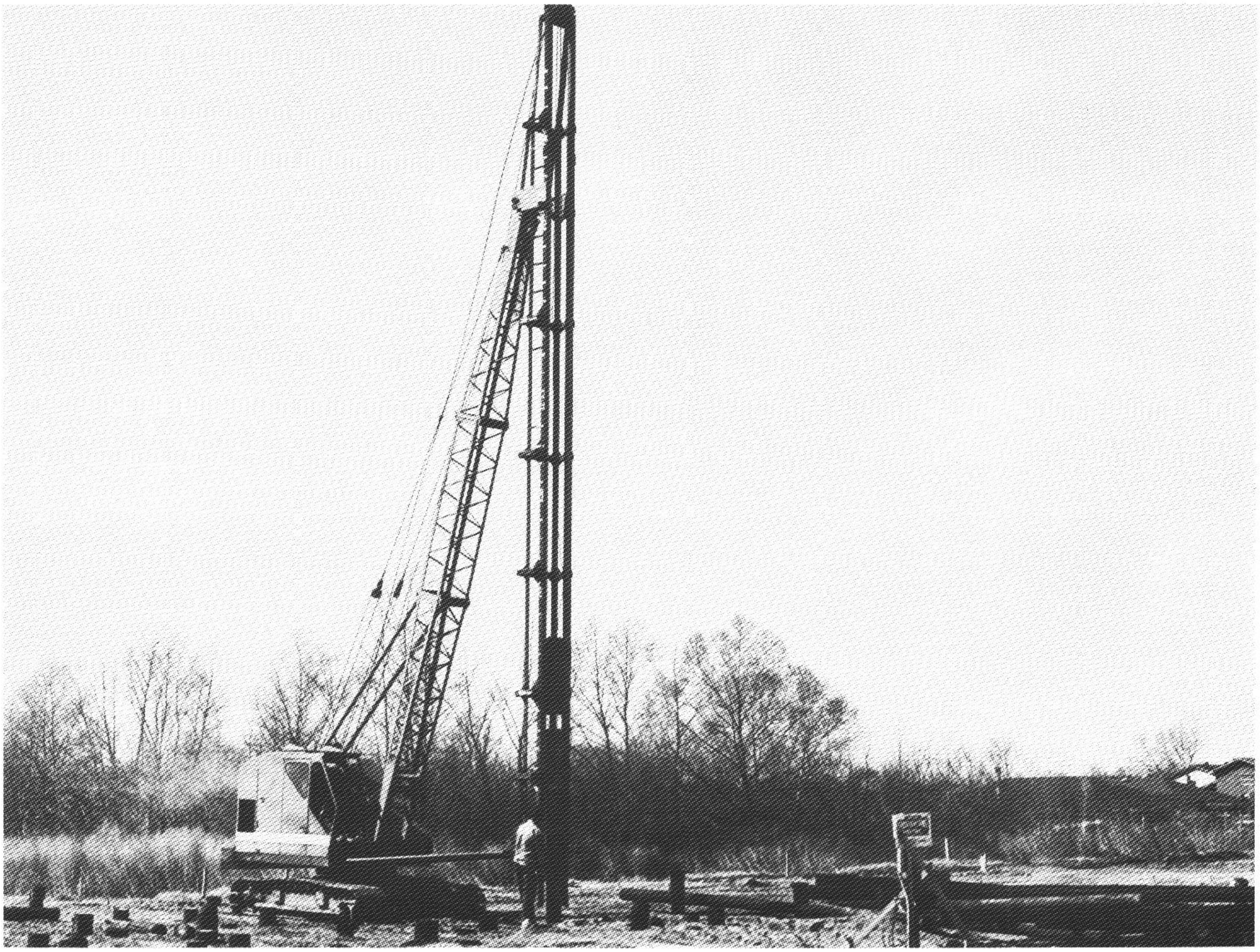


Figure 1.—Wooden pilings are driven deep into the soil to help support the foundations of houses and commercial buildings without basements on Allemands muck, drained.

and wetland wildlife. Food and cover are available for rabbits, deer, raccoon, and waterfowl.

The soils of this map unit are poorly suited to urban or intensive recreation uses. Wetness and low strength for roads and streets are the main limitations, and flooding is a hazard. If the soils are used for buildings, pilings and specially constructed foundations are needed (fig. 2). Drainage is needed for most urban uses. Septic tank absorption fields do not function properly because of wetness and flooding.

These soils are moderately well suited to crops and pasture. Wetness is the main limitation. Suitable pasture plants are common bermudagrass, Dallisgrass, ryegrass, wheat, and white clover.

These Aquents are in capability subclass IIIw. They are not assigned a woodland ordination symbol.

AT—Aquents, dredged, frequently flooded. This map unit consists of poorly drained soils forming in hydraulically deposited fill material dredged from nearby marshes and swamps during the construction and maintenance of waterways. Areas extend 0.25 to 1 mile from one or both sides of the waterway. Fewer observations were made in these areas than in areas of

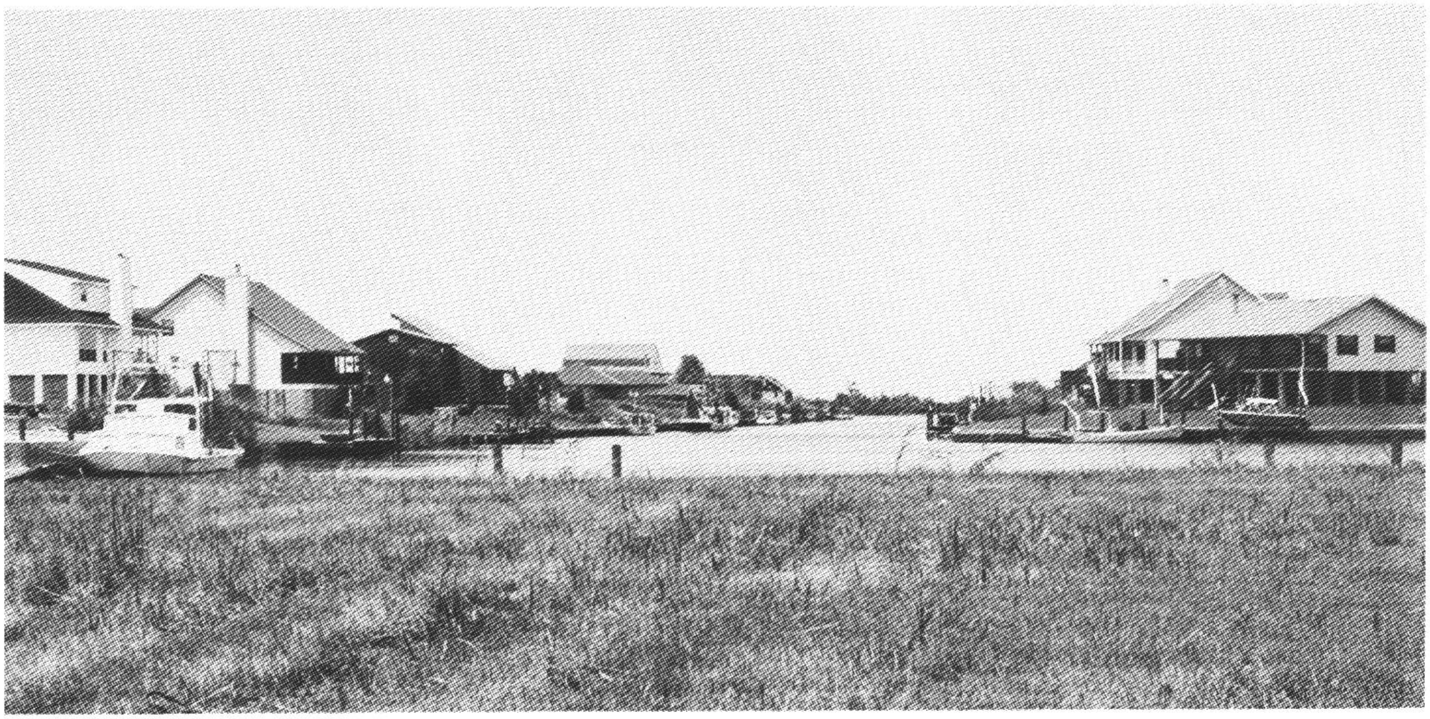


Figure 2.—If specially designed foundation supports are used on Aquents, dredged, these soils can be used as building sites.

some other soils in the survey area. The 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 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 quantities of oyster and clam shells. The reaction of the surface layer ranges from very strongly acid to moderately alkaline. The reaction in the underlying material ranges from strongly acid to moderately alkaline.

These soils are flooded by high tides for long or very long periods during storms. The seasonal high water table ranges from the soil surface to a depth of 1.5 feet. The soil has low strength. The total subsidence potential is medium or 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 are a few long, narrow areas of Aquents that have slopes of 1 to 5 percent. The included soils make up about 10 percent of the map unit.

Most of the acreage is used as habitat for wetland wildlife. A small acreage is developed for docks and other shipping facilities.

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

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

These soils are not suited to crops, woodland, or pasture. Wetness, the hazard of flooding, salinity, and low strength are too severe for these uses.

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

This map unit is in capability subclass Vw and has not been assigned a woodland ordination symbol.

CE—Clovelly muck. This very poorly drained, very fluid, slightly saline, organic soil is in brackish marshes. It is flooded and ponded most of the time. Fewer observations were made in areas of this soil; the mapping, however, is adequate for the expected uses of the soil. Areas range from about 500 to 1,000 acres. Slope is less than 1 percent.

Typically, this soil has a very dark grayish brown and black, very fluid muck surface layer about 31 inches thick. The underlying material to a depth of about 72 inches is gray and dark gray, very fluid clay and mucky clay.

This 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 most of the year, but during periods of sustained north wind and low tides, the water is as much as 0.5 foot below the soil surface. This soil has low strength and poor trafficability. Permeability is rapid in the organic surface layer and very slow in the clayey layers. 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.

Included in mapping are a few small to large areas of Gentilly and Lafitte soils. Gentilly soils are mineral and are in slightly higher positions on the landscape. Lafitte soils are in positions similar to those of Clovelly soil and they have a thicker organic layer. Few to many small ponds and tidal channels are included in places. Also included are large areas of soils that are similar to Clovelly soil except 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.

Most of the acreage of this soil is used as habitat for wetland wildlife and for extensive forms of recreation, such as hunting and fishing.

The natural vegetation consists mainly of marshhay cordgrass (fig. 3), Olney bulrush, big cordgrass, dwarf spikesedge, marsh morningglory, saltmarsh bulrush, widgeongrass, and sumpweed.

This soil is well suited to habitat for wetland wildlife. It provides habitat for large populations of waterfowl and furbearers, such as mink, muskrat, nutria, 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. 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 crops, pasture, or woodland because of wetness, flooding, salinity, low strength, and poor accessibility. This soil generally is too fluid and boggy to support livestock grazing.

This soil is not suited to urban and intensive recreation uses. Flooding, wetness, low strength for roads and streets, and high subsidence potential are too severe. If this soil is drained and protected from flooding, it will subside 1 to 5 feet below sea level.

This Clovelly soil is in capability subclass VIIIw. It is not assigned a woodland ordination symbol.

Cm—Commerce silt loam. This somewhat poorly drained soil is in high positions on natural levees of the Mississippi River and its distributaries. Areas range from about 10 to 200 acres. Slope is less than 1 percent.

Typically, this soil has a dark gray silty clay loam surface layer about 5 inches thick. The subsoil to a depth of about 33 inches is dark grayish brown silty clay loam in the upper part and grayish brown and gray silt loam in the middle and lower parts. The substratum to a depth of about 60 inches is gray silt loam.

This soil has high fertility. Water and air move through it at a moderately slow rate. Water runs off the surface at a slow rate. 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 moderate shrink-swell potential.

Included in mapping are a few small areas of Harahan and Sharkey soils. These soils are in lower positions on the landscape than Commerce soils and have a clayey subsoil. The included soils make up about 5 percent of the map unit.

Almost all the acreage of this soil is in urban areas. A small acreage is woodland, and a very small acreage is in crops, mainly vegetables and citrus. Houses, streets, buildings, and parking lots cover 25 to 75 percent of most urban areas. The open areas are mostly lawns, vacant lots, playgrounds, or vegetable gardens.

This Commerce soil has moderate limitations affecting most urban uses; however, it is one of the best soils in the survey area for these uses. It is firm, consists of mineral material throughout, and can support the foundation of most low structures without the use of pilings. Wetness and the moderate shrink-swell potential are the main limitations affecting

Figure 3.—Marshhay cordgrass is the dominant natural vegetation in this area of Clovelly muck.

dwellings without basements. These limitations can be overcome easily by drainage 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. Low strength is a limitation affecting 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. Suitable pasture plants are improved bermudagrass, common bermudagrass, Dallisgrass, ryegrass, tall fescue, vetch, arrowleaf clover, red clover, and white clover. 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 and soil in good condition.

This soil is well suited to cultivated crops and is one of the best soils in the parish for this use. The main crops are vegetables and citrus; but soybeans, sugarcane, and corn are also grown. This soil is friable and easy to keep in good tilth. It 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 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 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 to plant. Equipment use limitations are moderate because of wetness.

This soil is moderately well suited to intensive recreation uses. Wetness is the main limitation. Excess surface water can be removed by providing the proper grade for drainage and by constructing shallow ditches.

Plant cover can be maintained by fertilizing and by controlling traffic.

This Commerce soil is in capability subclass IIw. The woodland ordination symbol is 13W.

Co—Commerce silty clay loam. This somewhat poorly drained soil is in high and intermediate positions on natural levees of the Mississippi River and its distributaries. Areas range from about 10 to 200 acres. Slope is less than 1 percent.

Typically, this soil has a dark gray silt loam surface layer about 4 inches thick. The subsoil to a depth of about 32 inches is dark grayish brown silty clay loam in the upper part and grayish brown silty clay loam and silt loam in the lower part. The substratum to a depth of about 60 inches is gray silt loam.

This soil has high fertility. Water and air move through it at a moderately slow rate. Water runs off the surface at a slow rate. 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 moderate shrink-swell potential.

Included in mapping are a few small areas of Harahan and Sharkey soils. These soils are in lower positions than Commerce soil and have a clayey subsoil. The included soils make up about 5 percent of the map unit.

Almost all the acreage of this soil is in urban areas. A small acreage is woodland. Houses, streets, buildings, and parking lots cover about 25 to 75 percent of most urban areas. The open areas are mostly lawns, vacant lots, playgrounds, or vegetable gardens.

This Commerce soil has moderate limitations affecting most urban uses; however, it is one of the best soils in the survey area for these uses. It is firm, consists of mineral material throughout, and can support the foundation of most low structures without the use of pilings. Wetness and the moderate shrink-swell potential are the main limitations affecting dwellings without basements. These limitations can be overcome easily by drainage 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. Low strength is a limitation affecting 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. Suitable pasture plants are improved bermudagrass, common bermudagrass, Dallisgrass, ryegrass, tall fescue, wheat, vetch, arrowleaf clover, red clover, and white clover. 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 and soil in good condition.

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

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

This soil is moderately well suited to intensive recreation uses. Wetness is the main limitation. Good drainage is needed 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. The woodland ordination symbol is 13W.

CS—Commerce and Sharkey soils, frequently flooded. These somewhat poorly drained and poorly drained soils are on the unprotected riverbanks between the Mississippi River and the protection levees. They 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 Commerce soil, some are all Sharkey soil, and other areas are both soils. The soils were mapped together since the frequent flooding is a common feature controlling use and management. The texture of the surface layer changes as the river reworks the deposits. Commerce soil makes up about 50 percent of the map unit, and Sharkey soil makes up about 30 percent. Areas range from about 10 to 200 acres. Slope is less than 1 percent.

Typically, the Commerce soil has a dark grayish brown silt loam surface layer about 5 inches thick. The subsoil is grayish brown silty clay loam to a depth of about 29 inches. The substratum to a depth of about 60 inches is grayish brown silty clay loam and silt loam.

Typically, the Sharkey soil has a dark grayish brown silty clay loam surface layer about 10 inches thick. The subsoil and substratum to a depth of about 60 inches are gray clay.

Commerce and Sharkey soils are frequently flooded by overflow from the Mississippi River, mostly in the spring. Depth of the floodwater ranges from 2 to 10 feet. During nonflood periods, the Sharkey soil is wet and the water table is at the surface or within 2 feet of the surface. The Commerce soil has a water table at a depth of 1.5 to 4 feet during nonflood periods. The soils have low to fair strength. The Commerce soil is moderately slowly permeable. It has very high available water capacity and moderate shrink-swell potential. The Sharkey soil is very slowly permeable. It has very high 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 flood levels. In several areas, soils that are above normal flood levels are included. Also included are a few small areas of soils similar to the Commerce soil except they have less clay in the subsoil. The included soils make up about 20 percent of the map unit.

Most of the acreage is in urban uses or it is idle. A small acreage is used for extensive forms of recreation.

The soils in this map unit are not suited to cultivated crops, and they are poorly suited to pasture because of deep, frequent flooding. Scouring and sedimentation are also problems.

The Commerce soil is well suited to woodland, and the Sharkey soil is moderately well suited. Flooding and wetness limit the use of equipment on both soils, and seedling mortality is severe. Eastern cottonwood and American sycamore are suitable trees to plant on the Commerce soil, and baldcypress and willow are suitable trees to plant on the Sharkey soil. After harvesting, reforestation must be carefully managed to reduce competition from undesirable plants.

These soils generally are not suited to urban uses or intensive forms of recreation, mainly because of flooding, 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 above normal flood levels.

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

The soils in this map unit are in capability subclass Vw. The woodland ordination symbol is 12W for the Commerce soil and 6W for the Sharkey soil.

Dp—Dumps. This map unit consists of refuse dumps and sanitary landfills. It is mostly in swamps and marshes. Dumps are nearly level to sloping. Areas range from 5 to 50 acres.

Typically, these areas consist of successive layers of compacted refuse and thin soil layers. The combined thickness of these layers can range from 5 feet to more than 30 feet.

Included with these areas in mapping are a few small areas of Harahan; Westwego; Aquents, dredged; Clovelly; and Lafitte soils that are not yet covered by refuse.

This map unit is used chiefly for the disposal of solid waste. Dumps are not suited to agricultural, forest, or urban uses. Dumps are, however, used occasionally as commercial sites, but numerous problems preclude this as a recommended use.

Dumps are not assigned to interpretive groups.

GE—Gentilly muck. This very poorly drained, fluid, mineral soil is in brackish marshes. It is flooded or ponded most of the time. Fewer observations were made in areas of this soil; the mapping, however, is adequate for the expected uses. Areas of this soil range from about 20 to 500 acres. Slope is less than 1 percent.

Typically, this soil has a dark gray and very dark gray, very fluid muck surface layer about 10 inches thick. The underlying material to a depth of about 80 inches is gray, fluid and very fluid clay in the upper part and greenish gray, firm clay in the lower part. A few stumps and logs are buried in the underlying material in places.

This soil is almost continuously flooded. During storms, floodwater is as deep as 4 feet. The water table ranges from 1 foot above the surface to 0.5 foot below the surface. This soil has low strength. It is saturated with water and is very fluid. This soil has medium total subsidence potential. Shrink-swell potential is very high in the lower part of the soil. Permeability is very slow.

Included in mapping are a few large areas of Clovelly and Lafitte soils. Clovelly and Lafitte soils have a thick organic surface layer and are in positions similar to those of Gentilly soil. Also included are many small ponds and perennial streams. The included soils make up about 25 percent of the map unit.

Most of the acreage of this soil is used as habitat for wetland wildlife and for extensive forms of recreation.

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

This soil is well suited to habitat for wetland wildlife.

It provides habitat for large numbers of ducks and other species of waterfowl. It also provides habitat for crawfish, alligators, swamp rabbits, deer, nutria, mink, otter, and raccoon. The small ponds and perennial streams have many species of fish. Sport fishing and duck hunting are also popular. Intensive habitat management is difficult. Water control structures are difficult to construct because of the instability and very fluid nature of the upper layers of the soil.

This soil is not suited to crops, trees, or pasture because of wetness and flooding. Livestock can graze this soil during the dry seasons; however, the soil may be too soft and boggy most of the year.

This soil is not suited to urban uses or intensive recreation uses because of flooding, wetness, subsidence, and low strength for roads and streets. The soil material is poorly suited to the construction of levees. Upon drying, it shrinks and cracks considerably, and levees constructed of this soil fail.

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

Ha—Harahan clay. This poorly drained soil is in low positions on the Mississippi River flood plain. It is in former swamps. This soil is firm in the upper part and slightly fluid and very fluid in the lower part. Areas range from about 20 to 500 acres. Slope is less than 1 percent.

Typically, this soil has a black clay surface layer about 6 inches thick. The subsoil extends to a depth of about 36 inches. It is gray, firm clay. The substratum to a depth of about 72 inches is gray, slightly fluid and very fluid clay. Logs and stumps are in the underlying material in places. In most areas that are developed for urban uses, this soil is covered with about 1 to 3 feet of loamy or sandy fill material.

This Harahan soil is protected from most flooding by levees and is drained by pumps. Under normal conditions the water table is at a depth of about 1 to 3 feet. After heavy rains, the water table is near the surface for short periods. Adequate water is available to plants in most years. Flooding is rare, but it can occur during hurricanes or when water pumps or protection levees fail. Flooding occurs less often than once in 10 years, but can occur during anytime of the year. Water and air move through this soil at a very slow rate. Water runs off the surface slowly. This soil is high in fertility. It has very high shrink-swell potential and medium total subsidence potential.

Included with this soil in mapping are a few small areas of Sharkey and Westwego soils. Sharkey soils are in higher positions than Harahan soil and are firm and clayey throughout. Westwego soils are in positions similar to those of Harahan soil and they contain buried layers of organic material. The included soils make up about 5 percent of the map unit.

Most of the acreage of this soil is in urban uses. Houses, streets, buildings, and parking lots cover about 25 to 75 percent of most areas. The open areas are mostly lawns, vacant lots, and playgrounds. A small acreage is in pasture or is idle land that is reserved for future urban uses.

This soil is moderately well suited to pasture and crops. Suitable pasture plants are common bermudagrass, improved bermudagrass, Dallisgrass, ryegrass, tall fescue, and white clover. 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 moderately well suited to woodland; however, the soil is mainly reserved for future urban development and probably will not be used for commercial timber production.

This soil is poorly suited to urban uses and intensive forms of recreation. Wetness, very slow permeability, subsidence, low strength, and the very high shrink-swell potential are the main limitations, and flooding is a hazard. If buildings are constructed, pilings and specially constructed foundations are needed. Loamy fill material added to the soil surface can provide additional support and stability for buildings and roads. Adequate water control is needed to reduce wetness and to control the rate of subsidence. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with mineral material that has low shrink-swell potential. Shallow excavations are difficult to construct because of the buried stumps and logs in the soil and the slightly fluid and very fluid underlying material. Septic tank absorption fields do not function properly because of wetness and the very slow permeability. A community sewage system is needed if housing density is moderate to high.

This Harahan soil is in capability subclass IIIw. It is not assigned a woodland ordination symbol.

Ke—Kenner muck, drained. This poorly drained organic soil is in former freshwater marshes that have been drained and are protected from most floodwaters. Areas of this soil range from 500 to 5,000 acres. Slope is less than 1 percent.

In undisturbed areas, this soil typically has a black muck surface layer about 10 inches thick. The next layer to a depth of about 75 inches is very dark grayish brown and black muck that has a thin layer of gray, very fluid silty clay. Stumps and logs are in the underlying material in places. In most areas that have been developed for urban uses, 1 to 3 feet of loamy or sandy fill has been added to the surface. This soil shrinks and cracks upon drying and it remains cracked when wet.

This Kenner soil is drained by pumps and protected from flooding by levees. Under normal conditions, the water table is at a depth of about 1 to 4 feet. After prolonged high intensity rains, the water table is near 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 material and very slow in the mineral material. Although the surface has been covered with mineral fill material, cracks in the surface layer remain open and extend into the underlying material. Water and air move freely through these cracks. Natural fertility is high. The content of organic matter is very high. Available water capacity is very high. The shrink-swell potential is low in the organic material and high in the mineral material. The total subsidence potential is high.

Included with this soil in mapping are a few small areas of Allemands, Harahan, and Westwego soils. All of these soils are in slightly higher positions than Kenner soil. Also included are a few small areas of Kenner soils that have severely subsided and have a water table at the surface most of the time. The included soils make up about 15 percent of the map unit.

Most of the acreage of this soil is in urban uses. Houses, streets, buildings, and parking lots cover about 25 to 75 percent of most areas. Some areas are about 90 percent covered. The open areas are mostly lawns, vacant lots, playgrounds, and vegetable gardens. A small acreage is in pasture or idle land that is reserved for future urban uses.

This soil is poorly suited to most urban uses or intensive forms of recreation. Wetness, subsidence, and low strength for roads and streets are the main limitations, and flooding is a hazard. When the water table is lowered, the organic matter oxidizes and slowly subsides. Buried stumps and logs cause uneven subsidence in places. If dry, the organic material is subject to burning.

If this soil is used for buildings, pilings and specially constructed foundations are needed. Sandy or loamy fill material added to the soil surface can provide additional support and stability for buildings and roads. Adequate water control is needed to reduce wetness and to control the rate of subsidence. Drainage ditches and other shallow excavations are difficult to construct and maintain because of buried stumps and logs in the soil, the fluid nature of the underlying material, and the continuing subsidence. Septic tank absorption fields do not function properly in this soil because of wetness. A community sewage system is needed if housing density is moderate to high. Soil acidity limits the choice of ornamental trees and other plants used in landscaping.

This soil is moderately well suited to crops and pasture; however, few areas remain that are not in urban uses. Wetness is the main limitation. Adequate water control is needed. Suitable pasture plants are common bermudagrass, Dallisgrass, tall fescue, ryegrass, and white clover.

This Kenner soil is in capability subclass IVw. It is not assigned a woodland ordination symbol.

LF—Lafitte muck. This very poorly drained, slightly saline, very fluid, organic soil is in brackish marshes (fig. 4). It is flooded and ponded most of the time. Areas range from about 50 to 3,000 acres. Fewer observations were made in areas of this soil; the mapping, however, is adequate for the expected uses. Slope is less than 1 percent.

Typically, this soil has a very dark brown, slightly fluid muck surface layer about 6 inches thick. The next layer to a depth of about 75 inches is black, very fluid muck in the upper part and very dark brown, very fluid muck in the lower part. The underlying material to a depth of about 99 inches is dark grayish brown and gray, slightly fluid and very fluid clay.

This soil is flooded most of the time by brackish water and it is wet throughout the year. During storms, it 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 is as much as 0.5 foot below the soil surface. This soil has low strength and poor trafficability. Permeability is moderately rapid in the organic layers and very slow in the clayey layers. The subsidence potential is very high. If drained, the organic material dries and 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 drainage. 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 with this soil in mapping are a few small to large areas of Clovelly and Gentilly soils. Clovelly soils are in positions similar to those of Lafitte soil and they have a thinner layer of organic material over the clayey underlying material. Gentilly soils are in slightly higher

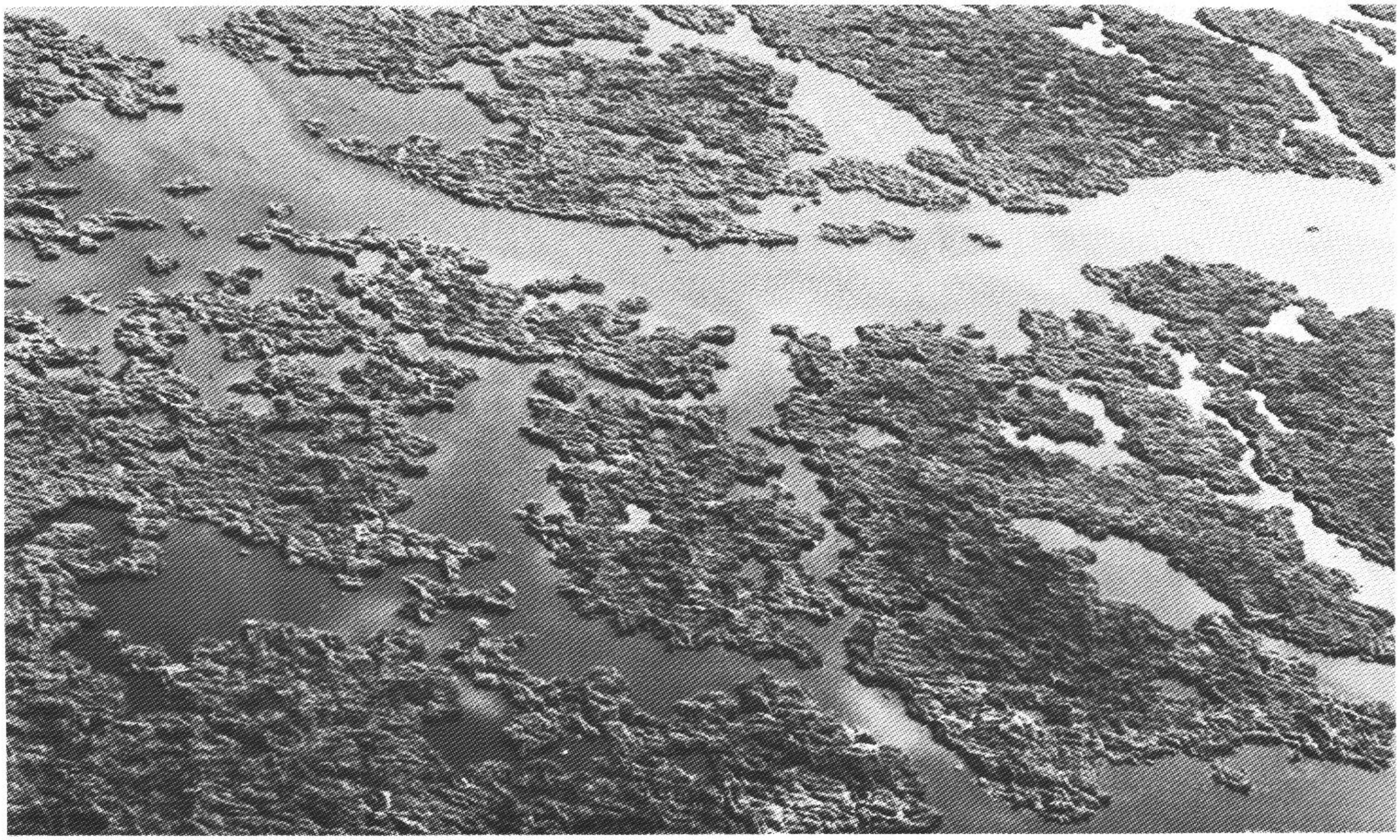


Figure 4.—Many tidal channels and small areas of open water are in most areas of Lafitte muck.

positions and are mineral soils. Few to many small ponds and tidal channels are included in places. Also included are a few small areas of soils similar to Lafitte soil except they contain buried logs and stumps. The included soils make up about 20 percent of the map unit.

Most of the acreage of this soil is used as habitat for wetland wildlife and for extensive forms of recreation, such as hunting and fishing.

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

This soil is well suited to habitat for wetland wildlife. It provides habitat for large numbers of waterfowl and furbearers, such as mink, muskrat, nutria, 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. Hunting of waterfowl is also popular.

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

This soil is not suited to urban and intensive recreation uses. Flooding, wetness, low strength for roads and streets, and subsidence potential are too severe for these uses. 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 ordination symbol.

Sh—Sharkey silty clay loam. This poorly drained, firm, mineral soil is in low and intermediate positions on natural levees of the Mississippi River and its distributaries. It is protected from most flooding by earthen levees. Areas range from about 10 to 300 acres. Slope is less than 1 percent.

Typically, this soil has a very dark grayish brown silty clay loam surface layer about 5 inches thick. The subsoil to a depth of 24 inches is dark gray clay in the upper part and 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 soil has high fertility. Water and air move through it at a very slow rate. Water runs off the surface at a slow rate and stands in low places for short periods after heavy rains. Flooding is rare, occurring less often than once in 10 years, but it can occur after prolonged heavy rains and anytime during the year. A seasonal high water table fluctuates between a depth of about 2 feet and the soil surface during the winter and spring. Adequate water is available to plants in most years. The surface layer of this soil is sticky when wet and hard when dry. This soil has very high shrink-swell potential.

Included with this soil in mapping are a few small areas of Commerce, Harahan, and Westwego soils. Commerce soils are in slightly higher positions than Sharkey soil and are loamy throughout. Harahan and Westwego soils are in slightly lower positions and have slightly fluid, clayey underlying material. The included soils make up about 5 percent of the map unit.

Most of the acreage of this soil is in urban uses. Buildings, streets, and parking lots cover about 25 to 75 percent of most urban areas. The open areas are mostly lawns, vacant lots, or playgrounds. A small acreage is in woodland, pasture, or crops.

This soil is poorly suited to most urban or intensive forms of recreation uses; however, it is one of the better soils in the survey area for these uses because it is firm, has mineral material throughout, and can support the foundation of most low structures without the use of pilings. The main limitations are wetness, very slow permeability, and very high shrink-swell potential. Rare flooding is a hazard. Drainage 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 trenches and constructing long absorption lines help to compensate for the very slow permeability. Providing drainage and adding sandy or loamy material to the surface improve this soil for playgrounds and other intensive recreation uses.

This soil is well suited to pasture. Suitable pasture plants are common bermudagrass, improved bermudagrass, Dallisgrass, ryegrass, tall fescue, wheat, vetch, and white clover. 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 and soil 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 sticky when wet and hard when dry and it becomes cloddy if tilled when too wet or too dry. Surface drainage is needed for most cultivated crops and pasture plants. Land grading and smoothing 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 production of hardwoods. American sycamore, water oak, and eastern cottonwood are suitable trees to plant. 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. The woodland ordination symbol is 7W.

Sk—Sharkey clay. This poorly drained, firm, mineral soil is in low positions on the natural levees of the Mississippi River and its distributaries. It is protected from river overflows by large earthen levees. Areas range from about 10 to 1,000 acres. Slope is less than 1 percent.

Typically, this soil has a dark gray clay surface layer about 5 inches thick. The subsoil to a depth of about 37 inches is dark gray clay in the upper part and gray clay in the lower part. The substratum to a depth of about 60 inches is gray clay.

This soil has high fertility. Water and air move through it at a very slow rate. Water runs off the surface at a slow rate and stands in low places for short periods after heavy rains. Flooding is rare, but it can occur after heavy prolonged rains. Flooding occurs less often than once in 10 years but can occur anytime of the year. A seasonal high water table fluctuates between the soil surface and a depth of about 2 feet during the winter and spring. Adequate water is available to plants in most years. The surface layer is very sticky when wet and very hard when dry. This soil has very high shrink-swell potential.

Included with this soil in mapping are a few small areas of Commerce, Harahan, and Westwego soils. Commerce soils are in slightly higher positions than Sharkey soil and have a loamy subsoil. Harahan and

Westwego soils are in slightly lower positions and have a fluid underlying material.

Most of the acreage of this soil is in urban uses. A small acreage is in woodland, pasture, or crops.

This soil is poorly suited to urban and intensive recreation uses; however, it is one of the best soils in the survey area for these uses. This firm, mineral soil can support the foundation of most low structures without the use of piling. The main limitations are wetness, very slow permeability, and the very high shrink-swell potential. Rare flooding is a hazard. Drainage 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, providing surface drainage and adding sandy or loamy material to the surface reduce wetness and stickiness of the surface layer.

This soil is well suited to pasture. Suitable pasture plants are common bermudagrass, improved bermudagrass, Dallisgrass, ryegrass, tall fescue, wheat, vetch, and white clover. 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 and the soil 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. The surface layer is very sticky when wet and very hard when dry, and it becomes very cloddy if tilled when too wet or too dry. This soil is difficult to keep in good tilth, and can be worked only within a narrow range of moisture content. A surface drainage system is needed for most cultivated crops and pasture plants. Land grading and smoothing help to remove excess water. Maintaining crop residue 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, water oak, and eastern cottonwood are suitable trees to plant. Trees should be water tolerant, and they should be planted or harvested during dry periods. The clay texture of the surface layer and wetness limit the use of equipment.

This Sharkey soil is in capability subclass IIIw. The woodland ordination symbol is 7W.

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. The areas range from 10 to 1,000 acres.

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.

Urban land is not assigned to interpretive groups.

Ww—Westwego clay. This poorly drained, mineral soil is in swamps that have been drained and are protected from most flooding. Areas range from about 10 to 1,000 acres. Slope is less than 1 percent.

Typically, this soil has a very dark gray clay surface layer about 4 inches thick. The subsoil to a depth of about 29 inches is dark gray and gray, firm clay. The subsoil shrinks and cracks and it remains cracked when wet. The next layer is very dark grayish brown, slightly fluid muck that is underlain by gray and greenish gray, very fluid and slightly fluid clay to a depth of 70 inches. Many logs and stumps are buried in the lower layers in places. 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 at a depth of about 1 to 3 feet. After heavy rains, the water table may be near 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. Flooding occurs less often than once in 10 years, but can occur anytime of the year. 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 with this soil in mapping are a few small areas of Allemands, Harahan, Kenner, and Sharkey soils. Allemands and Kenner soils are in lower positions on the landscape and are organic soils. Harahan and Sharkey soils are in slightly higher positions and are clayey throughout. The included soils make up about 5 percent of the map unit.

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

This soil is poorly suited to urban or intensive recreation uses. The main limitations are wetness, subsidence, low strength for roads and streets, and the high shrink-swell potential. Rare flooding is a hazard. Buried stumps and logs cause uneven subsidence in places.

If the soil is used for dwelling sites, pilings and specially constructed foundations are needed. Adding sandy or loamy fill material 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 using proper engineering designs for buildings and roads. Buried logs and stumps cause uneven subsidence of the soil in places. Septic tank absorption fields do not function properly 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 the very fluid mineral and organic materials subside and crack as the soil dries.

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

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

Prime Farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Orleans Parish are listed.

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

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

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They are used for producing food or fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water control structures. Public land is land not available for farming in national forests, national parks, military reservations, and state parks.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not subject to frequent flooding during the growing season. The slope ranges mainly from 0 to 1 percent.

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

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.

Cm	Commerce silt loam
Co	Commerce silty clay loam
Ha	Harahan clay
Sh	Sharkey silty clay loam
Sk	Sharkey clay

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 avoid 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 behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation 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 that is in harmony with nature.

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

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

Crops and Pasture

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

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 Soil Conservation Service or the Cooperative Extension Service.

Only a small acreage in Orleans Parish is used for crops and pasture, but that acreage is remaining fairly constant. Small acreages of cropland and pasture are converted to industrial use each year.

Differences in crop suitability and management needs are the result of differences in soil characteristics, such as fertility levels, erodibility, content of organic matter, and the availability of water for plant growth. Drainage, the hazard of flooding, cropping systems, and soil tillage are also important in management. Because the soil pattern of a farm is unique, each farm has unique management problems. Some principles of farm management, however, apply to specific soils and certain crops. This section gives the general principles of management that can be applied widely to the soils of Orleans Parish.

Perennial grasses, legumes, or mixtures of grasses and legumes are grown for pasture and hay. These mixtures generally consist of either a summer or a winter perennial grass and a suitable legume. In addition, many farmers seed small grains or ryegrass in the fall for winter and spring forage. Excess grass in summer is harvested as hay.

Common and improved bermudagrass and Pensacola bahiagrass are the main summer perennials. These grasses produce good quality forage. Tall fescue, the main winter perennial grass, grows well on most of the soils in the parish. All of these grasses respond well to fertilizer, particularly nitrogen. White clover, crimson clover, vetch, and wild winterpeas are the most common legumes.

Proper grazing is essential for high quality forage, stand survival, and erosion control. A system of rotation grazing improves forage production and quality. Brush and weed control, applications of fertilizer, and renovation of the pasture are also important.

Fertilization and liming. The amount of fertilizer needed depends upon the crop, past cropping history, level of yield desired, and the soil phase. Specific recommendations should be based on laboratory analysis of soil samples from each field.

A soil sample for laboratory testing should consist of a single soil phase and should represent no more than 10 acres. Agricultural agencies in the parish can supply detailed information and instruction regarding soil sampling.

The soils in Orleans Parish generally range from medium acid to moderately alkaline in the upper 20 inches. They generally do not require lime. However, the drained marshes and swamps have a highly oxidized organic or clayey layer at the surface that ranges to extremely acid. Liming of these soils may not be economically practical because of the large lime requirement.

Organic matter content. Organic matter is an important source of nitrogen for crop growth. It also increases the water intake rate, reduces surface crusting and soil loss by erosion, and promotes good physical condition of the surface soil.

Most of the cultivated soils in Orleans Parish are low to moderate in content of organic matter. To a limited extent, organic matter can be improved and maintained by leaving plant residue on the soil, promoting more plant growth and using plants that have extensive root systems, adding barnyard manure, and growing perennial grasses and legumes in rotation with other crops.

Soil tillage. Soil tillage prepares the seedbed and controls weeds. Seedbed preparation and cultivating and harvesting tend to damage the soil structure. Crusting of the surface and compaction of the soil can be reduced by returning the crop residue to the soil and using conservation tillage. Excessive cultivation of soils should be avoided. Some of the clayey soils in the parish become cloddy if they are plowed.

A compacted layer develops in loamy soils that are plowed to the same depth for long periods or are plowed when wet. This compacted layer, generally known as a traffic pan or plowpan, develops just below the plow layer. This condition can be avoided by not plowing when the soil is wet, by varying the depth of plowing, or by subsoiling or chiseling.

Some tillage implements stir the surface and leave crop residue as protection from beating rains; thus, the use of such implements helps to control erosion, reduce runoff, and increase infiltration.

Drainage. The soils in the parish need surface drainage. Early drainage methods involved a complex pattern of main ditches, laterals, and field drains. A more recent approach combines land leveling and grading with minimum use of open ditches. Larger and more uniformly shaped fields are created and are more suited to the use of modern, multirow farm machinery.

The Mississippi River guide levee system protects most cropland and pastureland from flooding, yet some of the soils at lower elevations are subject to flooding by runoff from higher areas. Flooding in many of these areas is controlled by constructing a ring levee system and by pumping away excess water.

Water for plant growth. In Orleans Parish, water commonly is available for optimum plant growth without irrigation. Large amounts of rainfall occur in summer, and the distribution pattern favors the growth of sugarcane. The rainfall pattern precludes economical growth of certain crops. Cotton, for example, is better suited to a drier climate. Soybeans are grown, but the climate in Orleans Parish is near the maximum wetness range. The available water capacity of soils in the parish is high or very high.

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 fertility and maintain permeability in the subsoil, and a close-growing crop to help maintain the content of organic matter. 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 a cropping system that has a higher percentage of pasture than the cropping system used on cash-crop farms. Grass or legume cover crops are commonly grown during the fall and winter.

Additional information on cropping systems can be obtained from the Soil Conservation Service, the Cooperative Extension Service, or the Louisiana Agricultural Experiment Station.

Control of erosion. Soil erosion is not a serious problem in Orleans Parish mainly because the topography is level or nearly level. Sheet erosion is moderate in all fallow-plowed fields and in newly constructed drainage ditches. Some gully erosion occurs where side water enters the drainage ditches unless water control structures are installed. Sheet and gully erosion can be reduced by maintaining a cover of vegetation or plant residue, by conservation tillage, and by controlling weeds by methods other than fallow plowing. New drainage ditches need to be seeded immediately after construction. Water control structures placed in areas where water flows into drainage ditches help control gully erosion.

Land Capability Classification

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

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

Class I soils have few limitations that restrict their use. There are no class I soils in Orleans 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 they 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 Orleans 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, such as *w*, 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).

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

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

Woodland Management and Productivity

Soils vary in their ability to produce trees. Depth, 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 soils 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 6 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 6 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 *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 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*.

Ratings of *windthrow hazard* consider the likelihood of trees being uprooted by the wind. Restricted rooting depth is the main reason for windthrow. Rooting depth can be restricted by a high water table or by a combination of such factors as soil wetness, texture, structure, and depth. The risk is *slight* if strong winds cause trees to break but do not uproot them; *moderate* if strong winds cause an occasional tree to be blown over and many trees to break; and *severe* if moderate or strong winds commonly blow trees over. Ratings of *moderate* or *severe* indicate the need for care in thinning or possibly not thinning. Specialized equipment may be needed to avoid damage to shallow root systems in partial cutting operations. A plan for periodic salvage of windthrown trees and the maintenance of a road and trail system may be needed.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. *Plant competition* becomes more severe on the more productive soils, on poorly drained soils, and on soils having a restricted root zone that holds moisture. The risk is *slight* if competition from undesirable plants reduces adequate natural or artificial reforestation but does not necessitate intensive site preparation and maintenance. The risk is *moderate* if competition from undesirable plants reduces natural or artificial reforestation to the extent that intensive site preparation and maintenance are needed. The risk is *severe* if competition from undesirable plants prevents adequate natural or artificial reforestation unless the site is intensively prepared and maintained. A *moderate* or *severe* rating indicates the need for site preparation to ensure the development of an adequately stocked stand. Managers must plan site preparation measures to ensure reforestation without delays.

The potential productivity of *common trees* on a soil is expressed as a *site index*. 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 the site index that was determined at age 30 years for eastern cottonwood, 35 years for American sycamore, and 50 years for all other species.

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 procedure and technique for determining the site index are given in the site index tables used for the Orleans Parish soil survey *(3, 4, 5, 6)*.

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

In table 7, the soils of the survey area are rated according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness 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 sewerlines. 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 use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface 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 almost level and 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, Soil Conservation Service, helped to prepare this section.

Wildlife habitat in Orleans Parish is primarily restricted to the marshland. Urbanization has virtually eliminated wildlife habitat on other lands.

In the southwestern part of the parish, a seasonally flooded hardwood area called "Algiers Point" currently provides limited habitat for woodland wildlife. Future urban expansion is expected to consume most of this woodland habitat.

The marshland in Orleans Parish is in a narrow band between Lake Borgne and Lake Pontchartrain. The Intracoastal Waterway crosses a significant part of this marshland.

The undeveloped marshland in the parish is habitat for many kinds of wildlife *(23)*. It makes up about 5,000 acres, or 2 percent of the total area of the parish. Most species of waterfowl that use the Mississippi Flyway either winter in the marsh or stop for food and rest during their migration further south. The mottled duck is a permanent resident. Common furbearers that inhabit the marsh are muskrat, raccoon, nutria, otter, and mink. The American alligator is an inhabitant, and the marshes provide habitat for many resident and migratory nongame birds. In addition, the marshes are part of the coastal estuarine complex that significantly supports marine life from the Gulf of Mexico.

The kinds and population densities of wildlife using any part of a marsh depend to a large extent upon the salinity levels and the kind of native plants. In Orleans Parish, the majority of the marshes are classified as brackish marshes *(14)*. The native plants growing in these marshes are tolerant of moderate amounts of salt. Marshhay cordgrass, dwarf spikerush, Olney bulrush, saltmarsh bulrush, coastal waterhyssop, and saltmarsh morningglory are the dominant plants. A complete list of native plants growing in the soils of the brackish marsh is in table 8.

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

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

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

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, 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, lovegrass, 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, 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, salinity, slope, and surface stoniness. 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 or coniferous plants or both 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, nutria, and beaver.

Marshland Management

Billy R. Craft, state staff biologist, Soil Conservation Service, helped to 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 is available at the local office of the Soil Conservation Service, the Cooperative Extension Service, or the Louisiana Agricultural Experiment Station.

The loss of Louisiana's coastal marshlands has reached a crisis level. Orleans 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 *(13)*. 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 man's actions can be controlled with better management and restraint. Activities such as drainage and the construction of channels for navigation accelerate the rates of erosion, subsidence, and salt water 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 *(14)*. The marsh plants are the basic source of energy for dependent animal populations, such as muskrat, and conditions enhancing plant growth also 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. Salt water 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.

Many opportunities exist for improving the marshes of Orleans Parish for fish, wildlife, and other resources *(23)*. 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 watercourses 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 that have fixed crests are most useful in brackish marshes. Other types of water control structures are needed for freshwater 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. This has positive impact on furbearers, such as muskrat, and other wildlife species.

Prescribed burning results are best in brackish marshes, but freshwater marshes also benefit. Controlled burning done in the fall is 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 to help control shoreline erosion. Structural and vegetative approaches or a combination of both are currently being used.

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

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

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. The ratings are given in the following tables: 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, and 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 must 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, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind 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, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

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

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

Building Site Development

Table 10 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 basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to a very firm dense layer, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the 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, shrink-swell potential, and organic layers can cause the movement of footings. Depth to 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 to 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, depth to 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 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and that good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

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

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel 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 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, depth to a high water table, flooding, and content of organic matter.

Excessive seepage due to rapid permeability of 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 needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to a water table, and flooding affect both types of landfill. Texture, highly organic layers, soil reaction, and content of salts and sodium affect trench type 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 type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture and wetness 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 bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as 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 12 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. No soils in Orleans Parish are a suitable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help 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 mainly by a high water table. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand. They 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 or a 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 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 clayey, have less than 20 inches of suitable material, have a large amount of soluble salts or have a seasonal 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 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to permeable material.

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

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

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

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and the salinity of the soil.

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 other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; 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, or 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, and permeability. 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 characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, 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 14 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 "Soil Series and Their Morphology."

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

Classification of the soils is determined according to the Unified soil classification system *(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 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They influence the soil's adsorption of cations, moisture retention, 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 ⅓ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of movement of water through the soil when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, 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 in each major soil layer is stated in inches of water per inch of soil. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

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

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

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

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

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The 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; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year *(24)*. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

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

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

In table 15, 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 of 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 16 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, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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

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

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have 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 covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

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). 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. November-May, for example, means that flooding can occur during the period November through May. 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 16 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 16.

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.

The two numbers in the "High water table—Depth" column indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that the water table exists for less than a month.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence 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 16 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 creates 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 the amount of sulfates in the saturation extract.

Urban Development Features

Expansion of the New Orleans metropolitan area 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, drained; Aquents, dredged; Aquents, dredged, frequently flooded; Clovelly muck; Gentilly muck; Harahan clay; Kenner muck, drained; Lafitte 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 50 percent reduction in 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 upon temperature (amount of time per year above 41 degrees Fahrenheit, 5 degrees Centigrade), 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	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 upon 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, and runoff increases. Consequently, drainage canal size and pumping capacity generally are 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 materials 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. Buildings tilt and foundations crack unless piling is used for support. Organic soils around structures built on piling 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 (fig. 5). Underground utility lines may be damaged.

Resolving the problem of subsidence is a concern of homeowners and communities. Some things can be done to minimize subsidence problems.

Selection of building site.—Avoid sites that have organic or fluid mineral soil layers. Table 16 gives the subsidence potential of each soil. The final selection should be based on onsite examination.

Structure design and minerals.—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 is 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 can eliminate cracking and possibly make re-leveling after subsidence easier. Other construction materials, such as brick, shell, gravel, or lightweight aggregate, can be considered for these uses.

Initial site fill practices.—Subsidence can be reduced by adding mineral fill material to the organic soil

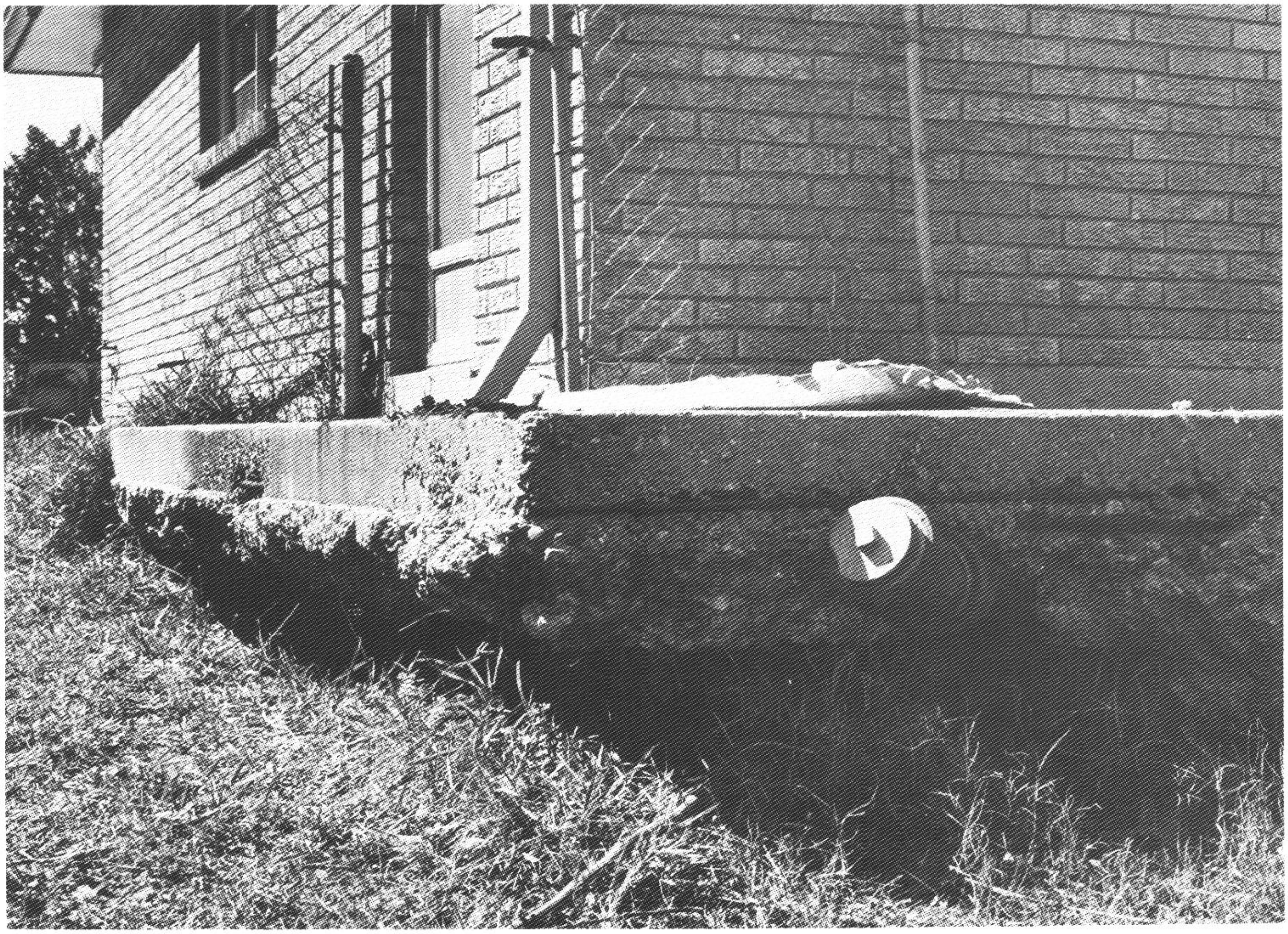


Figure 5.—Subsidence severely limits Kenner muck, drained, for urban uses because building foundations are exposed and utility lines are damaged.

surface. 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 material will be eliminated. Future subsidence (unless the water table is lowered) will be limited to compaction or displacement. Loamy mineral soil material generally is considered the most desirable fill material. Fill material high in content of organic matter 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 occurs, adding small amounts or thin layers of fill generally is preferable to adding thick layers. Regularly adding 1 or 2 inches of fill material as needed generally will not permanently harm most lawn grasses and landscaping plants. If filling is postponed until several inches to a foot or more of fill is required, the thick layers of fill can permanently damage lawn grasses and landscape plants.

Underground utilities.—Engineering innovations that allow utility lines to be moved as soil surface elevation changes should reduce the number of failures. For example, flexible pipes at joints where pipes are connected to stationary structures can 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 can help eliminate the differences in water table depth. Also, a carefully designed and constructed drainage system makes 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 can 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. The water table could then 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.

Lawns and Gardens

Before the Mississippi River guide levees were constructed, all of the soils in Orleans Parish were subject to flooding by the river. Additional increments of fertile sediment were added to the soils with each flood, thus, most of the soils in the parish have fertility levels that are adequate for most lawn and garden plants. Other important soil properties for growing lawn and garden plants are texture, subsidence potential, wetness, and reaction. Flooding is also important. The use and management of soils in the parish for lawns and gardens are discussed in this section.

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 suitable for 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 the 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 Kenner, drained, and Allemands, drained, soils are in former marshes. These soils have a thick organic surface layer that subsides and cracks irreversibly. These soils can be covered with several inches of loamy fill material to improve their use for lawns and gardens.

Some soil related problems cannot be eliminated by adding fill material to the soil surface. For example, continuing subsidence causes planters to 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. In addition, large cracks can form on the surface during dry periods. These problems can be partly overcome by adding a few inches of loamy fill material to the soil surface annually or more often as needed.

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

Fill material.—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 area are listed in descending order of suitability for use in gardens and lawns.

Loamy material deposited by the Mississippi River.—This material is excavated from areas of Commerce soils along the river or within the Bonnet Carre Floodway. 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 capacity 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 typically is excavated from the drained swamps and marshes and has some unfavorable characteristics. For example, the organic material shrinks, subsides, and decomposes over time, and becomes extremely acid as it decomposes. Mixing loamy material with the organic material and applying lime improves the suitability of this material.

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

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 17 and the results of chemical analysis in table 18. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by the Soil Fertility Laboratory, Louisiana State University.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods *(25)*.

Sand—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).
Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all materials less than 2 mm (3A1).
Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).
Water retained—pressure extraction, percentage of oven-dry weight of less than 2 mm material; ⅓ or 1/10 (3/10) bar (4B1), 15 bars (4B2).
Field moist bulk density—of less than 2 mm material, saran-coated clods (4A3a).
Organic carbon—dichromate, ferric sulfate titration (6A1a).
Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (6O2), sodium (6P2), potassium (6Q2).
Extractable acidity—barium chloride-triethanolamine (6G2b).
Cation-exchange capacity—sodium acetate, pH 8.2 (5A2a).
Base saturation—ammonium acetate, pH 7.0 (5C1).
Reaction (pH)—1:1 water dilution (8C1a).
Reaction (pH)—calcium chloride (8C1e).
Iron—dithionate-citrate extract (6C1).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(22)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fluvaquents (*Fluv*, meaning 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 is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fluvaquents. The adjective *Aeric* identifies a subgroup that is browner and better aereated than the typic subgroup.

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

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the substratum within a series. The Commerce series is an example of a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other 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 (20)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (22)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Allemands Series

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

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

Allemands soils commonly are near Harahan, Kenner, Sharkey, and Westwego soils. Allemands soils are similar to Clovelly soils that are in nearby undrained marshes and are more saline. Harahan and Westwego soils are in drained swamps and are mineral soils. Kenner soils are in slightly lower positions than Allemands soils and have organic layers more than 51 inches thick. Sharkey soils are in higher positions than the Allemands soil and are firm mineral soils.

Typical pedon of Allemands muck, drained; 2 miles south of Interstate 10, 0.3 mile north of U.S. Highway 90, 300 feet west of Paris Road; Spanish Land Grant 6, T. 12 S., R. 13 E.

Oa1—0 to 6 inches; very dark gray (10YR 3/1) muck; about 40 percent fiber, 10 percent rubbed; massive; friable; nonsticky; common fine live roots; about 40 percent mineral matter; strongly acid; clear wavy boundary.

Oa2—6 to 25 inches; black (10YR 2/1) muck; about 20 percent fiber, less than 5 percent rubbed; massive; nonsticky; few fine live roots; about 40 percent mineral matter; strongly acid; clear wavy boundary.

Oa3—25 to 30 inches; very dark grayish brown (10YR 3/2) muck; about 10 percent fiber, less than 5 percent rubbed; massive; slightly fluid; few fine live roots; about 50 percent mineral matter; strongly acid; clear smooth boundary.

Cg1—30 to 46 inches; gray (5Y 5/1) clay with thin strata of fine sandy loam; few medium distinct light olive brown (2.5Y 5/6) mottles; massive; slightly fluid; mildly alkaline; clear smooth boundary.

Cg2—46 to 60 inches; gray (5Y 5/1) clay; massive; very fluid; mildly alkaline.

The organic material is 16 to 51 inches thick. The underlying mineral material is dominantly clay, but thin strata of loamy material are in some pedons.

The surface tier (0 to 12 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 extremely acid to neutral.

The organic material in the subsurface tier (12 to 36 inches) has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3. The content of rubbed fiber ranges from 1 to 10 percent. Reaction ranges from strongly acid to neutral.

The Cg horizon has hue of 5Y, 5G, or 5GY, value of 4 or 5, and chroma of 1 or 2. Reaction ranges from slightly acid to moderately alkaline.

Clovelly Series

The Clovelly series consists of very poorly drained, very slowly permeable, slightly saline, very fluid, organic soils. The soils formed in moderately thick accumulations of decomposed herbaceous plant material underlain by 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 Gentilly and Lafitte soils, both of which are in positions similar to those of Clovelly soils. Gentilly soils are very fluid, mineral soils underlain by consolidated clays. Lafitte soils have organic layers that are more than 51 inches thick.

Typical pedon of Clovelly muck; 1.3 miles east of Lake St. Catherine, 0.3 mile south of the Intracoastal Waterway, 200 feet west of canal; sec. 20, T. 11 S., R. 15 E.

Oa1—0 to 8 inches; very dark grayish brown (10YR 3/2) muck; about 20 percent fiber, 10 percent rubbed; massive; very fluid; many medium and fine roots; about 60 percent mineral; moderately alkaline; gradual smooth boundary.

Oa2—8 to 31 inches; black (10YR 2/1) muck; about 10 percent fiber, less than 5 percent rubbed; massive; very fluid; few fine roots; about 40 percent mineral; moderately alkaline; gradual smooth boundary.

C1g—31 to 46 inches; dark gray (10YR 4/1) mucky clay; massive; very fluid; moderately alkaline; clear smooth boundary.

C2g—46 to 72 inches; gray (5Y 5/1) clay; massive; very fluid; moderately alkaline.

The organic material is about 16 to 51 inches thick. 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 organic layers have 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 that 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 and has value of 4 to 6. The texture is clay, silty clay, or mucky clay. Reaction is mildly 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, moderately slowly permeable, firm, mineral soils. These soils formed in loamy Mississippi River alluvium. They are in high and intermediate positions on natural levees along the Mississippi River and its distributaries. Slope is 0 to 1 percent.

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

Commerce soils commonly are near Harahan, Sharkey, and Westwego soils. These soils are in lower positions than Commerce soils and they have a clayey subsoil.

Typical pedon of Commerce silty clay loam; in Algiers, 400 feet south of the intersection of General Meyers Avenue and Aurora Drive; Spanish Land Grant 18, T. 13 S., R. 24 E.

Ap—0 to 4 inches; dark gray (10YR 4/1) silty clay loam; weak fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

Bw1—4 to 14 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; slightly acid; gradual smooth boundary.

Bw2—14 to 22 inches; grayish brown (10YR 5/2) silty clay loam; few medium distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; gradual smooth boundary.

BC—22 to 32 inches; grayish brown (10YR 5/2) silt loam; few fine and medium distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; mildly alkaline; clear smooth boundary.

C—32 to 60 inches; gray (10YR 5/1) silt loam; few fine faint brown mottles; massive; friable; few fine roots; few black stains; common thin strata of very fine sandy loam, silty clay loam, and silty clay; mildly alkaline.

The solum is 20 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. Texture is silt loam or silty clay loam. The Ap horizon is 4 to 12 inches thick. If the value is 3, this horizon is less than 6 inches thick. Reaction ranges from medium acid to moderately alkaline. Some pedons have an Ab horizon that has the same range in color and texture as the Ap horizon, and reaction ranges from neutral to moderately alkaline.

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

Gentilly Series

The Gentilly series consists of very poorly drained, very slowly permeable, slightly to moderately saline soils that formed in thin accumulations of herbaceous plant remains and fluid clayey alluvium underlain by consolidated clayey deposits. Slope is less than 1 percent.

Soils of the Gentilly series are fine, montmorillonitic, nonacid, thermic Typic Hydraquents.

Gentilly soils commonly are near Clovelly and Lafitte soils. These soils are in slightly lower positions than Gentilly soils and are organic.

Typical pedon of Gentilly muck; about 14 miles northeast of New Orleans, 1 mile north of U.S. Highway 90, 270 feet west of U.S. Highway 11; Spanish Land Grant 1, T. 11 S., R. 13 E.

Oa1—0 to 4 inches; dark gray (10YR 4/1) muck; massive; very fluid; about 18 percent fiber, 8 percent rubbed; about 70 percent mineral; medium acid; abrupt smooth boundary.

Oa2—4 to 10 inches; very dark gray (10YR 3/1) muck; massive; very fluid; about 12 percent fiber, 5 percent rubbed; about 65 percent mineral; many coarse yellowish brown (10YR 5/6) herbaceous plant stems and roots; medium acid; abrupt smooth boundary.

Cg1—10 to 20 inches; gray (5Y 5/1) clay; common medium prominent dark yellowish brown (10YR 3/2) mottles; weak medium subangular blocky structure; fluid; neutral; clear smooth boundary.

Cg2—20 to 40 inches; gray (5Y 5/1) clay; common medium prominent dark brown (7.5YR 4/4) and yellowish brown (10YR 5/6) mottles; massive; very fluid; neutral; clear smooth boundary.

Cg3—40 to 80 inches; greenish gray (5GY 5/1) clay; common medium distinct olive (5Y 4/4) mottles; massive; very sticky and very plastic; mildly 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 between 8 and 20 inches below the mineral surface have an *n* value of more than 0.7. The clay content of the mineral layer within the 10- to 40-inch control section is 35 to 60 percent.

Total thickness of the Oa horizon ranges from 4 to 16 inches. Texture of the Oa2 horizon is muck, mucky peat, peaty muck, or peat. The Oa horizon is dark gray (10YR 4/1), dark grayish brown (10YR 4/2), very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), dark brown (10YR 3/3; 7.5YR 3/2), or black (10YR 2/1). The mineral fraction is dominantly clay. Reaction ranges from medium acid to mildly alkaline, becoming strongly acid or very strongly acid after drainage.

The Cg horizon is gray (10YR 5/1; N 5/0; 5Y 5/1), dark gray (10YR 4/1; N 4/0; 5Y 5/1), greenish gray (5GY 5/1), or dark greenish gray (5GY 4/1). Texture is mainly clay or silty clay that has brownish or olive mottles or both. The upper part of the Cg horizon is mucky clay in some pedons. Reaction is neutral or mildly alkaline, becoming medium acid to very strongly acid in the upper part after drainage. Depth to underlying layers that have *n* value of 0.7 or less ranges from 20 to 40 inches below the mineral surface.

Harahan Series

The Harahan series consists of poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are firm in the upper part and slightly fluid in the lower part. They are in drained, former swamps in the lower part of the Mississippi River flood plain. The soils are rarely flooded. Elevation ranges from sea level to about 3 feet below sea level. Slope is less than 1 percent.

Soils of the Harahan series are very fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Harahan soils commonly are near Allemands, Sharkey, and Westwego soils. Allemands soils are in slightly lower positions than Harahan soils and are organic soils. Sharkey soils are in higher positions and they have an *n* value of less than 0.7 throughout. Westwego soils are in positions similar to those of Harahan soils and have organic layers within the control section.

Typical pedon of Harahan clay; 1.7 miles south of Interstate 10, 0.3 mile west of Paris Road, 200 feet south of U.S. Highway 90, 300 feet north of railroad right of way; Spanish Land Grant 44, T. 12 S., R. 12 E.

A—0 to 6 inches; black (10YR 2/1) clay; moderate medium subangular blocky structure; firm; common fine roots; medium acid; clear wavy boundary.

Bg1—6 to 20 inches; gray (5Y 5/1) clay; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; few slickensides that do not intersect; medium acid; clear wavy boundary.

Bg2—20 to 36 inches; gray (5Y 5/1) clay; weak coarse subangular blocky structure; firm; few fine roots; slightly acid; clear smooth boundary.

Abg—36 to 40 inches; very dark grayish brown (10YR 3/2) mucky clay; weak medium subangular blocky structure; slightly fluid; few wood fragments; slightly acid; clear smooth boundary.

Cg1—40 to 57 inches; gray (5Y 5/1) clay; massive; slightly fluid; neutral; clear smooth boundary.

Cg2—57 to 72 inches; gray (5Y 5/1) clay; massive; very fluid; moderately alkaline.

The solum is 20 to 40 inches thick. Depth to layers with *n* value of more than 0.7 ranges from 20 to 40 inches. Cracks as wide as 1.5 inches form and extend 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. It is 3 to 7 inches thick. 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 that 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.

Kenner Series

The Kenner series consists of poorly drained, rapidly permeable, organic soils. The soils formed in herbaceous plant material in freshwater marshes that have been drained. Slope is less than 1 percent.

Soils of the Kenner series are euic, thermic Fluvaquentic Medisaprists.

Kenner soils commonly are near Allemands, Harahan, and Westwego soils and are similar to Lafitte soils. Allemands soils do not have mineral layers in the upper part of the profile. Harahan and Westwego soils are in areas of drained swamp and are mineral soils. Lafitte soils are in nearby undrained brackish marshes.

Typical pedon of Kenner muck, drained; 1.5 miles south of Interstate 10, 0.6 mile north of U.S. Highway 90, about 500 feet east of Michoud Boulevard, 1,200 feet west of Etienne de Boré Elementary School, 100 feet southwest of intersection of Revel and North Nemours Streets; Spanish Land Grant 37, T. 12 W., R. 13 E.

Oa1—0 to 10 inches; black (10YR 2/1) muck; about 20 percent fiber, 10 percent rubbed; weak fine granular structure; friable; few fine roots; about 50 percent mineral; very strongly acid; clear wavy boundary.

Oa2—10 to 36 inches; very dark grayish brown (10YR 3/2) muck; about 10 percent fiber, less than 5 percent rubbed; weak fine granular structure; friable; common fine roots; about 40 percent mineral; neutral; clear smooth boundary.

Cg1—36 to 40 inches; gray (5Y 5/1) silty clay; massive; very fluid; slightly acid; clear smooth boundary.

Oa3—40 to 55 inches; very dark grayish brown (10YR 3/2) muck; about 30 percent fiber, 5 percent rubbed; massive; very fluid; about 50 percent mineral; neutral; clear smooth boundary.

Oa4—55 to 75 inches; black (10YR 2/1) muck; about 20 percent fiber, less than 5 percent rubbed; massive; very fluid; about 60 percent mineral; neutral.

The organic material is 51 to more than 100 inches thick. Depth to thin mineral strata ranges from 12 to 51 inches.

The organic material in the surface tier (0 to 12 inches) has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The content of rubbed fiber ranges from 5 to 60 percent, and the mineral content ranges from 40 to 70 percent. Reaction ranges from extremely acid to neutral. A thin overwash of clay is in some pedons.

The organic material in the subsurface and bottom tiers (12 to 51 inches) has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The content of rubbed fiber ranges from 1 to 15 percent. Reaction ranges from extremely acid to neutral.

Thickness of mineral strata (Cg horizons) within the subsurface and bottom tiers ranges from 1 millimeter to 25 centimeters. The Cg horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or hue of 5Y or 5GY, value of 4 or 5, and chroma of 1. Reaction ranges from neutral to extremely acid. The Cg horizon is clay, silty clay, or mucky clay.

Lafitte Series

The Lafitte series consists of very poorly drained, saline, organic soils. These soils are rapidly permeable in the upper part and very slowly permeable in the lower part. They formed in decomposed herbaceous plant material. These soils are in the brackish Gulf Coast marshes. They are ponded or almost continuously flooded. Slope is less than 1 percent.

Soils of the Lafitte series are euic, thermic Typic Medisaprists.

Lafitte soils commonly are near Clovelly and Gentilly soils and are similar to Kenner soils. Clovelly soils have organic layers that are thinner than those of the Lafitte soils. Gentilly soils are in freshwater marshes and are mineral soils. Kenner soils are in drained freshwater marshes and are not so saline as Lafitte soils.

Typical pedon of Lafitte muck; 3.4 miles east of junction of Louisiana Highway 47 and Interstate 10; Spanish Land Grant 1, T. 11 S., R. 13 E.

Oa1—0 to 6 inches; very dark brown (10YR 2/2) muck, same color pressed and rubbed; about 5 percent fiber, less than 1 percent rubbed; weak coarse subangular blocky structure; slightly fluid; many fine live roots; dominantly herbaceous fiber; about 50 percent mineral matter; few very dark reddish brown (5YR 3/4) fragments of woody fiber; moderately alkaline; gradual smooth boundary.

Oa2—6 to 16 inches; black (10YR 2/1) muck, same color pressed and rubbed; about 6 percent fiber, 1 to 2 percent rubbed; weak medium granular structure; very fluid; dominantly herbaceous fiber; about 20 percent mineral matter; moderately alkaline; gradual smooth boundary.

Oa3—16 to 30 inches; black (10YR 2/1) muck, same color pressed and rubbed; about 3 percent fiber, less than 1 percent rubbed; weak fine granular structure; very fluid; dominantly herbaceous fiber; about 20 percent mineral matter; moderately alkaline; gradual smooth boundary.

Oa4—30 to 48 inches; black (10YR 2/1) muck, same color pressed and rubbed; about 5 percent fiber, 1 percent rubbed; weak fine granular structure; fluid; about 25 percent mineral matter; moderately alkaline; clear smooth boundary.

Oa5—48 to 52 inches; black (10YR 2/1) muck, same color pressed and rubbed; about 8 percent fiber, 2 percent rubbed; weak coarse subangular blocky structure; very fluid; dominantly herbaceous fiber; about 30 percent mineral matter; moderately alkaline; clear smooth boundary.

Oa6—52 to 75 inches; very dark brown (10YR 2/2) muck, same color pressed, dark reddish brown (5YR 3/2) rubbed; about 20 percent fiber, 5 percent rubbed; weak coarse granular structure; very fluid; dominantly herbaceous fiber; about 55 percent mineral matter; moderately alkaline; abrupt smooth boundary.

Agb—75 to 90 inches; dark grayish brown (2.5Y 4/2) clay; massive; slightly fluid; moderately alkaline; abrupt smooth boundary.

Cg—90 to 99 inches; gray (N 6/0) clay; massive; very fluid; moderately alkaline.

Depth to mineral layers ranges from 51 to 100 inches or more. The sodium adsorption ratio in the subsurface tier (12 to 36 inches) ranges from 12 to 18, and the exchangeable sodium percentage ranges from 8 to 27. The average conductivity of the saturation extract ranges from 8 to 16 millimhos per centimeter throughout the soils.

The organic materials in the surface tier (0 to 12 inches) are black (10YR 2/1), dark brown (10YR 4/3; 7.5YR 3/2), very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), dark gray (10YR 4/1), or very dark brown (10YR 2/2), and content of rubbed fiber ranges from 1 to 35 percent. Reaction in the surface tier ranges from slightly acid to moderately alkaline when undrained and from extremely acid to strongly acid when drained. Some pedons have mineral overwash layers 2 to 10 inches thick or have a thin Oe horizon of muck or mucky loam.

The organic materials in the subsurface tier (12 to 36 inches) and the bottom tier (36 to 51 inches) are black (10YR 2/1), very dark brown (10YR 2/2), very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or dark brown (7.5YR 3/2). Content of rubbed fiber averages from 1 to 10 percent of the organic volume. The subsurface and bottom tiers are slightly acid to moderately alkaline when undrained and extremely acid to medium acid when drained. The sodium adsorption ratio is more than 13, and the exchangeable sodium percentage is more than 15. Salinity is moderate or high in some or all layers within these tiers.

The Agb and Cg horizons are very dark gray (5Y 3/1, N 3/0), olive gray (5Y 4/2), gray (5Y 5/1), dark gray (5Y 4/1), dark greenish gray (5GY 4/1), or greenish gray (5GY 5/1). They are dominantly clay or silty clay, and some pedons have thin strata of silty clay loam or silt loam. Reaction ranges from neutral to moderately alkaline.

Sharkey Series

The Sharkey series consists of poorly drained, very slowly permeable, firm, mineral soils. These soils formed in clayey alluvium. They are in low and intermediate positions on natural levees of the Mississippi River and its distributaries. Slope is less than 1 percent.

Soils of the Sharkey series are very fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Sharkey soils commonly are near Allemands, Commerce, Harahan, and Westwego soils. Allemands, Harahan, and Westwego soils are in slightly lower positions than Sharkey soils and have a slightly fluid Cg horizon. In addition, Allemands soils are organic. Commerce soils are in higher positions than Sharkey soils and are fine-silty.

Typical pedon of Sharkey clay; in Lower Coast, 1 mile east of Algiers, 2,000 feet east of Algiers Lock, 400 feet northwest of Louisiana Highway 406; Spanish Land Grant 6, T. 13 S., R. 25 E.

A—0 to 5 inches; dark gray (10YR 4/1) clay; weak fine granular structure; firm; many fine roots; neutral; clear smooth boundary.

Bg1—5 to 14 inches; dark gray (10YR 4/1) clay; moderate medium subangular blocky structure; firm; few fine roots; few peds stained with strong brown (7.5YR 5/6); few slickensides about 2 centimeters long; mildly alkaline; gradual wavy boundary.

Bg2—14 to 25 inches; gray (10YR 5/1) clay; common medium distinct brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; few slickensides; mildly alkaline; clear smooth boundary.

BCg—25 to 37 inches; gray (5Y 5/1) clay; many medium distinct brown (10YR 4/3) mottles; weak coarse subangular blocky structure; firm; few fine roots; few shiny ped faces; moderately alkaline; gradual smooth boundary.

Cg—37 to 60 inches; gray (5Y 5/1) clay; massive; firm; few peds stained with strong brown (7.5YR 5/6); few wood fragments; moderately alkaline.

The solum is 36 to 60 inches thick. 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 or silty clay loam. The A horizon is 4 to 15 inches thick. If the value is 3, this 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. 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 medium acid to moderately alkaline.

The Cg horizon has the same range in colors as the Bg horizon. Texture is clay or silty clay. Reaction ranges from neutral to moderately alkaline.

Westwego Series

The Westwego series consists of poorly drained, very slowly permeable soils. They formed in fluid, clayey alluvium and organic material that dried and shrank irreversibly in the upper part as the result of artificial drainage. These soils are in broad, drained, former swamps within the delta of the Mississippi River. They are protected from most flooding by a system of levees and are artificially drained by pumps. Elevation ranges from sea level to about 3 feet below sea level. 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 Allemands, Harahan, Kenner, and Sharkey soils. Allemands and Kenner soils are in slightly lower positions than Westwego soils and are organic soils. Harahan soils are in positions similar to those of Westwego soils, and they do not have thick organic layers within the control section. Sharkey soils are in higher positions and have an *n* value of less than 0.7 throughout.

Typical pedon of Westwego clay; in Algiers, 2 miles east of Greater New Orleans Bridge, 0.2 mile south of DeGaulle Drive, 200 feet east of Behrman Highway; Spanish Land Grant 17, T. 13 S., R. 24 E.

A—0 to 4 inches; very dark gray (10YR 3/1) clay; moderate fine subangular blocky structure; firm; medium acid; many fine roots; clear wavy boundary.

Bg1—4 to 15 inches; dark gray (10YR 4/1) clay; common medium distinct brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; common cracks as much as 2 centimeters wide; medium acid; clear wavy boundary.

Bg2—15 to 29 inches; gray (10YR 5/1) clay; common medium distinct brown (7.5YR 5/4) mottles; coarse medium subangular blocky structure; firm; few fine roots; few cracks as much as 1 centimeter wide; medium acid; clear wavy boundary.

Oa—29 to 38 inches; very dark grayish brown (10YR 3/2) muck; about 10 percent fiber; less than 5 percent rubbed; massive; slightly fluid; about 60 percent mineral; medium acid; clear wavy boundary.

Cg1—38 to 50 inches; gray (5Y 5/1) clay; massive, slightly fluid; neutral; clear smooth boundary.

Cg2—50 to 70 inches; greenish gray (5BG 5/1) clay; massive; very fluid; moderately alkaline.

Depth to slightly fluid or very fluid layers ranges from 28 to 40 inches. Depth to an organic layer more than 8 inches thick ranges from 20 to 40 inches. Reaction of the A, Bg, and O horizons ranges from very strongly acid to slightly acid. Reaction of the Cg 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. It is 2 to 7 inches thick.

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. Some pedons have a Bgb horizon that has the same range in color and texture as the Bg horizon.

Some pedons have an Agb horizon that has hue of 10YR or 5Y, value of 2 or 3, and chroma of 1, or it is neutral and has value of 2 or 3. Texture is clay or mucky clay.

The Oa 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 Cg 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

This section explains the processes and factors of soil formation and relates them to the soils in the survey area.

Factors of Soil Formation

Soil is a natural, three-dimensional body that formed 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.

The interaction of five main factors influences the processes of soil formation and results in differences among the soils. These factors are the climate during the formation of soil material from the parent material; the physical and chemical composition of the 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 soil temperature and moisture conditions; and the length of time for the soil to form.

The effect of any one factor can differ from place to place, but the interaction of all the factors determines 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 Orleans Parish is influenced by several factors; including relief, parent material, and living organisms. In the following paragraphs the factors of soil formation are described as they relate to soils in the survey area.

Climate

Orleans Parish has the subtropical, humid climate that is characteristic of areas near the Gulf of Mexico. The warm, moist climate has promoted rapid soil formation. Climate is uniform throughout the parish, although its effect is modified locally by relief. The minor climate differences within the parish are not considered significant enough to create soil differences. Detailed information about climate is given in the section "General Nature of the Parish."

Living Organisms

Living organisms, including plants, bacteria, fungi, and animals, 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 modify porosity. As they grow, they break up and rearrange the soil particles. Plants transfer nutrients from the subsoil to the surface layer, and when they die, plant tissue supplies organic matter to the soils. Bacteria and other micro-organisms decompose organic matter and help improve the physical condition of the soil. The native vegetation and the associated complex communities of bacteria and fungi generally have had a greater influence on soil formation in this parish than other living organisms. 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.

Man's activities, such as cultivating, fertilizing, channel constructing, harvesting, burning, draining, diking, flooding, and land smoothing, affect the soil. Some soils in Orleans Parish, such as the drained areas of swamp soils that are now mapped as Harahan or Westwego soils, have been changed significantly.

The soils of the natural levees along streams formed under bottom land hardwood forest vegetation.

Soils of the marsh formed under grass and sedge vegetation *(7)*. The thick layers of organic material in the Lafitte soils accumulated in fresh and brackish water. As the land surface subsided, the area was flooded with fresh water. The buildup of organic material by freshwater plants kept pace with subsidence. However, further land subsidence and sea level rise introduced seawater over the area *(18)*. With the change in salinity, brackish marsh types of vegetation became established; namely, marshhay cordgrass, coastal waterhyssop, dwarf spikerush, and saltmarsh bulrush. The Clovelly and Lafitte soils formed in the organic material accumulated in areas that are now brackish.

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, and drainage, and color of the surface layer and subsoil. Textural differences in parent material are accompanied by differences in chemical and mineral composition. In general, soils that form in loamy and sandy parent material have a lower capacity to hold nutrients than those that form in clay.

The soils in Orleans Parish formed in alluvial and marine sediments and accumulations of organic material.

The alluvium is from distributary streams of present and former deltas of the Mississippi River *(16)*. Bordering the stream channels are low ridges called natural levees. These levees are highest next to the channels and slope gradually away from it. 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 higher parts of natural levees formed in loamy material that has a moderate sand content. These soils are generally lighter in color, more permeable, and better drained than the soils on the lower part and beyond the natural levees. An example is the Commerce soils. On the lower part of the natural levees and beyond the natural levees in the backswamps is the clayey sediment that was dropped from slow moving water. Sharkey soils formed in this type of material. The Gentilly soils also formed in clayey alluvium, but they can contain some marine sediment.

Organic material accumulates in areas that are saturated or flooded with water. Water prevents the complete oxidation and decomposition of the plant residue. Water, vegetation, and time coupled with a rise in sea level and a land subsidence created the conditions in which thick layers of organic material accumulated in the marshes of Orleans Parish. The buildup of organic material kept pace with land subsidence and sea level rise. The Kenner and Lafitte soils formed in thick accumulations of herbaceous organic material. The Allemands and Clovelly soils formed in moderately thick accumulations of herbaceous organic material over clayey alluvium.

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 Orleans Parish, sediment accumulated at a much faster rate than the erosion 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 for such soils as the Commerce soils. Soil 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 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 and 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 Clovelly soils illustrate the influence of relief on the soils in the parish. Commerce soils are at 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. Clovelly soils are in the lower positions, are very poorly drained, and are ponded most of the time unless they are artificially drained. These soils have a thick organic surface layer (the result of accumulations of decaying vegetation) and clayey underlying material. If the Clovelly soils are drained, their elevation is as low as 3 feet below sea level because of subsidence.

The dominant soils are the Commerce and Sharkey soils at the higher elevations, and the Clovelly and Lafitte soils in marshes at the lower elevations. Soils at the lower elevations receive runoff from those at the higher elevations, and the water table is nearer the surface for longer periods. Differences in the content of organic matter of the soils are related to the internal drainage of the soils, which is related to relief. The content of organic matter generally increases as internal soil drainage becomes more restricted.

Soils in the higher and better drained positions, such as the Commerce soils, have an environment in which more extensive oxidation of organic matter takes place. The very poorly drained Clovelly and Lafitte soils are ponded for extended periods, which results in a more limited environment and in a greater accumulation of organic matter.

The relief factor in the parish is somewhat unique because the soils are on a low-lying, slowly subsiding landmass. Geologic investigations indicate that the overall area is very slowly decreasing in elevation *(13)*. Present elevation of undrained soils ranges from sea level to a maximum of about 20 feet above sea level. The subsidence can be attributed partly to the continued accumulation in the Gulf of Mexico of sediment 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 an 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, seawater moves landward with each increment of subsidence; consequently, some soils that were formerly in freshwater marshes are now in brackish or saline marshes.

Subsidence and the resulting intrusions of saltwater are accelerated by some of man's actions. Artificial drainage can cause organic soils to subside several feet in a short time. In addition, ditches and channels dug for drainage or navigation purposes create courses for seawater to intrude inland for great distances.

The resulting increase in soil and water salinity has a marked effect on marsh and swamp vegetation. The less salt-tolerant vegetation is quickly replaced by more salt-tolerant vegetation. In addition, numbers and species of fish and crustaceans in any given area change dramatically as salinity of the soil and water increases.

In many areas, natural and accelerated subsidence have lowered the elevation to such an extent that only lakes and ponds exist where land once was visible.

Time

Time influences the kinds of horizons and their degree of development. Long periods generally are required for prominent horizons to form.

In general, the soils of Orleans Parish are young; time has been too short for distinct horizons to develop. Soils, such as Commerce and Sharkey soils on the natural levees of streams, however, have been influenced by soil-forming processes long enough to develop faintly differentiated horizons. Development is evident by the darkening of the A horizon by organic matter and the weakly developed B horizon. These soils developed in alluvium about 2,000 years old *(15, 16)*.

The youngest soils in the parish have little, if any, profile development. The Clovelly soils are young and show little evidence of profile development. These soils in the marshes are forming in recent accumulations of herbaceous organic material and alluvium.

Processes of Horizon Differentiation

The processes of soil formation influence the kind and degree of development of soil horizons. The factors of soil formation—climate, living organisms, relief, parent material, and time—determine the rate and relative effectiveness of the different processes.

Important soil-forming processes 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 *(17)*.

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 Orleans 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, muck, of the Clovelly and Westwego soils in the marshes and drained swamps. Because most of the organic matter is produced in and above the surface layer, the surface layer 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 contribute to darker colors, increased water-holding and cation-exchange capacities, and 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 typically is 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 mottles 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 Commerce soils. In general, the permanently wet soils of the marshes and swamps have rarely been leached. Areas of organic soils, however, are readily leached during unusual and extended dry periods or when these soils are artificially drained.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

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.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bottom land. The normal flood plain of a stream, subject to flooding.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. 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.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Very fluid.—When specimen is squeezed in the hand, soil material flows easily between the fingers, and after full pressure is applied little or no residue is left in the hand.

Cemented.—Hard; little affected by moistening.

Slightly fluid.—When specimen is squeezed in the hand, some material tends to flow between the fingers, and after full pressure is applied most of the residue is left in the hand.

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.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

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.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic)—Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated)—Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, such as fire, that exposes the surface.

Excess lime (in tables). Excess carbonates in the soil restrict the growth of some plants.

Excess sodium (in tables). Excess exchangeable sodium is in the soil. The resulting poor physical properties restrict the growth of plants.

Fast intake (in tables). The movement of water into the soil is rapid.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the 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*.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

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.

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 (geology). Water filling all the unblocked pores of underlying 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.

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 upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock (unweathered bedrock) beneath the soil. The rock commonly underlies a C horizon, but 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-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

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.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 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, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

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 to move through the profile. Permeability is measured as the number of inches per hour that water moves through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

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.

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 the acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH value are—

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rooting depth (in tables). There is a 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.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

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 or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. 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 feet.

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.

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 underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

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."

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). An 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.

Weathering. All physical and chemical changes produced by atmospheric agents in rocks or other deposits at or near the earth's surface. These changes result in disintegration and decomposition of the material.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data recorded in the period 1955-77 at New Orleans, Louisiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	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 or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	61.5	42.6	52.0	81	19	186	4.73	2.06	5.89	6	.0
February---	64.8	44.7	54.8	82	25	207	5.23	2.99	7.04	6	.1
March------	71.1	51.3	61.2	84	31	361	4.66	1.82	6.96	6	.0
April------	78.6	58.8	68.7	88	39	561	3.90	1.29	5.97	5	.0
May--------	84.4	65.1	74.8	92	50	769	5.01	2.27	7.23	6	.0
June-------	89.0	70.4	79.7	95	58	891	4.89	2.52	6.83	7	.0
July-------	90.4	73.1	81.8	97	67	986	6.25	4.42	7.94	10	.0
August-----	89.5	72.7	81.1	96	64	964	6.19	3.20	8.63	9	.0
September--	86.3	69.6	78.0	94	56	840	6.32	2.83	9.16	7	.0
October----	79.2	59.0	69.1	90	40	592	2.84	.98	4.34	4	.0
November---	70.1	49.9	60.0	84	30	310	3.94	1.15	6.19	6	.0
December---	64.2	44.9	54.6	82	23	199	5.39	3.28	7.27	7	.1
Yearly:											
Average--	77.4	58.5	68.0	---	---	---	---	---	---	---	---
Extreme--	---	---	---	97	19	---	---	---	---	---	---
Total----	---	---	---	---	---	6,866	59.35	48.45	69.71	79	.2

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1955-77 at New Orleans, 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--	February 10	February 26	March 25
2 years in 10 later than--	February 1	February 17	March 15
5 years in 10 later than--	January 8	January 30	February 25
First freezing temperature in fall:			
1 year in 10 earlier than--	December 16	November 22	November 13
2 years in 10 earlier than--	December 28	December 2	November 20
5 years in 10 earlier than--	January 31	December 22	December 5

TABLE 3.--GROWING SEASON

[Data recorded in the period 1955-77 at New Orleans, Louisiana. The symbol > means more than]

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	326	281	245
8 years in 10	340	294	258
5 years in 10	>365	322	282
2 years in 10	>365	>365	306
1 year in 10	>365	>365	319

TABLE 4.--SUITABILITY AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP FOR SPECIFIED USES

Map unit	Percent of area	Cultivated crops	Pastureland	Woodland	Urban uses	Intensive recreation areas
Sharkey-Commerce----	26	Moderately well suited: wetness, poor tilth.	Well suited.	Moderately well suited: wetness, moderate and severe equipment use limitations.	Poorly suited: flooding, wetness, shrink-swell, moderately slow and very slow permeability, low strength for roads and streets.	Poorly suited: flooding, wetness, moderately slow and very slow permeability.
Clovelly-Lafitte-Gentilly-----------	37	Not suited: flooding, ponding, salinity.	Not suited: flooding, ponding, salinity.	Not suited: flooding, ponding.	Not suited: flooding, ponding, low strength.	Not suited: flooding, ponding, low strength.
Harahan-Westwego----	15	Moderately well suited: wetness, poor tilth.	Moderately well suited: wetness, poor tilth.	Moderately well suited: wetness, severe equipment use limitations.	Poorly suited: flooding, wetness, slow permeability, shrink-swell, low strenth for roads.	Poorly suited: flooding, wetness, very slow permeability, subsidence.
Allemands, drained-Kenner, drained----	9	Somewhat poorly suited: wetness, soil acidity.	Moderately well suited: wetness, soil acidity.	Moderately well suited: wetness, severe equipment use limitations.	Poorly suited: flooding, wetness, subsidence, low strength for roads.	Poorly suited: flooding, wetness.
Aquents-------------	13	Not suited: flooding, wetness.*	Poorly suited: flooding, wetness.*	Poorly suited: wetness, flooding, severe equipment use limitations.*	Not suited: flooding, wetness, subsidence, shrink-swell, low strength for roads.**	Not suited: flooding, wetness, subsidence.

* Rarely flooded areas are moderately well suited.
** Rarely flooded areas are poorly suited.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ae	Allemands muck, drained	5,885	2.6
An	Aquents, dredged	7,512	3.3
AT	Aquents, dredged, frequently flooded	8,148	3.6
CE	Clovelly muck	26,175	11.7
Cm	Commerce silt loam	4,560	2.0
Co	Commerce silty clay loam	2,153	1.0
CS	Commerce and Sharkey soils, frequently flooded	602	0.4
Dp	Dumps	389	0.2
GE	Gentilly muck	4,148	2.0
Ha	Harahan clay	13,347	6.0
Ke	Kenner muck, drained	4,446	2.0
LF	Lafitte muck	19,223	8.6
Sh	Sharkey silty clay loam	1,006	0.5
Sk	Sharkey clay	22,549	10.0
Ub	Urbanland	2,287	1.0
Ww	Westwego clay	4,930	2.2
	Total land acreage	127,360	57.1
	Water	96,326	42.9
	Total acreage	223,686	100.0

TABLE 6.--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: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
Cm, Co: Commerce	13W	Moderate	Slight	Slight	Moderate	Eastern cottonwood	120	13	Eastern cottonwood, American sycamore.
						Green ash	120	13	
						Nuttall oak	90	---	
						Water oak	110	8	
						Pecan	---	---	
						American sycamore	---	---	
						Willow oak	---	---	
CS:									
Commerce	12W	Moderate	Severe	Slight	Moderate	Eastern cottonwood	113	12	Eastern cottonwood, American sycamore.
						Nuttall oak	---	---	
						Overcup oak	---	---	
						Water hickory	---	---	
						Sugarberry	---	---	
Sharkey	6W	Severe	Severe	Moderate	Severe	Green ash	98	6	Baldcypress, eastern cottonwood.
						Water hickory	---	---	
						Overcup oak	---	---	
						Baldcypress	---	---	
						Black willow	---	---	
						Sugarberry	---	---	
Sh, Sk: Sharkey	7W	Severe	Moderate	Moderate	Severe	Sweetgum	90	7	Eastern cottonwood, American sycamore, sweetgum.
						Willow oak	100	---	
						Water oak	90	---	
						Nuttall oak	90	---	
						Sugarberry	---	---	

* 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.

TABLE 7.--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
Ae------------------- Allemands	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess humus.	Severe: excess humus, wetness.	Severe: wetness, excess humus.	Severe: wetness.
An, AT. Aquents					
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.
CS:					
Commerce------------	Severe: flooding.	Moderate: flooding, wetness, percs slowly.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.
Sharkey-------------	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Dp. Dumps					
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, percs slowly, excess humus.	Severe: excess humus, percs slowly.	Severe: excess humus, percs slowly, wetness.	Severe: excess humus.	Severe: 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.
Sh------------------- Sharkey	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
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.
Ub. Urban land					
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.

TABLE 8.--NATIVE PLANTS ON SELECTED SOILS IN BRACKISH MARSHES

Soil series	Scientific name	Common name
Clovelly, Gentilly, Lafitte	Amaranthus cuspidata	Southern waterhemp
	Aster tenuifolius	Saline aster
	Bacopa monnieri	Coastal waterhyssop
	Cuscuta indecora	Bigseed alfalfa dodder
	Cyperus odoratus	Fragrant flatsedge
	Echinochloa walteri	Coast cockspur
	Eleocharis parvula	Dwarf spikerush
	Eleocharis sp.	Spikesedge
	Heliotropium curassavicum	Salt heliotrope
	Hibiscus lasiocarpus	Woolly rosemallow
	Ipomoea sagittata	Saltmarsh morningglory
	Kosteletzkya virginica	Virginia saltmarsh mallow
	Leptochloa fascicularis	Bearded sprangletop
	Lythrum lineare	Wand lythrum
	Myriophyllum spicatum	Water milfoil
	Panicum amarulum	Shoredune panicum
	Paspalum vaginatum	Seashore paspalum
	Phragmites communis	Common reed
	Pluchea camphorata	Camphor pluchea
	Potamogeton pectinatus	Sago pondweed
	Ruppia maritima	Widgeongrass
	Scirpus olneyi	Olney bulrush
	Scirpus robustus	Saltmarsh bulrush
	Sesbania exaltata	Hemp sesbania
	Spartina cynosuroides	Big cordgrass
	Spartina patens	Marshhay cordgrass
	Vigna luteola	Hairypod cowpea

TABLE 9.--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 herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ae	Poor	Fair	Fair	Fair	Fair	Good	Very poor.			
An, AT. Aquents										
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.
CS:										
Commerce	Poor	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair.
Sharkey	Poor	Poor	Fair	Good	Poor	Fair	Fair	Poor	Fair	Fair
Dp. Dumps										
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	Poor	Fair	Fair	Fair	Fair	Good	Very poor.	Fair	Fair	Good.
LF: Lafitte	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Very poor.	Very poor.	Very poor.	Good.
Sh, Sk: Sharkey	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
Ub. Urban land										
Ww: Westwego	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ae: Allemands	Severe: excess humus, wetness.	Severe: flooding, subsides, wetness.	Severe: flooding, subsides, wetness.	Severe: wetness, subsides.	Severe: wetness.
An, AT. Aquents					
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.
CS:					
Commerce	Severe: wetness.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
Sharkey	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Dp. Dumps					
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, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides.	Severe: 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.
Sh: Sharkey	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Sk---------------- Sharkey	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.
Ub. Urban land					
Ww---------------- Westwego	Severe: excess humus, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell.	Severe: too clayey.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ae------------------ Allemands	Severe: percs slowly, wetness.	Severe: seepage, excess humus.	Severe: excess humus, wetness.	Severe: seepage, wetness.	Poor: excess humus, wetness.
An, AT. Aquents					
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.
CS:					
Commerce-----------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
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					
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: subsides, percs slowly, wetness.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: excess humus, wetness.
LF------------------ Lafitte	Severe: flooding, ponding, subsides.	Severe: seepage, flooding, excess humus.	Severe: flooding, ponding, seepage.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
Sh, Sk-------------- Sharkey	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

TABLE 11.--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					
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.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Topsoil
Ae Allemands	Poor: thin layer, wetness.	Poor: excess humus, wetness.
An, AT. Aquents		
CE Clovelly	Poor: wetness.	Poor: excess humus, wetness.
Cm, Co Commerce	Poor: low strength.	Fair: thin layer.
CS: Commerce	Poor: low strength.	Fair: too clayey, thin layer.
Sharkey	Poor: low strength, wetness, shrink-swell.	Poor: wetness.
Dp. Dumps		
GE Gentilly	Poor: low strength, wetness, shrink-swell.	Poor: excess humus, wetness.
Ha Harahan	Poor: low strength, shrink-swell.	Poor: too clayey.
Ke Kenner	Fair: wetness.	Poor: excess humus.
LF Lafitte	Poor: excess humus, wetness.	Poor: excess humus, wetness.
Sh Sharkey	Poor: low strength, wetness, shrink-swell.	Poor: wetness.
Sk Sharkey	Poor: low strength, wetness, shrink-swell.	Poor: too clayey,
Ub. Urban land		
Ww Westwego	Poor: low strength.	Poor: too clayey.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--			Features affecting--	
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation
Ae: Allemands	Severe: seepage.	Severe: excess humus, wetness.	Severe: slow refill.	Percs slowly, subsides.	Percs slowly, wetness.
An, AT. Aquents					
CE: Clovelly	Severe: seepage.	Severe: ponding, excess humus.	Slight	Flooding, percs slowly, subsides.	Flooding, ponding, percs slowly.
Cm, Co: Commerce	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill.	Favorable	Wetness, erodes easily.
CS:					
Commerce	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill.	Flooding	Wetness, erodes easily.
Sharkey	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, percs slowly.
Dp. Dumps					
GE: Gentilly	Slight	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, flooding.	Ponding, percs slowly, flooding.
Ha: Harahan	Slight	Severe: excess humus, hard to pack, wetness.	Severe: slow refill.	Percs slowly, subsides.	Wetness, slow intake, percs slowly.
Ke: Kenner	Severe: seepage.	Severe: excess humus, wetness.	Severe: slow refill.	Percs slowly, subsides.	Percs slowly, wetness.
LF: Lafitte	Severe: seepage.	Severe: excess humus, ponding.	Slight	Ponding, flooding, subsides.	Ponding, flooding, excess salt.
Sh: Sharkey	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.
Sk: Sharkey	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, slow intake, percs slowly.
Ub. Urban land					
Ww: Westwego	Severe: seepage.	Severe: wetness, hard to pack, excess humus.	Severe: slow refill.	Subsides, percs slowly.	Wetness, slow intake, percs slowly.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than. Absence of an entry indicates that data were not estimated. Some soils may have Unifed classifications 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		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	4	10	40	200		
	In								Pct	
Ae------------- Allemands	0-6	Muck------------	PT	A-8	---	---	---	---	---	---
	6-30	Muck------------	PT	A-8	---	---	---	---	---	---
	30-46	Clay, mucky clay	MH, OH	A-7-5	100	100	95-100	80-100	65-90	30-50
	46-60	Clay, very fine sandy loam, silty clay loam.	CH, CL, ML, MH	A-7-6, A-6, A-4	100	100	85-95	75-95	30-75	6-45
An, AT. Aquents										
CE------------- Clovelly	0-31	Muck------------	PT	A-8	---	---	---	---	---	---
	31-72	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	0-5	Silt loam--------	CL-ML, CL, ML	A-4	100	100	100	75-100	<30	NP-10
	5-33	Silty clay loam, silt loam, loam.	CL	A-6, A-7-6	100	100	100	85-100	32-45	11-23
	33-60	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
	4-32	Silty clay loam, silt loam, loam.	CL	A-6, A-7-6	100	100	100	85-100	32-45	11-23
	32-60	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
CS: Commerce-------	0-5	Silt loam--------	CL-ML, CL, ML	A-4	100	100	100	75-100	<30	NP-10
	5-29	Silty clay loam, silt loam, loam.	CL	A-6, A-7-6	100	100	100	85-100	32-45	11-23
	29-60	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	Silty clay loam	CL	A-6, A-7-6	100	100	100	95-100	32-50	11-25
	10-38	Clay------------	CH	A-7-6, A-7-5	100	100	100	95-100	56-85	30-50
	38-60	Clay, silty clay	CL, CH	A-6, A-7-6, A-7-5	100	100	100	95-100	32-85	11-50
Dp. Dumps										
GE------------- Gentilly	0-10	Muck------------	PT	A-8	---	---	---	---	---	---
	10-40	Clay, silty clay, mucky clay.	MH	A-7-5	100	100	100	95-100	70-90	35-45
	40-80	Clay, silty clay	MH, CH	A-7-5	100	100	100	95-100	60-90	30-45

TABLE 14.--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	
Ha------------- Harahan	0-6	Clay-------------	OH, MH, CH	A-7-5, A-8, A-7-6	100	100	100	95-100	60-90	35-50
	6-36	Clay, silty clay	CH, MH	A-7-6, A-7-5	100	100	100	95-100	60-90	35-50
	36-72	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
Ke------------- Kenner	0-36	Muck-------------	PT	A-8	---	---	---	---	---	---
	36-40	Clay, silty clay, mucky clay.	MH, OH	A-7-5	100	100	100	95-100	70-100	30-55
	40-75	Muck-------------	PT	A-8	---	---	---	---	---	---
LF------------- Lafitte	0-75	Muck-------------	PT	A-8	---	---	---	---	---	---
	75-99	Variable---------	---	---	---	---	---	---	---	---
Sh------------- Sharkey	0-5	Silty clay loam	CL	A-6, A-7-6	100	100	100	95-100	32-50	11-25
	5-24	Clay-------------	CH	A-7-6, A-7-5	100	100	100	95-100	56-85	30-50
	24-60	Clay, silty clay	CL, CH	A-6, A-7-6, A-7-5	100	100	100	95-100	32-85	11-50
Sk------------- Sharkey	0-5	Clay-------------	CH, CL	A-7-6, A-7-5	100	100	100	95-100	46-85	22-50
	5-37	Clay-------------	CH	A-7-6, A-7-5	100	100	100	95-100	56-85	30-50
	37-60	Clay, silty clay	CL, CH	A-6, A-7-6, A-7-5	100	100	100	95-100	32-85	11-50
Ub. Urban land										
Ww------------- Westwego	0-29	Clay-------------	CH	A-8, A-7-6	100	100	100	95-100	50-81	35-60
	29-38	Muck, peat-------	PT	A-8	---	---	---	---	---	---
	38-70	Clay, mucky clay	CH	A-8, A-7-6	100	100	100	95-100	50-82	35-60

TABLE 15.--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	mmhos/cm				Pct
Ae: Allemands	0-6	---	0.05-0.25	>2.0	0.20-0.50	3.6-7.0	<4	Low	----	---	30-85
	6-30	---	0.05-0.25	>2.0	0.20-0.50	5.1-7.0	<4	Low	----		
	30-46	60-95	0.15-1.00	<0.06	0.14-0.18	6.1-8.4	<4	Very high	0.32		
	46-60	20-95	0.25-1.00	<0.6	0.12-0.18	6.1-8.4	<4	High	0.37		
An, AT. Aquents											
CE: Clovelly	0-31	---	0.05-0.25	>2.0	0.10-0.45	6.6-8.4	4-8	Low	----	---	30-60
	31-72	50-90	0.15-1.00	<0.06	0.11-0.18	7.4-8.4	4-8	Low	0.28		
Cm: Commerce	0-5	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
	5-33	14-39	1.35-1.65	0.2-0.6	0.20-0.22	6.1-8.4	<2	Moderate	0.32		
	33-60	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
	4-32	14-39	1.35-1.65	0.2-0.6	0.20-0.22	6.1-8.4	<2	Moderate	0.32		
	32-60	14-39	1.35-1.65	0.2-2.0	0.20-0.23	6.6-8.4	<2	Low	0.37		
CS: Commerce	0-5	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
	5-29	14-39	1.35-1.65	0.2-0.6	0.20-0.22	6.1-8.4	<2	Moderate	0.32		
	29-60	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	27-35	1.35-1.75	0.2-0.6	0.20-0.22	5.1-8.4	<2	Moderate	0.37	5	.5-4
	10-38	60-90	1.20-1.50	<0.06	0.12-0.18	5.6-8.4	<2	Very high	0.28		
	38-60	25-39	1.20-1.65	0.06-0.2	0.12-0.18	6.6-8.4	<2	High	0.28		
Dp. Dumps											
GE: Gentilly	0-10	45-90	0.15-0.60	>2.0	0.20-0.50	5.6-7.8	2-8	Low	----	---	---
	10-40	60-95	0.25-1.20	<0.06	0.12-0.15	6.6-7.8	2-8	Low	0.37		
	40-80	60-95	1.25-1.45	<0.06	0.12-0.15	6.6-7.8	2-8	Very high	0.37		
Ha: Harahan	0-6	50-95	0.50-1.50	<0.06	0.11-0.30	5.1-7.3	<2	Very high	0.37	5	2-25
	6-36	60-95	1.20-1.50	<0.06	0.11-0.20	5.1-7.3	<2	Very high	0.37		
	36-72	60-95	0.25-1.00	<0.06	0.11-0.30	6.6-8.4	<2	Very high	0.37		
Ke: Kenner	0-36	---	0.05-0.25	>2.0	0.20-0.50	3.6-7.3	<4	Low	----	---	30-60
	36-40	45-85	0.15-1.00	<0.06	0.12-0.18	3.6-7.3	<4	High	0.32		
	40-75	---	0.05-0.50	>6.0	0.20-0.50	3.6-7.3	<4	Low	----		
LF: Lafitte	0-75	---	0.05-0.25	2.0-6.0	0.18-0.45	6.1-8.4	8-16	Low	----	---	30-70
	75-90	60-90	0.25-1.20	<0.06	0.11-0.30	6.1-8.4	8-16	Low	0.32		
Sh: Sharkey	0-5	27-35	1.20-1.70	0.2-0.6	0.20-0.22	5.1-8.4	<2	Moderate	0.37	5	.5-4
	5-24	60-90	1.20-1.50	<0.06	0.12-0.18	5.6-8.4	<2	Very high	0.28		
	24-60	25-39	1.20-1.70	0.06-0.2	0.12-0.22	6.6-8.4	<2	High	0.28		
Sk: Sharkey	0-5	40-60	1.20-1.50	<0.06	0.12-0.18	5.1-8.4	<2	Very high	0.32	5	.5-4
	5-37	60-90	1.20-1.50	<0.06	0.12-0.18	5.6-8.4	<2	Very high	0.28		
	37-60	25-39	1.20-1.70	0.06-0.2	0.12-0.22	6.6-8.4	<2	High	0.28		

TABLE 15.--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	mmhos/cm				Pct
Ub. Urban land											
Ww--------------- Westwego	0-29	50-95	0.50-1.50	<0.06	0.11-0.30	4.5-6.5	<2	High------	0.37	5	2-25
	29-38	60-90	0.15-0.50	2.0-6.0	0.20-0.50	4.5-6.5	<2	High------	----		
	38-70	60-95	0.25-1.00	<0.06	0.11-0.30	6.6-8.4	<2	High------	0.37		

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," and "apparent" 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	Dura-tion	Months	Depth	Kind	Months	Initial	Total	Uncoated steel	Concrete
					Ft			In	In		
Ae------------- Allemands	D	Rare-------	---	---	0.5-4.0	Apparent	Jan-Dec	8-25	16-51	High-----	Moderate.
An, AT. Aquents											
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.
CS: Commerce------	C	Frequent---	Brief to very long.	Dec-Jun	1.5-4.0	Apparent	Dec-Apr	---	---	High-----	Low.
Sharkey-------	D	Frequent---	Brief to very long.	Dec-Jun	0-2.0	Apparent	Dec-Apr	---	---	High-----	Low.
Dp. Dumps											
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	Rare-------	---	---	1.0-4.0	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.
Sh, Sk--------- Sharkey	D	Rare-------	---	---	0-2.0	Apparent	Dec-Apr	---	---	High-----	Low.
Ub. Urban land											
Ww------------- Westwego	D	Rare-------	---	---	1.0-3.0	Apparent	Jan-Dec	3-8	6-20	High-----	Moderate.

TABLE 17.--PHYSICAL TEST DATA FOR SELECTED SOILS

[The symbol TR means trace. Dashes indicate analyses were not made]

Soil name and sample number	Horizon	Depth	Particle-size distribution: Sand: Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.1 mm)	Very fine (0.1-0.05 mm)	Total (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Fine clay (0.0002 mm)	Water content at tension: 1/3 bar	15 bar	WRD	Bulk density: Air-dry	Oven-dry	Field moist
		In	Pct									Pct (wt)			G/cm^3		
Gentilly muck: (S71LA-36-5)	Oa1	0-5	---	---	---	---	---	---	---	---	---	250	35.5	---	---	---	0.36
	Oa2	5-12	TR	0.1	0.3	1.2	10.5	12.1	51.5	36.4	17.5	62	17.4	---	---	---	0.98
	Cg1	12-19	TR	0.1	0.3	1.1	13.8	15.3	58.3	26.4	14.1	42	13.8	---	---	---	1.27
	Cg2	19-28	0.0	0.1	0.2	0.8	12.8	13.9	60.3	25.8	14.0	47	14.0	---	---	---	1.14
	Cg3	28-38	0.3	0.5	0.4	1.1	7.5	9.8	44.9	45.3	18.6	---	16.6	---	---	---	---

TABLE 18.--CHEMICAL TEST DATA FOR SELECTED SOILS

[Dashes indicate analyses were not made]

Soil and sample number	Horizon	Depth	Extractable bases: Ca	Mg	K	Na	Extractable acidity	Cation exchange capacity (NH$_4$OAc)	Base saturation	Organic carbon	pH: H$_2$O 1:1	KCl 1:1	CaCl$_2$ 1:2	Extractable iron	Extractable aluminum	Extractable hydrogen	Extractable phosphorus
		In	Meq/100g						Pct	Pct				Pct	Meq/100g		Ppm
Gentilly muck: (S71LA-36-5)	Oa1	0-5	11.4	19.7	2.4	30.5	27.9	51.9	---	1.08	5.0	---	5.0	0.5	---	---	---
	Oa2	5-12	7.7	12.9	1.4	16.3	38.8	42.7	90	.772	4.7	---	4.7	0.4	---	---	---
	Cg1	12-19	4.3	8.2	1.0	6.7	10.1	19.8	102	.122	4.3	---	4.3	0.2	---	---	---
	Cg2	19-28	5.7	11.3	1.3	6.0	4.3	21.2	---	.054	4.4	---	4.4	0.3	---	---	---
	Cg3	28-38	8.4	17.2	1.7	10.5	4.3	30.1	---	.049	6.6	---	6.4	1.0	---	---	---
Lafitte muck: (S71LA-36-1)	Oa1	0-6	72.4	76.8	2.6	93.6	54.1	137	---	2.62	5.5	---	5.7	0.2	---	---	---
	Oa2	6-16	71.2	95.7	1.7	61.9	74.1	155	---	2.42	5.9	---	6.0	0.1	---	---	---
	Oa3	16-30	74.8	97.6	1.8	80.2	88.8	166	---	2.11	5.7	---	5.9	0.1	---	---	---
	Oa4	30-48	90.0	116.0	2.0	95.9	69.6	168	---	2.07	5.9	---	6.0	0.1	---	---	---

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allemands	Clayey, montmorillonitic, euic, thermic Terric Medisaprists
Clovelly	Clayey, montmorillonitic, euic, thermic Terric Medisaprists
Commerce	Fine-silty, mixed, nonacid, thermic Aeric Fluvaquents
Gentilly	Very fine, montmorillonitic, nonacid, thermic Typic Hydraquents
Harahan	Fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts
Kenner	Euic, thermic Fluvaquentic Medisaprists
Lafitte	Euic, thermic Typic Medisaprists
Sharkey	Very fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts
Westwego	Very fine, montmorillonitic, nonacid, thermic, cracked Thapto-Histic Fluvaquents

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