USDA United States Department of Agriculture

Natural Resources Conservation Service

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

Soil Survey of Winn Parish, Louisiana

How to Use This Soil Survey

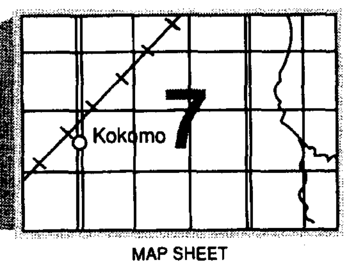
General Soil Map

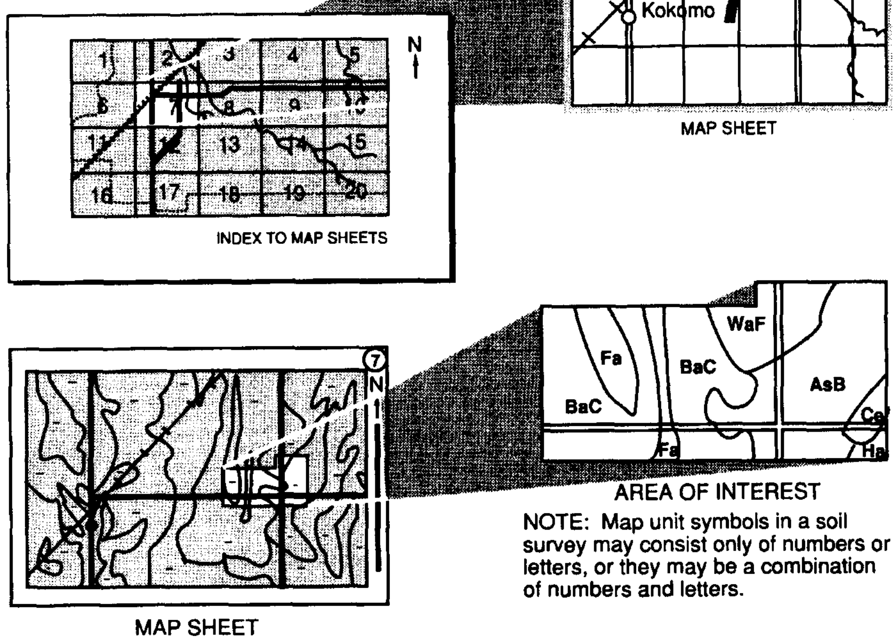
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

Detailed Soil Maps

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





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

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

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

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

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1991. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This soil survey was made cooperatively by the Natural Resources Conservation Service, the U.S. Forest Service, the Louisiana Agricultural Experiment Station, the Louisiana Soil and Water Conservation Committee, and the Winn Parish Policy Jury. It is part of the technical assistance furnished to the Dugdemona Soil and Water Conservation District.

Cover: A stand of pine trees on Sacul fine sandy loam, 1 to 5 percent slopes. Woodland is a major land use in the survey area. White markings on trees identify those trees in the Kitsatchie National Forest that are used as nesting sites by the red-cockaded woodpecker, an endangered species.

Issued 1998

Contents

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Winn Parish, Louisiana. 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 suitability of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

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

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

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Soil Survey of
Winn Parish, Louisiana

By William H. Boyd, Gail L. Bowden, and Marc J. Bordelon, Natural Resources Conservation Service

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

WINN PARISH is in north-central Louisiana, about 30 miles north of Alexandria (fig. 1). The total area is 612,200 acres, of which 609,900 acres is land and 2,300 acres is water in the form of lakes and major rivers. Winn Parish is bordered on the east by Caldwell and LaSalle Parishes, on the south by Grant Parish, on the west by Natchitoches Parish, and on the north by Bienville and Jackson Parishes. In 1990, the population was 17,269, according to the Bureau of the Census. Winnfield, with a population of 7,311, is the largest city and the parish seat. Other communities include Atlanta, Calvin, Dodson, Joyce, and Sikes.

The two major physiographic areas that make up the parish are the flood plains and the terraces and uplands. Elevation ranges from about 350 feet above sea level on the uplands west of Winnfield to about 50 feet above sea level on the flood plain of the Dugdemona River in the southeastern corner of the parish.

The flood plains of streams make up about 17.6 percent of the parish. They consist of level to gently undulating soils. The soils on flood plains of local streams are loamy, poorly drained, and frequently flooded. Most of the acreage is woodland. A few small areas are used as pastureland. The soils on the Red River flood plain are loamy or clayey and range from well drained to very poorly drained. They are subject to flooding. The loamy soils are well drained and are on natural levees along channels of the Red River and its distributaries. The clayey soils are very poorly drained or poorly drained and are in low areas. Most of the acreage has been cleared and is used as cropland or pastureland.

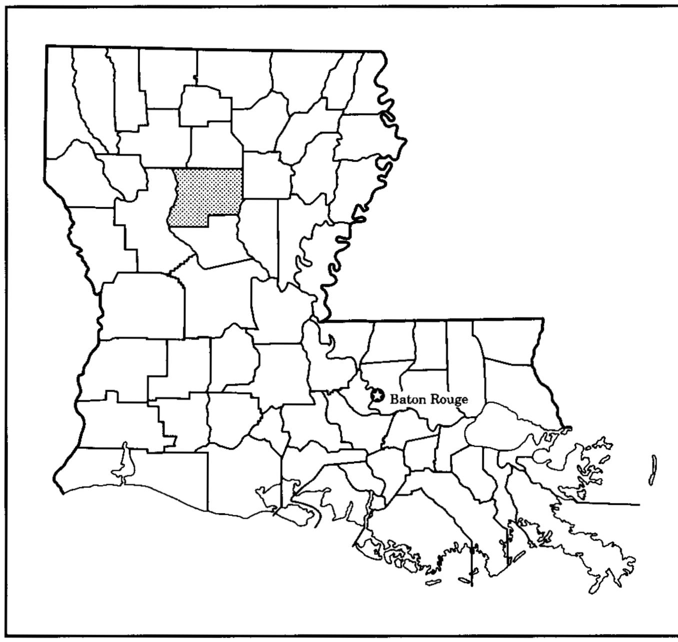

Figure 1.—Location of Winn Parish in Louisiana.

The terraces and uplands make up about 82.4 percent of the parish. They consist of level to moderately steep soils. The soils on the uplands are sandy, loamy, or clayey and range from poorly drained to somewhat excessively drained. These soils are generally low in natural fertility. Most of the acreage is woodland. A small acreage is used as pastureland, homesites, or urban development. The hazard of erosion is the main concern in soil management. Steepness of slope and low fertility are additional soil limitations for crops and pasture.

The major land use in the parish is commercial forest. About 94 percent of the parish, or 561,900 acres, is in commercial forest. About 9,200 acres is used as cropland, and about 11,000 acres is used as pastureland. The remainder of the parish is used as urban land, or it is water.

About 18 percent, or 110,000 acres, of Winn Parish is owned by the U.S. Government and is in the Kisatchie National Forest. Approximately 283,000 acres is owned by major timber industry corporations, such as Manville Forest Products, Louisiana Pacific, Cavanghan Timber Industries, Crown Zellerback, and others. The remaining acreage is owned by private individuals.

The first soil survey of Winn Parish was published in 1907 *(36)*. This survey updates the earlier survey and provides additional information.

General Nature of the Parish

This section gives general information concerning the climate, history and development, agriculture, industry, and transportation.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Bienville, Louisiana, in the period 1972 to 1986. 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 46 degrees F and the average daily minimum temperature is 35 degrees. The lowest temperature on record, which occurred at Bienville on February 25, 1983, is 4 degrees. In summer, the average temperature is 81 degrees and the average daily maximum temperature is 93 degrees. The highest recorded temperature, which occurred at Bienville on July 13, 1980, is 106 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 60 inches. Of this, 24 inches, or 40 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 21 inches. The heaviest 1-day rainfall during the period of record was 10 inches at Bienville on May 7, 1978. Thunderstorms occur on about 55 days each year, and most occur in summer.

The average seasonal snowfall is 1 inch. The greatest snow depth at any one time during the period of record was 5 inches. On an average of 1 day, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in spring.

History and Development

Initially, the area in which Winn Parish was formed was inhabited by native Indians of the Pascagoula, Choctaw, Natchitoches, and Tunica tribes. By 1850, the early white settlers had moved into the area. In 1541, Hernando DeSoto was possibly the first white man to explore the area. In 1591, Henry DeTonty, an explorer with LaSalle, visited the Natchitoches Indians where salt was made (Drake Salt Lick). In 1700, M. deBienville also visited this area. In 1826, the Prothro family established the first settlement in the parish at a site which is now St. Maurice. *(44)*.

The section of Winn in the Natchitoches land district was established in 1838. Winn Parish was established by legislative action in 1851 and was officially organized on February 24, 1852 *(6a)*. Winnfield was established as the Seat of Justice at the same time and has remained the parish seat ever since. It is believed that the parish and the town of Winnfield were named after Colonel Walter O. Winn, a lawyer from Alexandria.

The first industry of Winn Parish was that of the Natchitoches Indians who made salt from the brine springs in the parish and traded it with other Indian tribes some hundreds of miles away. In 1805, a man named Postelwaite was making 6 bushels of salt a day at Drakes Salt Lick. Later, the mine produced 30 to 40 bushels of salt per day. The salt was sold for $2 to $3 per bushel. It was delivered by keel boats to other settlements. In 1930, the Carey Salt Company began mining salt from the Winnfield Salt Dome. When water filled the mine, it was closed. Today, no salt is commercially mined in Winn Parish.

Other early industries were centered around the large virgin forests of the area. These included a turpentine distillery and sawmill in Atlanta in 1858. In 1900, the largest sawmill in the United States was located at Dodson. The small communities of Atlanta, Calvin, Dodson, Joyce, and Sikes were once busy logging mill towns. In 1900, Calvin had a population of about 1000; Dodson had a population of about 2000; and Winnfield, the center of government, had a population of about 133. The logging of the virgin forests provided work for many years for the people in these communities. Most mills operated from about 1900 to 1925. When the great virgin forests were gone, they closed, making ghost towns of the once populous communities.

Agriculture

Agriculture in Winn Parish was the mainstay of the early settlers. They raised farm produce, cattle, hogs, and chickens for home consumption and cotton as a money crop.

In 1879, 22,548 acres was used as cropland. About 7,379 acres was cotton, 8,588 acres was corn, 250 acres was sweet potatoes, 41 acres was sugarcane, and 4 acres was rice. The remaining acreage was presumed to be used as pastureland. The cotton produced 3,002 bales of raw cotton, which averaged 195 pounds of lint and 585 pounds of seed per bale. In 1904, the boll weevil invaded the area from Mexico, and cotton production soon dropped from one bale per acre to one bale per 100 acres. At this time, many abandoned farming, sold their land to large timber companies, and went to work logging the virgin forests which covered most of the parish.

Presently, row crop production is limited to the small area along the Red River in the southwestern part of the parish. Soybeans, grain sorghum, cotton, and wheat are the main crops. Pasture and hayland is managed as forage for beef cattle on many small to medium-sized farms throughout the parish. Two farms raise thoroughbred horses. An increase in horticultural crops, such as blueberries and peaches, has occurred in recent years. Many individuals raise vegetables, such as peas, beans, corn, tomatoes, okra, onions, cabbage, and potatoes, for home consumption. Some vegetables are sold locally. Several individuals operate chicken houses for egg and meat production. The recent trend indicates the number of poultry operations is increasing.

Industry

Timber production and wood products are the main economic activities in Winn Parish. A half-dozen major timber industry corporations have production facilities in Winn Parish. Large mills produce plywood, lumber, pulpwood chips, and veneer. Several other smaller operations also produce pulpwood chips, pressure treated wood products, and other finished wood products. The Louisiana Forest Festival is held each year in April in honor of the timber industry of the area.

Other industries in the parish include the production of minor amounts of oil and gas, the mining of rock from the caprock of the Winnfield Salt Dome, and a petrochemical plant which produces glues for use in the production of plywood.

Transportation

Winn Parish is served by U.S. Highways 84, 167, and 71, and by several paved state and parish highways. A minor bus line serves the parish with a north-south route. A small lighted runway near Winnfield is available for light air traffic. Commercial air service is available in Pineville, about 45 miles away. A railroad, which connects to a major railroad system, serves the parish.

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, landforms, relief, climate, and 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 a considerable degree of 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, kind and amount of rock fragments, distribution of plant roots, reaction, 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 interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

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

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

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or 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.

Each map unit is rated for *cultivated crops, pastureland, woodland,* and *urban uses.* Cultivated crops are those grown extensively in the survey area. Pastureland refers to pasture of native and improved grasses for livestock. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

The boundaries of the general soil map units in Winn Parish were matched, where possible, with those of the previously completed surveys of Caldwell, LaSalle, Grant, and Natchitoches Parishes. In a few places the lines do not join and the names of the map units differ. These differences result mainly because of changes in soil series concepts, differences in map unit designs, and changes in soil patterns near survey area boundaries.

The general soil map units in this survey have been grouped into two general landscapes. Descriptions of each of the broad groups and the map units in each group follow.

SOILS ON FLOOD PLAINS

The map units in this group consist of poorly drained and well drained, level to gently undulating, loamy and clayey soils on narrow flood plains. The soils are subject to flooding. These map units make up about 18 percent of Winn Parish. Most of the area is used as woodland, cropland, or pastureland. Wetness and the hazard of flooding are the main limitations for most uses.

1. Moreland-Perry-Roxana

Level to gently undulating, poorly drained and well drained soils that are clayey or loamy throughout

This map unit consists of soils in low positions, swales, and on low ridges on the flood plain of the Red River. The soils in this map unit are subject to occasional or frequent flooding. Slopes range from 0 to 3 percent.

This map unit makes up about 1 percent of the parish. It is about 43 percent Moreland soils, 30 percent Perry soils, 21 percent Roxana soils, and 6 percent soils of minor extent.

The Moreland soils are poorly drained. They are in low positions and in swales on flood plains and are subject to occasional flooding. The surface layer is dark brown clay. The subsoil and substratum are dark reddish brown clay. The subsoil is mottled in the middle part.

The Perry soils are in low positions on flood plains and are subject to occasional flooding. The surface layer is brown clay. The subsoil is dark gray, mottled clay in the upper part and dark reddish brown, mottled clay in the lower part. The substratum is dark reddish brown, mottled clay.

The Roxana soils are well drained. They are on natural levees, low ridges, and sand bars on flood plains and are subject to occasional or frequent flooding. The surface layer is strong brown silt loam or brown very fine sandy loam. The underlying material is strong brown silt loam in the upper part and reddish brown very fine sandy loam in the lower part.

The minor soils in this map unit are the well drained Gallion soils in high positions on natural levees and the Yorktown soils in backswamps.

Most of the acreage of these soils has been cleared and is used as cropland and pastureland. The main crops are soybeans, grain sorghum, cotton, corn, and wheat. A small acreage is used as habitat for wildlife and as woodland that is managed for timber production.

The soils in this map unit dominantly are moderately well suited to use as woodland. However, areas of Roxana soils that flood only occasionally are well suited to this use. An equipment use limitation and seedling mortality caused by wetness and flooding are the main management concerns.

The Moreland and Perry soils are poorly suited to use as cropland and moderately well suited to use as pastureland. Areas of Roxana soils that are subject to occasional flooding are moderately well suited to use as cropland and pastureland. Areas of Roxana soils that are subject to frequent flooding generally are not suited to use as cropland and pastureland. Wetness and poor tilth are the main limitations, and flooding is a hazard. A surface drainage system and flood protection are needed.

The soils in this map unit generally are not suited to use as homesites and dominantly are poorly suited to use as sanitary facilities and building site development. However, areas of Roxana soils that flood frequently are not suited for these purposes. Wetness, very slow permeability, and very high shrink-swell potential are the main limitations, and flooding is a hazard.

2. Guyton

Level, poorly drained soils that are loamy throughout

This map unit consists of soils on narrow flood plains of streams that drain the terraces and uplands. These soils are subject to frequent flooding. Slopes are less than 1 percent.

This map unit makes up about 17 percent of the parish. It is about 85 percent Guyton soils and 15 percent soils of minor extent.

The Guyton soils have a grayish brown silt loam surface layer. The subsurface layer is light brownish gray and grayish brown, mottled silt loam. The next layer is grayish brown, mottled silty clay loam and silt loam. The subsoil and substratum are grayish brown, mottled silty clay loam.

The minor soils in this map unit are the poorly drained Brimstone, the well drained Cahaba, and the somewhat poorly drained Frizzell soils on low terraces.

The soils in this map unit are used mainly as woodland. A small acreage is used as pastureland.

These soils are poorly suited to use as woodland. Hardwood trees and pine trees can be grown. Loblolly pine is suitable only in areas where flooding is of short duration. An equipment use limitation and seedling mortality are the main management concerns.

These soils generally are not suited to use as cropland and are poorly suited to use as pastureland because of flooding and seasonal wetness.

The soils in this map unit generally are not suited to use as sanitary facilities and building site development. The hazard of flooding is too severe for these uses.

SOILS ON TERRACES AND UPLANDS

The map units in this group consist of well drained to poorly drained, level to moderately steep, loamy and clayey soils on uplands and terraces. These map units make up about 82 percent of Winn Parish. Most of the area is used as woodland. A small acreage is used as pastureland or homesites. Seasonal wetness is the main limitation for most uses.

3. Frizzell-Glenmora-Guyton

Level to very gently sloping, moderately well drained to poorly drained soils that are loamy throughout

This map unit consists of soils on broad flats, broad convex ridgetops, and in depressional areas on terraces. Some areas are subject to rare flooding. Slopes range from 0 to 5 percent.

This map unit makes up about 12 percent of the parish. It is about 65 percent Frizzell soils, 20 percent Guyton soils, 10 percent Glenmora soils, and 5 percent soils of minor extent.

The Frizzell soils are nearly level and somewhat poorly drained. They are on broad flats. The surface layer is brown silt loam. The next layer is brown and grayish brown, mottled silt loam. The subsoil is yellowish brown silty clay loam in the upper and middle parts and yellowish brown and grayish brown silty clay loam in the lower part. The subsoil is mottled throughout.

The Glenmora soils are very gently sloping and moderately well drained. They are on broad, convex ridgetops. The surface layer is dark grayish brown silt loam. The layers of the subsoil from top to bottom are yellowish brown silt loam; yellowish brown silty clay loam; yellowish brown, mottled silty clay loam; yellowish brown, mottled silty clay loam and grayish brown silt loam; and mottled yellowish brown and grayish brown silty clay loam.

The Guyton soils are level and poorly drained. They are in depressional areas. The surface layer is dark grayish brown silt loam. The subsurface layer is grayish brown, mottled silt loam. The next layer is grayish brown, mottled silty clay loam and gray silt loam. The subsoil is grayish brown, mottled silty clay loam. The substratum is grayish brown, mottled silt loam.

The minor soils in this map unit are the well drained Cahaba soils, the excessively drained Darden soils, and the moderately well drained Harleston and Shatta soils in high positions on terraces.

Most of the acreage of these soils is used as habitat for wildlife and as woodland that is managed for timber production. Typically, the woodland is pine and mixed hardwoods. Some large areas have been planted to pure stands of loblolly pine. A small acreage is used as pastureland or homesites.

The Glenmora soils are well suited to use as woodland, and the Frizzell and Guyton soils are moderately well suited to this use. An equipment use limitation is moderate because of seasonal wetness.

The soils in this map unit are moderately well suited to use as cropland. The Glenmora soils are well suited to use as pastureland, and the Frizzell and Guyton soils are moderately well suited to this use. Low soil fertility and seasonal wetness are the main limitations. In sloping areas, conservation practices are needed to control erosion.

The Glenmora soils are moderately well suited to use as sanitary facilities and building site development, and the Frizzell and Guyton soils are poorly suited to these uses. The main limitations are wetness, low strength for roads and streets, and slow permeability.

4. Bellwood-Savannah-Vaiden

Level, gently sloping, and strongly sloping, somewhat poorly drained and moderately well drained soils that have a loamy surface layer and a clayey or loamy subsoil

This map unit consists of soils on level and gently sloping ridgetops and gently sloping and strongly sloping side slopes on uplands and terraces. Slopes range from 0 to 5 percent on the ridgetops and from 1 to 15 percent on the side slopes.

This map unit makes up about 15 percent of the parish. It is about 47 percent Bellwood soils, 20 percent Savannah soils, 7 percent Vaiden soils, and 26 percent soils of minor extent.

The Bellwood soils are gently sloping and strongly sloping and somewhat poorly drained. They are on ridgetops and side slopes on uplands. The surface layer is dark brown or very dark grayish brown loam. The subsoil is red clay in the upper part, mottled grayish brown and red clay in the middle part, and light brownish gray silty clay and clay in the lower part.

The Savannah soils are gently sloping and moderately well drained. They are on ridgetops and side slopes on terraces. The surface layer is dark grayish brown fine sandy loam. The subsurface layer is brown fine sandy loam. The subsoil is strong brown sandy clay loam in the upper part; yellowish brown, mottled clay loam in the middle part; and a fragipan of yellowish brown, mottled sandy clay loam in the lower part.

The Vaiden soils are level and somewhat poorly drained. They are on ridgetops on uplands. The surface layer is dark grayish brown silt loam. The subsoil is yellowish brown, mottled clay in the upper part and mottled yellowish brown and light brownish gray clay in the lower part. The substratum is mottled yellowish brown and light brownish gray clay in the upper part and mottled yellow and light gray clay in the lower part.

The minor soils in this map unit are the moderately well drained Hollywood and Oktibbeha soils, the well drained Keiffer soils, the somewhat poorly drained Frizzell and Metcalf soils, and the poorly drained Guyton soils.

Most of the acreage of these soils is used as habitat for wildlife and as woodland that is managed for timber production. Typically, the woodland is pine and mixed hardwoods. Some large areas have been planted to pure stands of loblolly pine. A small acreage is used as pastureland or homesites.

The Savannah soils are well suited to use as woodland, and the Bellwood and Vaiden soils are moderately well suited to this use. A moderate equipment use limitation and seedling mortality caused by seasonal wetness are the main management concerns.

The Savannah and Vaiden soils are moderately well suited to use as cropland and pastureland. The gently sloping Bellwood soils are poorly suited to use as cropland and moderately well suited to use as pastureland. The strongly sloping Bellwood soils generally are not suited to use as cropland and poorly suited to use as pastureland. Poor tilth, low fertility, and seasonal wetness are the main limitations. Erosion is a hazard on sloping soils.

The soils in this map unit dominantly are poorly suited to use as homesites and urban development. However, the Savannah soils are moderately well suited to these uses. Severe limitations for sanitary facilities and building site development caused by a very high shrink-swell potential, wetness, and moderately slow and very slow permeability limit their use for these purposes.

5. Sacul-Savannah

Gently sloping to moderately steep, moderately well drained soils that have a loamy surface layer and a clayey or loamy subsoil

This map unit consists of soils on gently sloping ridgetops and strongly sloping to moderately steep side slopes on uplands and terraces. Slopes range from 1 to 20 percent.

This map unit makes up about 46 percent of the parish. It is about 65 percent Sacul soils, 20 percent Savannah soils, and 15 percent soils of minor extent.

The Sacul soils are gently sloping to moderately steep. They are on uplands. The surface layer is dark grayish brown fine sandy loam. The subsurface layer is light yellowish brown fine sandy loam. The layers of the subsoil from top to bottom are red clay; red, mottled clay; mottled light brownish gray and red sandy clay; and light brownish gray, mottled sandy clay. The substratum is light yellowish brown, stratified loam and silty clay loam.

The Savannah soils are gently sloping. They are on terraces. The surface layer is dark grayish brown fine sandy loam. The subsurface layer is brown fine sandy loam. The layers of the subsoil from top to bottom are strong brown sandy clay loam; yellowish brown, mottled clay loam; and yellowish brown, mottled sandy clay loam. The lower part of the subsoil is a fragipan.

The minor soils in this map unit are the somewhat poorly drained Frizzell soils; the poorly drained Guyton and Osier soils; and the well drained Boykin, Ruston, and Smithdale soils.

Most of the acreage of these soils is used as habitat for wildlife and as woodland that is managed for timber production. Typically, the woodland is pine or mixed pine and hardwoods. Large areas have been planted to pure stands of loblolly pine. A small acreage is used as pastureland or homesites.

The Savannah soils are well suited to use as woodland, and the Sacul soils are moderately well suited to this use. The main management concern is a moderate equipment use limitation.

The Savannah soils are moderately well suited to use as cropland and pastureland. The gently sloping Sacul soils are poorly suited to use as cropland and moderately well suited to use as pastureland. The strongly sloping to moderately steep Sacul soils generally are not suited to use as cropland and poorly suited to use as pastureland. Steepness of slope, low fertility, and soil droughtiness are the main limitations. The hazard of erosion on the strongly sloping to moderately steep soils is severe.

The Savannah soils are moderately well suited to use as homesites and urban development, and the Sacul soils are poorly suited to these uses. Slow and moderately slow permeability, low strength for roads and streets, steepness of slope, wetness, and high shrink-swell potential are the main limitations.

6. Gore-Kolin

Gently sloping and strongly sloping, moderately well drained soils that have a loamy surface layer and a clayey or a loamy and clayey subsoil

This map unit consists of soils on gently sloping ridgetops and strongly sloping side slopes on terraces. Slopes range from 1 to 15 percent.

This map unit makes up about 2 percent of the parish. It is about 42 percent Gore soils, 19 percent Kolin soils, and 39 percent soils of minor extent.

The Gore soils are on gently sloping ridgetops and strongly sloping side slopes. The surface layer is dark grayish brown or brown silt loam. The layers of the subsoil from top to bottom are red clay; mottled red, yellowish red, and yellowish brown clay; and yellowish red silty clay. The substratum is yellowish red, mottled silty clay.

The Kolin soils are on gently sloping ridgetops. The surface layer is dark grayish brown silt loam. The subsurface layer is brown silt loam. The layers of the subsoil from top to bottom are strong brown silty clay loam; strong brown, mottled silty clay loam; yellowish brown, mottled silty clay loam and pale brown silt loam; mottled red and light brownish gray clay; and yellowish red, mottled silty clay.

The minor soils in this map unit are the somewhat poorly drained Frizzell soils, the poorly drained Guyton soils, the moderately well drained Savannah soils, and the well drained Ruston soils.

Most of the acreage of these soils is used as habitat for wildlife and as woodland that is managed for timber production. Typically, the woodland is pine or mixed pine and hardwoods. Large areas have been planted to pure stands of loblolly pine. A small acreage is used as pastureland or homesites.

The Kolin soils are well suited to use as woodland, and the Gore soils are moderately well suited to this use. A moderate equipment use limitation and seedling mortality caused by seasonal wetness and a clayey subsoil are the main management concerns.

The Kolin soils are moderately well suited to use as cropland and pastureland. The gently sloping Gore soils are poorly suited to use as cropland and moderately well suited to use as pastureland. The strongly sloping Gore soils generally are not suited to use as cropland and are poorly suited to use as pastureland. Steepness of slope, low fertility, and wetness are the main limitations.

The soils in this map unit are poorly suited to use as homesites and urban development. Very slow permeability, wetness, steepness of slope, high shrink-swell potential, and low strength for roads and streets are the main limitations.

7. Ruston-Savannah

Gently sloping, well drained and moderately well drained soils that are loamy throughout

This map unit consists of soils on ridgetops and side slopes on uplands and terraces. Slopes range from 1 to 5 percent.

This map unit makes up about 4 percent of the parish. It is about 45 percent Ruston soils, 40 percent Savannah soils, and 15 percent soils of minor extent.

The Ruston soils are well drained. They are on ridgetops on uplands. The surface layer is dark grayish brown fine sandy loam. The subsurface layer is brown fine sandy loam. The layers of the subsoil from top to bottom are dark red sandy clay loam, red sandy clay loam, yellowish red fine sandy loam, yellowish red and yellowish brown fine sandy loam, and red sandy clay loam.

The Savannah soils are moderately well drained. They are on ridgetops and side slopes. The surface layer is dark grayish brown fine sandy loam. The subsurface layer is brown fine sandy loam. The layers of the subsoil from top to bottom are strong brown sandy clay loam; yellowish brown, mottled clay loam; and yellowish brown, mottled sandy clay loam. The lower part of the subsoil is a fragipan.

The minor soils in this map unit are the well drained Boykin and Smithdale soils, the somewhat poorly drained Frizzell soils, the poorly drained Osier and Guyton soils, and the moderately well drained Sacul soils.

Most of the acreage of these soils is used as habitat for wildlife and as woodland that is managed for timber production. A small acreage is used as pastureland or homesites.

The soils in this map unit are well suited to use as woodland. They have few limitations to this use.

The Ruston soils are moderately well suited to use as cropland and well suited to use as pastureland. The Savannah soils are moderately well suited to use as cropland and pastureland. Steepness of slope, low fertility, low strength for roads and streets, and wetness are the main limitations.

The soils in this map unit are moderately well suited to use as homesites and urban development. Wetness and moderate and moderately slow permeability are the main limitations.

8. Mahan

Gently sloping and strongly sloping, well drained soils that have a loamy surface layer and a loamy and clayey subsoil

This map unit consists of soils on gently sloping ridgetops and strongly sloping side slopes on uplands. Slopes range from 1 to 15 percent.

This map unit makes up about 3 percent of the parish. It is about 63 percent Mahan soils and 37 percent soils of minor extent.

The Mahan soils have a dark grayish brown fine sandy loam surface layer. The subsurface layer is dark brown channery fine sandy loam. The subsoil is red, mottled sandy clay loam in the upper and middle parts and yellowish red, mottled sandy clay loam in the lower part. The substratum is yellowish red, mottled sandy loam.

The minor soils in this map unit are the somewhat poorly drained Bellwood soils on side slopes and Frizzell soils on terraces, the poorly drained Guyton soils on narrow flood plains, the well drained Ruston soils on ridgetops, and the moderately well drained Sacul and Savannah soils on side slopes.

Most of the acreage of these soils is used as habitat for wildlife and as woodland that is managed for timber production. Typically, the woodland is pine or mixed pine and hardwoods. Large areas have been planted to pure stands of loblolly pine. A small acreage is used as pastureland or homesites.

The soils in this map unit are well suited to use as woodland. They have few limitations to this use.

The gently sloping soils in this map unit are moderately well suited to use as cropland and well suited to use as pastureland. The strongly sloping soils in this map unit generally are not suited to use as cropland and poorly suited to use as pastureland. Low soil fertility is the main limitation, and erosion is a hazard.

The soils in this map unit are moderately well suited to use as homesites and building site development. The main limitations are moderate permeability, low strength for roads and streets, and steepness of slope.

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 the heading "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, stoniness, 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, Guyton silt loam, frequently flooded, is a phase of the Guyton series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Roxana-Moreland complex, gently undulating, occasionally flooded, is an example.

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. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas.* Such areas, e.g., Pits, gravel, have little or no soil material and support little or no vegetation. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

The boundaries of map units in Winn Parish were matched, where possible, with those of the previously completed surveys of Caldwell, LaSalle, Grant, and Jackson Parishes. In a few places, the lines do not join, and there are differences in the names of the map units. These differences result mainly from changes in soil series concepts, differences in map unit design, and changes in soil patterns near survey area boundaries.

Table 4 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.

All of the soils on the flood plains in Winn Parish were mapped at the same level of detail, except for most of those that are subject to frequent flooding. Frequent flooding limits the use and management of the soils, and separating the soils in these areas would be of little importance to the land user.

Most of the soils on the uplands and terraces are in forest land, and the use and management of these areas are not expected to change. If the landscape consisted of more than one soil in close association, the soils were not separated.

Bc—Bellwood loam, 1 to 5 percent slopes

This soil is gently sloping and somewhat poorly drained. It is on broad, slightly convex ridgetops and upper side slopes on uplands. Gilgai micro-relief is common in most areas. The areas of this soil are irregular in shape and range from 15 to 500 acres. Slopes are generally long and smooth.

Typically, the surface layer is dark brown loam about 3 inches thick. The subsoil to a depth of about 23 inches is red clay. The next layer to a depth of about 43 inches is mottled grayish brown and red clay. The subsoil between depths of 43 and 75 inches is light brownish gray silty clay in the upper part and light brownish gray clay in the lower part.

This soil has low fertility and high levels of exchangeable aluminum in the root zone that are potentially toxic to crops. Water and air move through this soil at a very slow rate. Runoff is medium, and the hazard of water erosion is moderate. A seasonal high water table ranges from 2 to 4 feet below the surface during December through April of most years. The available water capacity is moderate to high. The shrink-swell potential is very high in the subsoil.

Included with this soil in mapping are a few small areas of Frizzell, Keiffer, Oktibbeha, Sacul, Savannah, and Vaiden soils. Also included are areas of similar soils with slopes greater than 5 percent and, in some places, surface layers of silt loam, silty clay loam, silty clay, or clay. Frizzell and Savannah soils are at a lower elevation than the Bellwood soil and are loamy throughout the profile. Keiffer, Oktibbeha, Sacul, and Vaiden soils are in positions similar to those of the Bellwood soil. Keiffer, Oktibbeha, and Vaiden soils contain concretions of calcium carbonate somewhere in the profile. Sacul soils have a different mineralogy than the Bellwood soil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 78. Other trees commonly grown on this soil are shortleaf pine, white oak, and southern red oak. The main concerns in producing and harvesting timber are a severe equipment use limitation during wet seasons, moderate seedling mortality, a moderate windthrow hazard, and moderate plant competition. Because the clayey subsoil is sticky when wet, most planting and harvesting equipment can be used only during dry periods. Rutting and soil compaction are minimized by planting and harvesting only during dry periods. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is well suited to use as habitat for woodland and upland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife (fig. 2). Where the forest borders pastureland, field borders planted with shrubs or annual game-food mixtures will provide food and cover for wildlife.

This soil is moderately well suited to pasture. The main limitations are the severe hazard of erosion, low fertility, and wetness. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Use of lime and fertilizer help to overcome the low fertility and promote good growth of forage plants.

This Bellwood soil is poorly suited to cultivated crops, mainly because of the severe hazard of erosion, low fertility, wetness, and potentially toxic levels of exchangeable aluminum in the root zone. Erosion can be reduced if conservation tillage is used and tillage and seeding are on the contour. Also, waterways can be shaped and seeded to perennial grass. Lime and fertilizer improve fertility and reduce the levels of exchangeable aluminum.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. Wetness, very slow permeability, the clayey subsoil, low strength for roads and streets, and very high shrink-swell potential are the main limitations. If buildings are constructed on this soil, properly designing foundations and footings help to prevent the structural damage caused by shrinking and swelling. Wetness can be reduced by providing the proper grade or installing drain tile around footings. Road bases can be strengthened to overcome the limited capacity of the soil to support a load. Septic tank absorption fields do not function properly during rainy periods because of wetness and very slow permeability. Lagoons or self-contained disposal units can be used to dispose of sewage properly.

This Bellwood soil is in capability subclass IVe. The woodland ordination symbol is 8C.

BD—Bellwood loam, 5 to 15 percent slopes

This soil is strongly sloping and somewhat poorly drained. It is on side slopes on uplands. Gilgai micro-relief is common in most areas. The areas of this soil are irregular in shape and range from 15 to 300 acres. Fewer observations were made than in most other map units. The detail in mapping, however, is adequate for the expected use of the soil. Slopes are generally short and convex.

Figure 2.—When pine trees were harvested in this area of Bellwood loam, 1 to 5 percent slopes, hardwood trees were left along a drainageway to benefit wildlife.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsoil to a depth of about 60 inches is red clay in the upper part; mottled red and light brownish gray clay in the middle part; and light brownish gray, mottled clay in the lower part.

This soil has low fertility and high levels of exchangeable aluminum in the root zone that are potentially toxic to crops. Water and air move through this soil at a very slow rate. Runoff is rapid, and the hazard of water erosion is severe. A seasonal high water table ranges from 2 to 4 feet below the surface during December through April of most years. The available water capacity is moderate to high. The shrink-swell potential is very high in the subsoil.

Included with this soil in mapping are a few small areas of Keiffer, Oktibbeha, Sacul, and Savannah soils. Also included are areas of similar soils with slopes less than 5 percent or greater than 15 percent and, in some places, surface layers of loam, silty clay loam, silty clay, or clay. Savannah soils are at a lower elevation than the Bellwood soil and are loamy throughout the profile. Keiffer, Oktibbeha, and Sacul soils are in positions similar to those of the Bellwood soil. Keiffer and Oktibbeha soils have concretions of calcium carbonate somewhere in the profile. Sacul soils are moderately well drained and have a different mineralogy than the Bellwood soil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 78. Other trees commonly grown on this soil are shortleaf pine, white oak, and southern red oak. The main concerns in producing and harvesting timber are a severe equipment use limitation during wet seasons, moderate seedling mortality, a moderate windthrow hazard, and moderate plant competition. Because the clayey subsoil is sticky when wet, most planting and harvesting equipment can be used only during dry periods. Harvesting during dry seasons and locating skid trails, log landings, and haul roads properly and within limiting grades help to reduce soil compaction and erosion. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is well suited to use as habitat for woodland and upland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife. Field borders can be planted with shrubs or annual game-food mixtures to benefit deer, turkeys, quail, and rabbits.

This soil is poorly suited to pasture. The main limitations are the severe hazard of erosion, low fertility, and wetness. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Use of lime and fertilizer help to overcome the low fertility and promote good growth of forage plants.

This Bellwood soil generally is not suited to cultivated crops. The slopes are too steep and the hazard of erosion is too severe. Included areas of less sloping soils can be used as cropland if special conservation practices are used to control erosion.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. Wetness, very slow permeability, the clayey subsoil, steepness of slope, low strength for roads and streets, and very high shrink-swell potential are the main limitations. If buildings are constructed on this soil, properly designing foundations and footings help to prevent the structural damage caused by shrinking and swelling. Wetness can be reduced by installing drain tile around footings. Septic tank absorption fields do not function properly during rainy periods because of wetness and very slow permeability. Lagoons or self-contained disposal units can be used to dispose of sewage properly. Preserving the existing plant cover during construction helps to control erosion. Establishing and maintaining the plant cover can be achieved through proper fertilizing, seeding, mulching, and shaping of the slopes.

This Bellwood soil is in capability subclass VIe. The woodland ordination symbol is 8C.

Bo—Boykin loamy fine sand, 1 to 5 percent slopes

This soil is gently sloping and well drained. It is on ridgetops on uplands. The areas of this soil are irregular in shape and range from 5 to 100 acres. Slopes are generally long and smooth.

Typically, the surface layer is about 6 inches thick. It is dark grayish brown loamy fine sand in the upper part and brown loamy fine sand in the lower part. The subsurface layer to a depth of about 36 inches is brown loamy fine sand. The subsoil to a depth of about 60 inches is red sandy clay loam.

This soil has low fertility and moderately high to high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through the upper part of this soil at a rapid rate and through the lower part at a moderate rate. Runoff is slow, and the hazard of water erosion is moderate. A seasonal high water table is greater than 6 feet below the surface throughout the year. The surface layer of this soil dries quickly after rains. The available water capacity is low to moderate. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Sacul, Savannah, and Smithdale soils. Also included are areas of similar soils with slopes greater than 5 percent and, in some places, surface layers of fine sandy loam. Sacul soils are in positions similar to those of the Boykin soil and have a clayey subsoil. Savannah soils are in lower positions than the Boykin soil. Smithdale soils are on side slopes. Savannah and Smithdale soils are loamy throughout the profile. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as homesites.

This soil is well suited to the production of loblolly pine. The site index for loblolly pine is 92. Other trees commonly grown on this soil are shortleaf pine, longleaf pine, white oak, southern red oak, post oak, sweetgum, hickory, and blackjack oak. The main concerns in producing and harvesting timber are moderate seedling mortality caused by droughtiness and moderate plant competition. To reduce the seedling mortality rate, seedlings can be planted in early spring to obtain sufficient moisture from spring rain. Mulching around seedlings helps to retain moisture in summer. Some areas may require replanting if a sufficient stand is not attained. After harvesting, reforestation can be carefully managed to reduce competition from undesirable plants. Site preparation, such as chopping and burning, reduces debris, controls immediate plant competition, and facilitates planting. Applying herbicides to this soil to control undesirable woody vegetation increases the risk of contaminating the ground-water supply.

This soil is well suited to use as habitat for woodland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil is moderately well suited to pasture. The main limitations are low fertility and droughtiness. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, and crimson clover. Fertilizer is needed for optimum growth of grasses and legumes.

This Boykin soil is moderately well suited to cultivated crops. It is limited mainly by low fertility, droughtiness, and potentially toxic levels of exchangeable aluminum in the root zone. Fertilizer, lime, and irrigation help to ensure optimum production of crops.

This soil is well suited to homesites. It has few limitations for building sites and local roads and streets. Seepage can be a hazard for sewage lagoons. The bottom and walls of the lagoon should be coated with impervious material to reduce seepage and prevent contamination of nearby ground-water supplies. Mulching, fertilizing, and irrigating can help to establish lawn grasses and ornamental shrubs and trees.

The Boykin soil is in capability subclass IIIs. The woodland ordination symbol is 10S.

BP—Boykin loamy fine sand, 5 to 20 percent slopes

This soil is strongly sloping to moderately steep and well drained. It is on very narrow ridgetops and side slopes on uplands. The areas of this soil are irregular in shape and range from 10 to several hundred acres. Well-defined drainageways cross the map unit in most places. Fewer observations were made than in most other map units. The detail in mapping, however, is adequate for the expected use of the soil. Slopes are generally short and convex.

Typically, the surface layer is dark grayish brown loamy fine sand about 7 inches thick. The subsurface layer to a depth of about 22 inches is brown loamy fine sand. The subsoil to a depth of about 88 inches is red sandy clay loam in the upper part, yellowish red fine sandy loam in the middle part, and red sandy clay loam in the lower part.

This soil has low fertility and moderately high to high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through the upper part of this soil at a rapid rate and through the lower part at a moderate rate. The hazard of water erosion is moderate. A seasonal high water table is greater than 6 feet below the surface throughout the year. The available water capacity is low to moderate. The shrink-swell potential is low.

Included with this soil in mapping are a few small and large areas of Osier, Sacul, Savannah, and Smithdale soils. Also included are areas of similar soils with slopes less than 5 percent or greater than 20 percent and, in some places, surface layers of fine sandy loam. Osier soils are more poorly drained than the Boykin soil and are in narrow drain heads and seepy areas. Sacul and Smithdale soils are in positions similar to those of the Boykin soil. Sacul soils have a clayey subsoil, and Smithdale soils are loamy throughout the profile. Savannah soils are in lower positions than the Boykin soil and are loamy throughout the profile. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as homesites.

This soil is well suited to the production of loblolly pine. The site index for loblolly pine is 92. Other trees commonly grown on this soil are shortleaf pine, longleaf pine, white oak, southern red oak, post oak, sweetgum, hickory, and blackjack oak. The main concerns in producing and harvesting timber are moderate seedling mortality and moderate plant competition. To reduce the seedling mortality rate, seedlings can be planted in early spring when moisture supplies are high. Some areas may require replanting if a sufficient stand is not attained. Site preparation, such as chopping and burning, reduces debris and controls immediate plant competition. Applying herbicides to this soil to control undesirable woody vegetation can contaminate the ground water because of the moderate to rapid permeability.

This soil is well suited to use as habitat for woodland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil is poorly suited to pasture. The main limitations are the severe hazard of erosion, steepness of slope, low fertility, and droughtiness. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, and crimson clover. Tillage to prepare the seedbed should be on the contour to reduce erosion.

This soil generally is not suited to cultivated crops. The slopes are too steep and the hazard of erosion is too severe. Included areas of less sloping soils can be used as cropland if special conservation practices are used to control erosion.

This soil is moderately well suited to homesites and urban development. It has moderate to severe limitations for most sanitary facilities and moderate limitations for building site development because of steepness of slope. Included areas of less sloping soils in this map unit can be used as homesites. Erosion is a hazard in the steeper areas. Only the part of the site that is used for construction should be disturbed. Fertilizer, lime, and irrigation help to establish lawn grasses and ornamental trees and shrubs.

This Boykin soil is in capability subclass VIe. The woodland ordination symbol is 10S.

Br—Brimstone very fine sandy loam, occasionally flooded

This soil is level and poorly drained. It is on low terraces along streams that drain the uplands. This soil is subject to occasional flooding for brief to long periods. It contains high levels of sodium in the subsurface layer and subsoil. The areas of this soil are irregular in shape and range from 10 to 100 acres. Slopes are less than 1 percent.

Typically, the surface layer is grayish brown very fine sandy loam about 6 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 17 inches thick. The next layer to a depth of about 37 inches is grayish brown, mottled silty clay loam and light brownish gray silt loam. The subsoil to a depth of about 60 inches is grayish brown, mottled silt loam.

This soil has low fertility and a high concentration of sodium salts that limit root growth and the amount of water available to plants. Water and air move through this soil at a slow rate. Water runs off the surface at a slow rate. A seasonal high water table ranges from near the surface to 1.5 feet below the surface from December to April. The available water capacity is moderate to high.

Included with this soil in mapping are a few small areas of Frizzell and Guyton soils. Neither of these soils has high levels of sodium in the profile. Also included are areas of similar soils with surface layers of silt loam. Frizzell soils are in higher positions than the Brimstone soil. Guyton soils are in positions similar to those of the Brimstone soil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat.

This soil is poorly suited to the production of loblolly pine. The site index for loblolly pine is 80. Other trees commonly grown on this soil are willow oak, water oak, sweetgum, baldcypress, and green ash. In the understory vegetation, palmetto is an indicator species of the alkalinity of the soil. The main concerns in producing and harvesting timber are a severe equipment use restriction, moderate plant competition, a severe windthrow hazard, and moderate seedling mortality. High levels of sodium limit tree growth. Wetness and flooding limit the use of equipment. Trees are subject to windthrow because of the high water table and shallow rooting depth. If site preparation is not adequate, competition from undesirable plants can prevent or prolong establishment of trees. Pine seedlings have a high rate of seedling mortality because of wetness and high levels of sodium.

This soil is moderately well suited to use as habitat for woodland wildlife and well suited to use as habitat for wetland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation or by propagating desirable plants. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife. Habitat for waterfowl and furbearers can be improved by constructing ponds and providing small open areas in woodland.

This soil is moderately well suited to pasture. Wetness and low fertility are the main limitations. Flooding is a hazard. The main suitable pasture plants are common bermudagrass, ryegrass, white clover, and vetch. Grazing when the soil is wet compacts the surface layer. Proper grazing, weed control, and fertilizer are needed for maximum quality of forage.

This soil is poorly suited to cultivated crops. Wetness and excessive sodium in the soil are the main limitations. Flooding is a hazard. A drainage system can improve the soil for crops. Flooding in late spring or summer can damage crops in some years. Flooding can be controlled by major structures, such as levees. Returning crop residue to the soil, plowing under cover crops, and using a suitable cropping system help to maintain organic matter content and soil tilth. Most crops respond well to fertilizer.

This soil is poorly suited to urban development. Unless flooding is reduced, it generally is not suited to homesites. The main limitations are wetness, slow permeability, excess sodium, and low strength for roads and streets. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Roads should be located above the expected flood elevation and designed to overcome the limited ability of the soil to support a load.

This Brimstone soil is in capability subclass IIIs. The woodland ordination symbol is 11T.

Ca—Cahaba fine sandy loam, 1 to 3 percent slopes

This soil is very gently sloping and well drained. It is on convex ridges on low terraces. In a few low places, this soil is subject to rare flooding. The areas of this soil are generally long and narrow and range from 5 to 150 acres. Slopes are generally long and smooth.

Typically, the surface layer is dark grayish brown fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown fine sandy loam about 5 inches thick. The subsoil to a depth of about 40 inches is yellowish red sandy clay loam in the upper and middle parts and strong brown fine sandy loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown loamy sand.

This soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through the upper part of this soil at a moderate rate and through the lower part at a moderately rapid to rapid rate. Water runs off the surface at a medium rate. A seasonal high water table is more than 6 feet below the surface throughout the year. The available water capacity is moderate to high. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Brimstone, Frizzell, and Guyton soils. Also included are areas of similar soils with slopes greater than 3 percent. In some places, the subsoil is brown throughout, or it contains less clay than is typical for the Cahaba soil. Brimstone and Guyton soils are poorly drained and in lower positions than the Cahaba soil. Frizzell soils are in slightly lower positions than the Cahaba soil and are somewhat poorly drained. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

This soil is well suited to the production of loblolly pine. The site index for loblolly pine is 87. Other trees commonly grown on this soil are shortleaf pine, yellow poplar, sweetgum, southern red oak, and water oak. This soil has few limitations for forest management. It is well suited for year-round logging. The main concern in producing and harvesting timber is moderate plant competition. If site preparation is not adequate, competition from undesirable plants can prolong reestablishing trees. Site preparation, such as chopping and burning, reduces debris, controls immediate plant competition, and facilitates planting. Applying herbicides to this soil can contaminate the ground water because of the moderate to rapid permeability.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife. Where the forest borders hayland or pastureland, field borders planted with shrubs or annual game-food mixtures will provide food and cover for rabbits, quail, deer, and turkeys.

This soil is well suited to pasture. The main limitations are the moderate hazard of erosion, low fertility, and soil droughtiness. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, crimson clover, and ryegrass. Seedbed preparation should be on the contour or across the slope, where practical, to reduce erosion. Use of lime and fertilizer help to overcome the low fertility and promote good growth of forage plants. Proper stocking and pasture rotation help to keep the pasture in good condition.

This soil is moderately well suited to cultivated crops. It is limited mainly by low fertility, droughtiness, and high levels of exchangeable aluminum in the root zone. The hazard of erosion is moderate. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces erosion, reduces crusting, and increases the water intake rate. Crops respond well to lime and fertilizer. Terraces and farming on the contour help to conserve moisture and reduce runoff and the risk of erosion. In areas where water of suitable quality is available, supplemental irrigation can prevent damage to crops during dry periods.

This soil is well suited to homesites and urban development. The main limitation to these uses is the moderate to rapid permeability. Also, cutbanks cave easily on this soil. During the rainy season, effluent from onsite sewage disposal systems and sanitary landfills may seep into shallow aquifers and contaminate ground-water supplies. If the density of housing is moderate to high, community sewage systems are better suited to dispose of sewage. Where shallow excavations are made, special retainer walls can be used to prevent cutbanks from caving.

This Cahaba soil is in capability subclass IIe. The woodland ordination symbol is 9A.

Da—Darden loamy fine sand, 1 to 5 percent slopes

This soil is gently sloping and excessively drained. It is on convex ridges on terraces. The areas of this soil are generally long and narrow and range from 5 to 50 acres. Slopes are generally long and smooth.

Typically, the surface layer is about 23 inches thick. It is dark grayish brown loamy fine sand in the upper part and brown loamy fine sand in the lower part. The subsoil to a depth of about 72 inches is yellowish brown loamy fine sand.

This soil has low fertility and moderately high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a rapid rate. Water runs off the surface at a very slow rate. A seasonal high water table is more than 6 feet below the surface throughout the year. The available water capacity is low. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Frizzell and Guyton soils. These soils are in lower positions than the Darden soil and are loamy throughout the profile. Also, included are a few small areas of the Darden soil that are subject to rare or occasional flooding. The included soils make up about 10 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat.

This soil is poorly suited to the production of loblolly pine. The site index for loblolly pine is 80. Other trees commonly grown on this soil are shortleaf pine, blackjack oak, sand oak, and sassafras. Prickly pear cactus and lichens are common understory species. The main concerns in producing and harvesting timber are a moderate equipment use limitation and severe seedling mortality. In addition, droughtiness limits tree growth. Trafficability is poor when this sandy soil is dry. Inadequate moisture in the soil causes a high rate of seedling mortality. Seedling survival can be improved by planting in early spring when moisture supplies are high. Mulching around seedlings can also increase the amount of moisture available. Applying herbicides to this soil increases the risk of contaminating the ground water because of the rapid permeability.

This soil is poorly suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for openland wildlife. Droughtiness is the main limitation.

This soil is poorly suited to pasture. Droughtiness is the main limitation, and low fertility is a minor limitation. Suitable pasture plants are improved bermudagrass, weeping lovegrass, and crimson clover.

This soil is poorly suited to cultivated crops. The main limitations are soil droughtiness, low fertility, and moderately high levels of exchangeable aluminum in the root zone. Using conservation tillage or returning all crop residue to the soil helps to maintain organic matter content and conserve moisture. Light and frequent applications of fertilizer and lime improve fertility and prevent excess fertilizer from rapidly leaching through the soil.

This soil is moderately well suited to homesites and urban development. It has slight limitations for dwellings and local roads and streets and severe limitations for most sanitary facilities. Droughtiness is a limitation for lawns and landscape plants. Seepage is a hazard where sanitary facilities, such as sewage lagoons, are used. Cutbanks cave easily on this soil. Where shallow excavations are made, special retainer walls can be used to prevent cutbanks from caving. Landscape plants that tolerate droughtiness can be selected if irrigation is not provided. Self-contained sewage disposal systems or community sewage systems can be used to prevent contamination of water supplies as a result of seepage.

This Darden soil is in capability subclass IVs. The woodland ordination symbol is 8S.

Dp—Dumps, quarry

This miscellaneous area consists of areas onto which rock debris from rock pits has been dumped. The rock debris is several feet thick. The rock was removed from the cap rock of the Winnfield Salt Dome. Slopes range from 1 to 5 percent.

The surface of Dumps consists of large boulders to gravel-sized fragments of rock material. Some areas are very rough and irregular with large boulders strewn over the surface.

Most areas of this map unit are barren of vegetation or support a few low quality trees and sparse stands of grass.

Dumps are not suited to use as cropland, pastureland, woodland, or homesites.

This map unit is not in a capability subclass nor a woodland ordination group.

Fz—Frizzell-Guyton silt loams, 0 to 2 percent slopes

The Frizzell soil in this map unit is somewhat poorly drained, and the Guyton soil is poorly drained. In some places, these soils are subject to rare flooding. These soils are on low terraces. The areas of these soils are generally irregular in shape and parallel major streams. The areas of these soils range from 10 to several hundred acres. This map unit is about 63 percent Frizzell soil and 27 percent Guyton soil. The Frizzell soil is on broad flats and has slopes of 0 to 2 percent. The Guyton soil is in depressional areas and has slopes of less than 1 percent. The soils in this map unit are so intricately intermingled on the landscape that they cannot be separated at the mapping scale selected.

Typically, this Frizzell soil has a surface layer of brown silt loam about 3 inches thick. The next layer to a depth of about 39 inches is brown and grayish brown, mottled silt loam. The subsoil to a depth of about 85 inches is yellowish brown silty clay loam in the upper and middle parts and yellowish brown and grayish brown silty clay loam in the lower part. The subsoil is mottled throughout.

This Frizzell soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a slow rate. Water runs off the surface at a slow rate. A seasonal high water table is at a depth of about 1.5 feet to 4 feet during December through April of most years. The available water capacity is high. The shrink-swell potential is low.

Typically, this Guyton soil has a surface layer of dark grayish brown silt loam about 3 inches thick. The subsurface layer to a depth of about 28 inches is grayish brown, mottled silt loam. The next layer to a depth of about 38 inches is grayish brown, mottled silty clay loam and gray silt loam. The subsoil to a depth of about 58 inches is grayish brown, mottled silty clay loam. The substratum to a depth of about 66 inches is grayish brown, mottled silt loam.

This Guyton soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a slow rate. Water runs off the surface at a slow rate. A seasonal high water table ranges from the soil surface to about 1.5 feet below the surface during December through May. The available water capacity is high to very high. The shrink-swell potential is low.

Included with the Frizzell and Guyton soils in mapping are a few small areas of Brimstone, Cahaba, and Shatta soils. Also included are areas of similar soils with slopes greater than 2 percent. Brimstone soils are in positions similar to those of the Guyton soil and have high levels of sodium in the subsurface layer and subsoil. Cahaba and Shatta soils are in higher positions than the Frizzell soil. Cahaba soils have a reddish subsoil and are well drained. Shatta soils are moderately well drained and have a fragipan. The included soils make up about 15 percent of the map unit.

The Frizzell and Guyton soils are used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

These soils are moderately well suited to the production of loblolly pine. The site index for loblolly pine is 90 on the Frizzell soil and 85 on the Guyton soil. Other trees commonly grown on these soils are water oak and sweetgum. Green ash, cherrybark oak, and willow oak are also commonly grown on the Frizzell soil. Only trees that can tolerate seasonal wetness should be planted. The main concerns in producing and harvesting timber on these soils are severe plant competition, a moderate to severe windthrow hazard, and a moderate to severe equipment use limitation. In addition, seedling mortality is moderate on the Guyton soil because of wetness. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Trees are subject to windthrow because of the high water table and shallow rooting depth in these soils. Trafficability is poor when these soils are wet. Conventional methods of harvesting timber generally can be used except sometimes during rainy periods, generally from December to April.

The Frizzell soil in this map unit is well suited to use as habitat for woodland and openland wildlife, and the Guyton soil is moderately well suited to these uses. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

The soils in this map unit are moderately well suited to pasture. Wetness and low fertility are the main limitations. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, white clover, and winter peas. Grazing when the soil is wet results in puddling of the surface layer and poor tilth. Excess water on the surface can be removed by shallow ditches. Fertilizer and lime are needed for optimum production of forage. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

These soils are moderately well suited to cultivated crops. The main limitations are wetness, low fertility, and high levels of exchangeable aluminum in the root zone. Drainage can improve these soils for crops. Returning crop residue to the soil reduces compaction and crusting of the surface. Using conservation tillage or regularly adding other organic matter improves fertility and helps to maintain content of organic matter. Most crops respond well to lime and fertilizer, which improve fertility and reduce the high levels of exchangeable aluminum in the root zone.

These soils are poorly suited to homesites and urban development. The main limitations are wetness, slow permeability, and low strength for roads and streets. Excess water can be removed by shallow ditches and by providing the proper grade. Roads can be designed to offset the limited ability of these soils to support a load. Slow permeability and the high water table increase the possibility for septic tank absorption fields to fail. Lagoons or self-contained disposal units can be used to dispose of sewage properly.

The Frizzell soil is in capability subclass IIw, and the Guyton soil is in capability subclass IIIw. The woodland ordination symbol is 9W for the Frizzell soil and 8W for the Guyton soil.

Ga—Gallion silt loam, rarely flooded

This soil is level and well drained. It is on alluvial plains and in high positions on natural levees of former channels and distributaries of the Red River. The areas of this soil are long and narrow and range from 15 to 50 acres. Slopes are generally less than 1 percent.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil to a depth of about 46 inches is yellowish red silty clay loam in the upper part and yellowish red silt loam in the middle and lower parts. The substratum to a depth of about 60 inches is yellowish red silt loam.

This soil has high fertility. Water and air move through this soil at a moderate rate. Water runs off the surface at a slow rate. A seasonal high water table is more than 6 feet below the surface throughout the year. Areas of this soil are unprotected from flooding by backwater from the Red River. This soil is subject to flooding during unusually wet periods. Floodwaters typically are 0.5 to 2 feet deep. Flood duration may exceed one month. The available water capacity is high to very high. The shrink-swell potential is moderate in the subsoil.

Included with this soil in mapping are a few small areas of Moreland and Perry soils. Also included are areas of similar soils in which the surface layer is silty clay loam. Moreland and Perry soils are in lower positions than the Gallion soil and are clayey throughout the profile. The included soils make up about 15 percent of the map unit.

This soil is used mainly as pastureland. Some areas are idle. A small acreage is used as woodland or homesites.

This soil is well suited to use as woodland. However, since it is also well suited to use as pastureland and cropland, most areas have been cleared. If this soil is used to produce timber for commercial use, suitable trees to plant are water oak, Shumard oak, pecan, and cherrybark oak. If site preparation is not adequate, competition from undesirable plants can prevent or prolong reestablishment of trees.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by selectively harvesting timber to leave large den and mast-producing trees. Wildlife is benefited if grass and legume species that have different maturity dates are planted in separate fields to vary the harvesting season. Small clear-cuts in irregular shapes provide maximum edge for use by deer.

This soil is well suited to pasture. It has few limitations for this use. Suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, white clover, tall fescue, and ryegrass. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Fertilizer helps to ensure maximum production of forage.

This soil is well suited to use as cropland. It has few limitations for this use. Suitable crops are cotton, corn, soybeans, grain sorghum, and wheat. Fertilizer helps to ensure maximum crop production.

This soil is poorly suited to homesites and urban development. It has moderate limitations for most sanitary facilities and severe limitations for dwellings and local roads and streets. Moderate permeability, low strength for roads and streets, and moderate shrink-swell potential are the main limitations. Flooding is the main hazard. If flooding is controlled, septic tank absorption fields can be enlarged to offset the moderate permeability of the soil. Local roads and streets can be designed to offset the limited ability of the soil to support a load. The footings and foundations of buildings can be designed to offset the effects of shrinking and swelling. Homes can be built on properly designed mounds of soil material to raise them above expected flood elevations. Where sewage lagoons are used, the bottom and sides of the lagoon can be sealed with impervious material to prevent seepage of effluent.

This Gallion soil is in capability subclass I. The woodland ordination symbol is 9A.

Gc—Glenmora silt loam, 1 to 3 percent slopes

This soil is very gently sloping and moderately well drained. It is on broad, convex ridgetops on terraces. The areas of this soil are irregular in shape and range from 15 to several hundred acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. From top to bottom, the layers of the subsoil to a depth of about 60 inches are yellowish brown silt loam; yellowish brown silty clay loam; yellowish brown, mottled silty clay loam; yellowish brown, mottled silty clay loam and grayish brown silt loam; and mottled yellowish brown and grayish brown silty clay loam.

This soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops.

Water and air move through this soil at a slow rate. A seasonal high water table ranges from 2 to 3 feet below the surface from December to April. The available water capacity is high to very high. The shrink-swell potential is low in the upper part of the soil and moderate in the lower part.

Included with this soil in mapping are a few small areas of Gore, Guyton, and Kolin soils. Also included are areas of similar soils with slopes greater than 3 percent. Gore and Guyton soils are in lower positions than the Glenmora soil. Gore soils have a clayey subsoil. Guyton soils are poorly drained and are grayish throughout the profile. Kolin soils are in positions similar to those of the Glenmora soil and have a subsoil that is clayey in the lower part. The included soils make up about 10 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A few small areas are used as pastureland or homesites.

This soil is well suited to the production of loblolly pine. The site index for loblolly pine is 93. Other trees commonly grown on this soil are shortleaf pine, white oak, southern red oak, post oak, sweetgum, and hickory. The main concerns in producing and harvesting timber on this soil are a moderate windthrow hazard and severe plant competition. After harvesting, reforestation can be

Figure 3.—Vegetation in an area of Glenmora silt loam, 1 to 3 percent slopes. Upland forbs and grasses are allowed to grow among planted pine trees to provide food and cover for bobwhite quail and cottontail rabbits.

carefully managed to reduce competition from undesirable understory plants. Site preparation, such as chopping, burning, and applying herbicides, helps to control plant competition.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants (fig. 3). Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many wildlife species. Where the forest borders pastureland, field borders planted with shrubs or annual game-food mixtures will provide food and cover for wildlife.

This soil is well suited to pasture. The main limitation is low fertility. Erosion is a hazard when the soil is tilled and until pasture grasses are established. The main suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Fertilizer and lime help to ensure optimum production of forage. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This Glenmora soil is moderately well suited to cultivated crops. The main limitations are the moderate hazard of erosion, wetness, low fertility, and high levels of exchangeable aluminum in the root zone. Erosion can be reduced if conservation tillage or stubble mulch tillage is used and tillage and seeding are on the contour or across the slope. Field ditches and adequate outlets help to remove excess surface water. Most crops respond well to fertilizer and lime, which improve fertility and reduce the high levels of exchangeable aluminum in the root zone.

This soil is moderately well suited to homesites and urban development. Wetness, low strength for roads and streets, and slow permeability are the main limitations. Excess water can be removed by constructing shallow ditches or by providing the proper grade. Roads can be designed to offset the limited ability of the soil to support a load. Where this soil is used as septic tank absorption fields, sandy backfill can be placed in the trench and absorption lines can be enlarged to compensate for the slow permeability.

This Glenmora soil is in capability subclass IIe. The woodland ordination symbol is 10A.

Ge—Gore silt loam, 1 to 5 percent slopes

This soil is gently sloping and moderately well drained. It is on convex ridgetops on terraces. The areas of this soil are irregular in shape and range from 10 to 300 acres. Slopes are generally long and smooth.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. From top to bottom, the layers of the subsoil to a depth of about 56 inches are red clay; red, mottled clay; mottled red, yellowish red, and yellowish brown clay; and yellowish red silty clay. The substratum to a depth of about 72 inches is yellowish red, mottled silty clay.

This soil has low fertility and moderately high levels of exchangeable aluminum in the root zone that are potentially toxic to crops. Water and air move through this soil at a very slow rate. Water runs off the surface at a medium rate. A seasonal high water table is more than 6 feet below the surface throughout the year. The available water capacity is low to moderate. The shrink-swell potential is high in the subsoil.

Included with this soil in mapping are a few small areas of Guyton and Kolin soils. Also included are areas of similar soils with slopes greater than 5 percent. Guyton soils are in lower positions than the Gore soil and are poorly drained and loamy throughout the profile. Kolin soils are at a higher elevation than the Gore soil and are loamy in the upper part of the subsoil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 76. Other trees commonly grown on this soil are shortleaf pine, southern red oak, white oak, sweetgum, post oak, and hickory. The main concerns in producing and harvesting timber on this soil are a moderate equipment use limitation and moderate seedling mortality caused by the clayey subsoil. Soil droughtiness somewhat limits the growth of trees. Conventional methods of harvesting timber generally can be used except sometimes during rainy periods, generally from December to April. This can be overcome by using specialized equipment during wet seasons or by logging during the drier seasons. Replanting may be necessary in areas where an adequate stand is not attained.

This soil is moderately well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil is moderately well suited to pasture. The main limitations are the severe hazard of erosion, steepness of slope, low fertility, and soil droughtiness. Suitable pasture plants are bahiagrass, common bermudagrass, improved bermudagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Erosion is a hazard during the establishment of pasture plants. Seedbed preparation should be on the contour or across the slope where practical. Fertilizer and lime help to ensure optimum production of forage. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil is poorly suited to cultivated crops, mainly because of steepness of slope, low fertility, and moderately high level of exchangeable aluminum in the root zone. Soil droughtiness is an additional limitation. The hazard of erosion is severe because of the slope, the silty surface layer, and the very slowly permeable subsoil. Erosion can be reduced by gradient terraces and contour farming. Crop residue left on or near the surface helps to conserve moisture, improve tilth, and control erosion. Most crops respond well to fertilizer and lime, which improve fertility and reduce the levels of exchangeable aluminum in the root zone.

This soil is poorly suited to homesites. The main limitations are low strength for road and streets, very slow permeability, high shrink-swell potential, and the clayey subsoil. Roads can be designed to offset the limited ability of the soil to support a load. Septic tank absorption fields do not function properly during rainy periods because of very slow permeability. Lagoons or self-contained disposal units can be used to dispose of sewage properly. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

This Gore soil is in capability subclass IVe. The woodland ordination symbol is 7C.

GO—Gore silt loam, 5 to 15 percent slopes

This soil is strongly sloping and moderately well drained. It is on convex side slopes on terraces. The areas of this soil are irregular in shape and range from 15 to 75 acres. Slopes are short and convex. Many well-defined drainageways cross most areas of this soil. Fewer observations were made than in most other map units. The detail in mapping, however, is adequate for the expected use of the soil.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil to a depth of about 54 inches is reddish brown clay in the upper part and yellowish red, mottled silty clay in the lower part. The substratum to a depth of about 66 inches is yellowish red, mottled silty clay.

This soil has low fertility and moderately high levels of exchangeable aluminum in the root zone that are potentially toxic to crops. Water and air move through this soil at a very slow rate. Runoff is rapid, and the hazard of water erosion is severe. A seasonal high water table is more than 6 feet below the surface throughout the year. The available water capacity is low to moderate. The shrink-swell potential is high in the subsoil.

Included with this soil in mapping are a few small areas of Guyton and Kolin soils. Also included are areas of similar soils with slopes less than 5 percent or greater than 15 percent. Guyton soils are in lower positions than the Gore soil and are poorly drained and loamy throughout the profile. Kolin soils are at a higher elevation than the Gore soils and are loamy in the upper part of the subsoil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as homesites.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 76. Other trees commonly grown on this soil are shortleaf pine, southern red oak, white oak, sweetgum, post oak, and hickory. The main concerns in producing and harvesting timber on this soil are a moderate equipment use limitation and moderate seedling mortality caused by the clayey subsoil. Also, soil droughtiness limits tree growth. Conventional methods of harvesting timber generally can be used except sometimes during rainy periods, generally from December to April. This can be overcome by using specialized equipment during wet seasons or by logging during the drier seasons. Replanting may be necessary in areas where an adequate stand is not attained.

This soil is moderately well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil is poorly suited to pasture. The main limitations are the severe hazard of erosion and steepness of slope. Low fertility is an additional limitation. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Erosion is a severe hazard during the establishment of pasture plants. Seedbed preparation should be on the contour or across the slope where practical. Fertilizer and lime help to ensure optimum production of forage. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil generally is not suited to cultivated crops, mainly because of steepness of slope and the severe hazard of erosion. Low fertility and moderately high levels of exchangeable aluminum in the root zone are additional soil limitations.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. The main limitations are steepness of slope, high shrink-swell potential, low strength for roads and streets, and very slow permeability. Less sloping areas of this soil can be used as homesites if special measures are used to control erosion. If buildings are constructed on this soil, properly designing foundations and footings help to prevent structural damage caused by shrinking and swelling. Septic tank absorption fields do not function properly during rainy periods because of very slow permeability. Lagoons or self-contained disposal units can be used to dispose of sewage properly. Preserving the existing plant cover during construction helps to control erosion. Establishing and maintaining plant cover can be achieved through proper fertilizing, seeding, mulching, and shaping of the slopes.

This Gore soil is in capability subclass VIe. The woodland ordination symbol is 7C.

GY—Guyton silt loam, frequently flooded

This soil is level and poorly drained. In places, it is moderately well drained or somewhat poorly drained. This soil is on flood plains and subject to frequent flooding. The areas of this soil are long and narrow and range from 10 to several hundred acres. Fewer observations were made than in most other map units. The detail in mapping, however, is adequate for the expected use of the soil. Slopes are less than 1 percent.

Typically, the surface layer is grayish brown silt loam about 4 inches thick. The subsurface layer to a depth of about 16 inches is light brownish gray, mottled silt loam in the upper part and grayish brown, mottled silt loam in the lower part. The next layer to a depth of about 28 inches is grayish brown, mottled silty clay loam and gray silt loam. The subsoil and substratum to a depth of about 86 inches are grayish brown, mottled silty clay loam.

This soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a slow rate. Water runs off the surface at a slow rate. A seasonal high water table ranges from the soil surface to a depth of about 1.5 feet below the surface during December through May. This soil is subject to very brief to long periods of flooding during any time of the year. The available water capacity is high to very high. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Brimstone, Cahaba, and Frizzell soils. These soils are on nearby terraces. Brimstone soils have high levels of sodium in the subsurface layer and subsoil. Cahaba soils are well drained. Frizzell soils are somewhat poorly drained and are brownish throughout the profile. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland.

This soil is poorly suited to use as woodland, mainly hardwood trees. The site index is 100 for green ash and 95 for loblolly pine. Other trees commonly grown on this soil are black willow, Nuttall oak, sweetgum, American beech, swamp chestnut oak, eastern cottonwood, and sugarberry. The main concerns in producing and harvesting timber on this soil are a severe equipment use limitation, severe seedling mortality, a severe windthrow hazard, and severe plant competition caused by wetness and flooding. Conventional methods of harvesting timber generally can be used except sometimes during rainy periods or periods of flooding. This can be overcome by using specialized equipment during wet seasons or by logging during the drier seasons. Only trees that can tolerate seasonal wetness should be planted. Suitable trees to plant are green ash, Nuttall oak, eastern cottonwood, and American sycamore. Loblolly pine can be grown on this soil, but seedling mortality is high. Once pine trees are established, they can grow well. Trees are subject to windthrow because of the high water table and shallow rooting depth. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This soil is moderately well suited to use as habitat for woodland wildlife (fig. 4). Habitat for wildlife can be improved by planting appropriate vegetation or by propagating desirable plants. Habitat for wetland wildlife can be improved by constructing shallow ponds to provide open water areas for waterfowl and furbearers, such as mink, raccoon, muskrat, nutria, and otter. Leaving mast-producing trees when harvesting timber or during site preparation can benefit many species of wildlife.

This soil is poorly suited to pasture. The main limitations are flooding and wetness. The main suitable pasture plant is common bermudagrass. Wetness and flooding limit the choice of plants and the period of grazing. Grazing when the soil is wet causes puddling and compaction of the surface layer. During periods of

Figure 4.—Hardwood trees in this area of Guyton silt loam, frequently flooded, provide habitat for woodland wildlife.

flooding, cattle can be moved to pastures protected from flooding or pastures at higher elevations. It generally is not practical to apply high rates of fertilizer and lime because of frequent flooding. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Flooding can be reduced, but only by major flood-control structures, such as levees and water pumps.

This soil generally is not suited to use as cropland, homesites, or for urban development. The main hazard is flooding.

This Guyton soil is in capability subclass Vw. The woodland ordination symbol is 6W.

Ha—Harleston fine sandy loam, 1 to 3 percent slopes

This soil is very gently sloping and moderately well drained. It is on broad, slightly convex ridges on terraces. Circular or oblong mounds are in some areas. The areas of this soil are generally irregular in shape and parallel major streams. The areas of this soil range from 10 to several hundred acres. Slopes are generally long and smooth.

Typically, the surface layer is dark grayish brown fine sandy loam about 3 inches thick. The subsurface layer to a depth of about 8 inches is brown fine sandy loam. The subsoil extends to a depth of about 60 inches. From top to bottom, the layers are yellowish brown loam; yellowish brown, mottled loam; yellowish brown, mottled sandy clay loam; and mottled strong brown and grayish brown sandy clay loam.

This soil has low fertility and moderately high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a moderate rate. Water runs off the surface at a medium rate. A seasonal high water table is about 2 to 3 feet below the soil surface from November to April of most years. The available water capacity is moderate to high. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Cahaba, Frizzell, Guyton, and Savannah soils. Cahaba and Savannah soils are in positions similar to those of the Harleston soil and contain more clay in the subsoil. Frizzell and Guyton soils are in lower positions than the Harleston soil and contain less sand in the subsoil. Cahaba and Savannah soils are more clayey than the Harleston soil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

This soil is well suited to the production of loblolly pine. The site index for loblolly pine is about 90. Other trees commonly grown on this soil are shortleaf pine and sweetgum. The main limitation for producing and harvesting timber on this soil is moderate plant competition. After harvesting, reforestation can be managed to reduce competition from undesirable understory plants. Site preparation controls initial plant competition, and spraying controls subsequent growth.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for most species of wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving mast-producing trees when harvesting timber and during site preparation can benefit deer, squirrels, and turkeys.

This soil is well suited to pasture. Low fertility is the main limitation. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, crimson clover, and vetch. Erosion is a slight to moderate hazard. Fertilizer and lime help to ensure optimum production of forage. Proper stocking and pasture rotation help to keep the pasture in good condition. Tillage and seeding should be on the contour or across the slope to reduce erosion.

This soil is moderately well suited to cultivated crops. The main limitations are slope, wetness, low fertility, and moderately high levels of exchangeable aluminum that are potentially toxic to crops. A tillage pan forms easily if this soil is tilled when wet, but it can be broken by chiseling or subsoiling. Erosion can be reduced if conservation tillage is used and tillage and seeding are on the contour or across the slope. Most crops respond well to fertilizer and lime, which improve fertility and reduce the levels of exchangeable aluminum in the root zone. Excess water on the surface can be removed by shallow ditches and adequate outlets.

This soil is moderately well suited to homesites. The main limitation is wetness. A high water table increases the possibility for septic tank absorption fields to fail. Excess water can be removed by shallow ditches and by providing the proper grade.

This Harleston soil is in capability subclass IIe. The woodland ordination symbol is 9A.

Hw—Hollywood silty clay loam, 1 to 5 percent slopes

This soil is gently sloping and moderately well drained. It is on broad ridgetops and side slopes on uplands. The areas of this soil are generally irregular in shape and range from 20 to 300 acres. Slopes are long and smooth.

Typically, the surface layer is about 29 inches thick. It is black silty clay loam in the upper part and very dark gray, mottled clay in the middle and lower parts. The underlying material to a depth of about 72 inches is light olive brown, mottled clay. Soft or hard masses of calcium carbonate range from few to common in the underlying material.

This soil has high fertility. Water runs off the surface at a medium rate. Water and air move through this soil at a very slow rate. A seasonal high water table is more than 6 feet below the surface throughout the year. The surface layer of this soil is very sticky when wet and dries slowly. The available water capacity is moderate to high. The shrink-swell potential is high.

Included with this soil in mapping are a few small areas of Bellwood, Keiffer, and Oktibbeha soils. Also included are areas of similar soils with slopes greater than 5 percent and, in places, surface layers less than 20 inches thick. These soils are in positions similar to those of the Hollywood soil. Bellwood and Oktibbeha soils have a subsoil that is reddish in the upper part. Keiffer soils contain concretions of calcium carbonate throughout the profile. The included soils make up about 10 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

This soil is moderately well suited to the production of

loblolly pine. The site index for loblolly pine is 90. Other trees commonly grown on this soil are shortleaf pine, eastern redcedar, sweetgum, post oak, and southern red oak. The main concerns in producing and harvesting timber are a severe equipment use limitation, severe seedling mortality, and severe plant competition caused by the clayey texture. Unsurfaced roads and skid trails are sticky and slippery when wet and can be impassable during rainy periods. Logging roads require surfaces that are suitable for year-round use. The high temperature of the surface layer in summer and the clayey texture of the subsurface layers increase seedling mortality. Site preparation, such as chopping, burning, applying herbicides, and bedding, reduces debris and controls immediate plant competition. Selecting hardy nursery stock and adding phosphorus fertilizer to the soil can improve seedling survival. Larger trees left on the site provide shade for seedlings.

This soil is well suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving mast-producing trees when harvesting timber and during site preparation can benefit deer, squirrels, and turkeys.

This soil is moderately well suited to pasture. The main limitation is the severe hazard of erosion during establishment of pasture grasses. The main suitable pasture plants are tall fescue, white clover, common bermudagrass, and improved bermudagrass. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Grazing when the soil is wet results in puddling of the surface layer, poor tilth, and excessive runoff. Where practical, seedbed preparation should be on the contour or across the slope to reduce erosion. Use of nitrogen fertilizer promotes good growth of forage plants. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil is moderately well suited to most cultivated crops. The main limitations are poor tilth and the severe hazard of erosion. The plow layer becomes cloddy if farmed when it is too wet or too dry. Terraces help to conserve moisture and reduce runoff and the risk of erosion. Conservation tillage and returning all crop residue to the soil or regularly adding other organic matter helps to maintain soil tilth and fertility.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. The main limitations are very slow permeability, high shrink-swell potential, and low strength for road and streets. Also, cutbanks cave easily. If buildings are constructed on this soil, properly designing foundations and footings help to prevent the structural damage caused by shrinking and swelling. Septic tank absorption fields do not function properly because of the very slow permeability. Lagoons or self-contained disposal units can be used to dispose of sewage properly. Roadbeds can be strengthened to offset the limited ability of the soil to support a load. Where shallow excavations are made, special retainer walls can be used to prevent cutbanks from caving.

This Hollywood soil is in capability subclass IIIe. The woodland ordination symbol is 9C.

Ke—Keiffer loam, 1 to 5 percent slopes

This soil is gently sloping and well drained. It is on convex ridgetops and side slopes on uplands. The areas of this soil are irregular in shape and range from 5 to 100 acres. Slopes are generally short and convex.

Typically, the surface layer is very dark grayish brown loam about 5 inches thick. The subsoil to a depth of about 72 inches is light olive brown, mottled loam in the upper part; light yellowish brown, mottled silt loam in the middle part; and light yellowish brown, mottled clay loam in the lower part. The soil is calcareous and contains concretions of calcium carbonate throughout the profile.

This soil has medium fertility. Water and air move through this soil at a slow rate. Water runs off the surface at a medium rate. A seasonal high water table is more than 6 feet below the surface throughout the year. The surface layer of this soil is very sticky when wet and very hard when dry. The available water capacity is moderate to high. The shrink-swell potential is high.

Included with this soil in mapping are a few small areas of Bellwood, Hollywood, Oktibbeha, and Vaiden soils. These soils are in positions similar to those of the Keiffer soil. Bellwood and Oktibbeha soils are reddish in the upper part of the subsoil. Hollywood and Vaiden soils do not contain concretions of calcium carbonate in the upper part of the soil. The included soils make up about 10 percent of the map unit.

This soil is used mainly as pastureland and wildlife habitat. Most of the acreage of this soil is in native grasses and forbs. The prairies which make up this map unit are locally important for their wide variety of native wildflowers. Some areas are maintained and preserved by the Louisiana Natural Heritage Program.

This soil is poorly suited to use as woodland. It has low potential to produce trees of commercial value, mainly because it is alkaline and calcareous. Eastern redcedar is the only tree species that grows well on this soil. The main concerns in producing and harvesting timber on this soil are a moderate equipment use limitation and moderate seedling mortality.

This soil is moderately well suited to use as habitat for openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Controlled burning every three years can increase the amount of seed-producing plants for turkey and quail.

This soil is moderately well suited to pasture. Medium fertility and the narrow choice of high quality plants are the main limitations. Suitable pasture plants are Johnsongrass, bahiagrass, improved bermudagrass, and King Ranch bluestem. Proper grazing, weed control, and fertilizer are needed for maximum quality of forage.

This soil is moderately well suited to cultivated crops; however, no areas are cultivated. Medium fertility and the moderate hazard of erosion are the main limitations. Conservation tillage, terraces, diversions, and grassed waterways help to control erosion. Conservation tillage and returning all crop residue to the soil or regularly adding other organic matter improves fertility and helps to maintain tilth and content of organic matter.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. The main limitations are slow permeability, high shrink-swell potential, and low strength for roads and streets. Where this soil is used as homesites, high shrink-swell potential is the main limitation. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. Where this soil is used as septic tank absorption fields, sandy backfill placed in the trench and long absorption lines help to compensate for the slow permeability. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

This Keiffer soil is in capability subclass IIIe. The woodland ordination symbol is 3C.

Ko—Kolin silt loam, 1 to 5 percent slopes

This soil is gently sloping and moderately well drained. It is on slightly convex ridgetops on terraces. The areas of this soil are irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil to a depth of about 29 inches is strong brown silty clay loam in the upper part and strong brown, mottled silty clay loam in the lower part. The next layer to a depth of about 37 inches is yellowish brown, mottled silty clay loam and pale brown silt loam. The subsoil between depths of about 37 and 88 inches is mottled red and light brownish gray clay in the upper part and yellowish red, mottled silty clay in the lower part.

This soil has low fertility. Water and air move through the upper part of this soil at a moderately slow rate and through the lower part at a very slow rate. Water runs off the surface at a medium rate. A seasonal high water table ranges from about 1.5 to 3 feet below the surface during December through April. The available water capacity is high to very high. The shrink-swell potential is moderate in the upper part of the subsoil and high in the lower part.

Included with this soil in mapping are a few small areas of Gore, Guyton, and Ruston soils. Also included are areas of similar soils with slopes greater than 5 percent. Gore soils are in positions similar to those of the Kolin soil and have a red subsoil. Guyton soils are on narrow flood plains and are poorly drained and grayish throughout the profile. Ruston soils have more convex slopes than the Kolin soil and are loamy throughout the profile. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. In a few areas, it is used as pastureland or homesites.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 80. Other trees commonly grown on this soil are shortleaf pine, southern red oak, white oak, sweetgum, post oak, and hickory. The main concerns in producing and harvesting timber on this soil are a moderate windthrow hazard and severe plant competition. Conventional methods of harvesting timber generally can be used, but the soil may be compacted when it is moist or wet. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Site preparation, such as chopping, burning, applying herbicides, and bedding, reduces debris and controls immediate plant competition.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail.

This soil is moderately well suited to pasture. The main limitations are the moderate hazard of erosion, low fertility, and wetness. The main suitable pasture plants are bahiagrass, common bermudagrass, improved bermudagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Erosion is a hazard during the establishment of pasture plants. Where practical, seedbed preparation should on the contour or across the slope to reduce erosion. Fertilizer and lime help to ensure optimum production of forage. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil is moderately well suited to cultivated crops; however, no areas are cultivated. The moderate hazard of erosion, wetness, and low fertility are the main limitations. Terraces and contour farming reduce the risk of sheet and rill erosion on the steeper slopes. Most crops respond well to fertilizer and lime, which improve fertility. Excess water can be removed by shallow ditches and adequate outlets.

This soil is poorly suited to homesites and urban development. The main limitations are low strength for roads and streets, wetness, very slow permeability, and high shrink-swell potential. Roads can be designed to offset the limited ability of the soil to support a load. Drainage can improve the soil for homesites. Septic tank absorption fields do not function properly during rainy periods because of wetness and very slow permeability. Lagoons or self-contained disposal units can be used to dispose of sewage properly. The footings and foundations of buildings can be designed to offset the effects of shrinking and swelling.

This Kolin soil is in capability subclass IIIe. The woodland ordination symbol is 8A.

Ma—Mahan fine sandy loam, 1 to 5 percent slopes

This soil is gently sloping and well drained. It is on convex ridgetops on uplands. The areas of this soil are irregular in shape and range from 20 to 300 acres. Slopes are generally long and smooth.

Typically, the surface layer is dark grayish brown fine sandy loam about 5 inches thick. The subsurface layer is dark brown channery fine sandy loam about 8 inches thick. The subsoil to a depth of about 43 inches is red, mottled sandy clay in the upper and middle parts and yellowish red, mottled sandy clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish red, mottled sandy loam.

This soil has low fertility and moderately high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a moderate rate. Water runs off the surface at a medium rate. A seasonal high water table is more than 6 feet below the surface throughout the year. The available water capacity is moderate to high. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Bellwood, Guyton, Ruston, and Sacul soils. Bellwood and Sacul soils are in positions similar to those of the Mahan soil and have grayish mottles in the upper part of the subsoil. Guyton soils are on narrow flood plains and are poorly drained and grayish throughout the profile. Ruston soils are at a lower elevation than the Mahan soil and contain less clay in the subsoil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. In a few areas, it is used as pastureland or homesites.

This soil is well suited to the production of loblolly pine. It has few limitations for producing and harvesting timber. The site index for loblolly pine is 90. Other trees commonly grown on this soil are shortleaf pine, southern red oak, white oak, sweetgum, post oak, and hickory.

This soil is well suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Small clear-cuts in irregular shapes provide maximum edge for deer. Where the forest borders agricultural lands, field borders planted with shrubs or annual game-food mixtures will provide food and cover for deer, rabbits, quail, turkeys, and other nongame birds and animals.

This soil is well suited to pasture. The main limitations are the moderate hazard of erosion and low fertility. The main suitable pasture plants are bahiagrass, common bermudagrass, and improved bermudagrass. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Erosion is a hazard when the soil is tilled and until pasture plants are established. Seedbed preparation should be on the contour or across the slope where practical. Fertilizer and lime help to ensure optimum production of forage. Proper stocking and pasture rotation help to keep the pasture in good condition.

This soil is moderately well suited to cultivated crops. The main limitations are the moderate hazard of erosion, low fertility, and moderately high levels of exchangeable aluminum in the root zone. Gradient terraces and contour farming reduce the risk of sheet and rill erosion on the steeper slopes. Diversions and grassed waterways help to control gullying. Crops respond well to lime and fertilizer, which improve fertility and reduce the levels of exchangeable aluminum in the root zone.

This soil is moderately well suited to homesites and urban development. It has slight limitations for building sites and moderate limitations for local roads and streets and most sanitary facilities. The main limitations are low strength for roads and streets, moderate permeability, and the hazard of seepage where sewage lagoons are used.

Roads can be designed to offset the limited ability of the soil to support a load. Seepage from sewage lagoons can be reduced by sealing the floor of the lagoon with impervious material. Where septic tanks are used, the limitation of moderate permeability can be overcome by increasing the size of the absorption field.

This Mahan soil is in capability subclass IIIe. The woodland ordination symbol is 9A.

MB—Mahan fine sandy loam, 5 to 15 percent slopes

This soil is strongly sloping and well drained. It is on side slopes on uplands. The areas of this soil are irregular in shape and range from 20 to 300 acres. Fewer observations were made than in most other map units. The detail in mapping, however, is adequate for the expected use of the soil. Slopes are generally short and choppy.

Typically, the surface layer is dark grayish brown fine sandy loam about 8 inches thick. The subsurface layer is brown fine sandy loam about 6 inches thick. The subsoil to a depth of about 57 inches is red clay in the upper part; red, mottled clay in the middle part; and yellowish red, mottled sandy clay loam in the lower part. The substratum to a depth of about 64 inches is mottled yellowish red and grayish brown sandy clay loam.

This soil has low fertility and moderately high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a moderate rate. Runoff is rapid, and the hazard of water erosion is severe. A seasonal high water table is more than 6 feet below the surface throughout the year. The available water capacity is moderate to high. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Bellwood, Guyton, Sacul, and Savannah soils. Bellwood and Sacul soils are in positions similar to those of the Mahan soil and have grayish mottles in the upper part of the subsoil. Guyton soils are on narrow flood plains and are gray and loamy throughout the profile. Savannah soils are at a lower elevation than the Mahan soil, are loamy throughout the profile, and have a fragipan. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. In a few areas, it is used as pastureland.

This soil is well suited to the production of loblolly pine. It has few limitations for producing and harvesting timber. The site index for loblolly pine is 90. Other trees commonly grown on this soil are shortleaf pine, southern red oak, white oak, sweetgum, post oak, and hickory.

This soil is well suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife. Where the forest borders agricultural lands, field borders planted with shrubs and game-food mixtures will provide food and cover for deer, quail, rabbits, turkeys, and other nongame birds and animals.

This soil is poorly suited to pasture. The main limitations are the severe hazard of erosion, steepness of slope, and low fertility. The main suitable pasture plants are bahiagrass, common bermudagrass, and improved bermudagrass. Erosion is a severe hazard during the establishment of pasture plants. Seedbed preparation should be on the contour or across the slope where practical. Terraces reduce runoff and help to control erosion. Fertilizer and lime help to ensure optimum production of forage.

This soil generally is not suited to cultivated crops, mainly because of steepness of slope and the severe hazard of erosion. Low fertility, irregular slopes, and high levels of exchangeable aluminum in the root zone are additional limitations. Included areas of less sloping soils can be used as cropland if special conservation practices are used.

This soil is moderately well suited to homesites and urban development. It has moderate to severe limitations for building sites, local roads and streets, and most sanitary facilities. The main limitations are steepness of slope, low strength for roads and streets, moderate permeability, and seepage. Revegetating disturbed areas around construction sites as soon as possible helps to control soil erosion. Roads can be designed to offset the limited ability of the soil to support a load. Where septic tanks are used, the limitation of moderate permeability can be overcome by increasing the size of the absorption field. If lagoons are used to dispose of sewage, seepage of effluent can be a problem. This can be overcome by coating the floor of the lagoon with impervious material.

This Mahan soil is in capability subclass VIe. The woodland ordination symbol is 9A.

Me—Metcalf silt loam, 0 to 2 percent slopes

This soil is nearly level and somewhat poorly drained. It is on broad ridgetops on uplands. The areas of this soil range from about 20 to 200 acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil to a depth of about 28 inches is yellowish brown, mottled silty clay loam. The next layer to a depth of about 34 inches is yellowish brown, mottled silty clay loam and light brownish gray silt. The subsoil to a depth of about 60 inches is mottled red and light brownish gray silty clay.

This soil has low fertility. Water and air move through the upper part of this soil at a moderately slow rate and through the lower part at a very slow rate. Water runs off the surface at a medium rate. A seasonal high water table ranges from about 1.5 feet to 2.5 feet below the surface from December through April. The available water capacity is high. The shrink-swell potential is low in the upper part of the profile and high in the lower part.

Included with this soil in mapping are a few small areas of Bellwood and Vaiden soils. Also included are areas of similar soils with slopes greater than 2 percent and areas in which the upper part of the subsoil contains more sand than is typical for the Metcalf soil. Bellwood and Vaiden soils are in positions similar to those of the Metcalf soil and are clayey throughout the subsoil.

This soil is used mainly as woodland and wildlife habitat. In a few small areas, it is used as pastureland or homesites.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 92. Other trees commonly grown on this soil are shortleaf pine, white oak, southern red oak, post oak, sweetgum, and hickory. The main concerns in producing and harvesting timber on this soil are a moderate equipment use limitation, a moderate windthrow hazard, and severe plant competition caused by seasonal wetness. Conventional methods of harvesting timber generally can be used except sometimes during rainy periods, generally from December to April. This can be overcome by using specialized equipment during wet periods. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Site preparation, such as chopping, burning, applying herbicides, and bedding, reduces debris and controls immediate plant competition.

This soil is well suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Controlled burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Where the forest borders agricultural lands, field borders planted with shrubs and other game-food plants will provide food and cover for deer, quail, rabbits, turkeys, and other nongame birds and animals.

This soil is well suited to pasture. The main limitations are wetness and low fertility. The main suitable pasture plants are improved bermudagrass, common bermudagrass, bahiagrass, white clover, and winter peas. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Fertilizer and lime help to ensure optimum production of forage. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil is moderately well suited to cultivated crops. The main limitations are wetness and low fertility. Excess water on the surface can be removed by shallow ditches and adequate outlets. Most crops respond well to fertilizer and lime, which improve fertility.

This soil is poorly suited to homesites and urban development. Wetness, low strength for roads and streets, and moderately slow to very slow permeability are the main limitations. Excess water can be removed by shallow ditches and by providing the proper grade. Roads can be designed to offset the limited ability of the soil to support a load. Where this soil is used as septic tank absorption fields, sandy backfill placed in the trench and long absorption lines help to compensate for the moderately slow and very slow permeability. Sewage lagoons or self-contained sewage disposal units can be used instead of absorption fields.

This Metcalf soil is in capability subclass IIw. The woodland ordination symbol is 10W.

Mo—Moreland clay, occasionally flooded

This soil is level and somewhat poorly drained. It is in low positions on the flood plain of the Red River and its distributaries. In places, this soil is subject to frequent flooding. The areas of this soil are irregular in shape and range from 20 to several hundred acres. Slopes are less than 1 percent.

Typically, the surface layer is dark brown clay about 7 inches thick. The subsoil to a depth of about 42 inches is dark reddish brown clay. It is mottled in the middle part. The substratum to a depth of about 84 inches is dark reddish brown clay. In places, the surface layer is silt loam or silty clay loam.

This soil has high fertility. Water and air move through this soil at a very slow rate. Water runs off the surface at a slow rate. A seasonal high water table ranges from the soil surface to a depth of about 1.5 feet below the surface during December through April of most years. This soil is subject to brief to very long periods of flooding from December to June of some years. Floodwaters typically are 1 to 3 feet deep, but they may be as deep as 5 feet. Flood duration may exceed one month. The surface layer of this soil is very sticky when wet and dries slowly. The available water capacity is moderate to high. The shrink-swell potential is very high.

Included with this soil in mapping are a few small areas of Gallion, Perry, and Roxana soils. Gallion and Roxana soils are in higher positions than the Moreland soil and are loamy throughout the profile. Perry soils are in lower positions than the Moreland soil and have a subsoil that is dark gray in the upper part. The included soils make up about 15 percent of the map unit.

This soil is used mainly as pastureland. A small acreage is in native hardwoods or is used as cropland.

This soil is moderately well suited to use as woodland. Trees commonly grown on this soil are Nuttall oak, overcup oak, green ash, sweetgum, honeylocust, water hickory, and baldcypress. The main concerns in producing and harvesting timber are a severe equipment use limitation, moderate seedling mortality, a moderate windthrow hazard, and severe plant competition caused by wetness and occasional flooding. Conventional methods of harvesting timber can be used, but only during dry periods of the year. Only trees that can tolerate seasonal wetness, such as Nuttall oak, green ash, Shumard oak, and baldcypress, should be planted.

This soil is well suited to use as habitat for woodland and wetland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Habitat for wetland wildlife can be improved by constructing shallow ponds to provide open water areas for waterfowl and furbearers.

This soil is moderately well suited to pasture. The main limitation is seasonal wetness, and flooding is a hazard. The main suitable pasture plant is common bermudagrass. Excess water on the surface can be removed by shallow ditches. Flooding can be controlled, but only by major structures, such as levees and water pumps. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Fertilizer helps to ensure optimum production of forage.

This soil is poorly suited to most cultivated crops, mainly because of flooding, wetness, and poor tilth. Suitable crops are soybeans, grain sorghum, and rice. Planting dates are delayed and crops are damaged by floods in some years. This soil is difficult to keep in good tilth and can be worked only within a narrow range of moisture content. Proper row arrangement, field ditches, and vegetated outlets help to remove excess surface water. Flooding can be controlled, but only by major structures, such as levees. Returning crop residue to the soil improves tilth.

This soil is poorly suited to urban development. It generally is not suited to homesites because of the hazard of flooding. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. Seasonal wetness, very slow permeability, very high shrink-swell potential, and low strength for roads and streets are the main limitations. Major flood-control structures and surface drainage can protect this soil from flooding and wetness. The effects of shrinking and swelling can be minimized by using proper engineering designs for foundations and by backfilling with material that has low shrink-swell potential. Roads can be designed to offset the limited ability of the soil to support a load. If flooding is controlled, lagoons or self-contained disposal units can be used to dispose of sewage properly.

This Moreland soil is in capability subclass IVw. The woodland ordination symbol is 3W.

Ok—Oktibbeha silt loam, 1 to 5 percent slopes

This soil is gently sloping and moderately well drained. It is on convex ridgetops and side slopes on uplands. The areas of this soil are generally irregular in shape and range from 15 to 100 acres.

Typically, the surface layer is dark brown silt loam about 4 inches thick. The subsoil to a depth of about 34 inches is yellowish red clay in the upper and middle parts and yellowish red and yellowish brown clay in the lower part. The subsoil is mottled in the middle and lower parts. The substratum to a depth of about 88 inches is light yellowish brown, mottled clay. The substratum contains concretions of calcium carbonate.

This soil has low fertility. Water and air move through this soil at a very slow rate. Water runs off the surface at a medium rate. A seasonal high water table is more than 6 feet below the surface throughout the year. The available water capacity is low to moderate. The shrink-swell potential is high in the subsoil.

Included with this soil in mapping are a few small areas of Bellwood, Hollywood, Keiffer, and Vaiden soils. Also included are areas of similar soils with slopes greater than 5 percent and areas in which the soil contains concretions of calcium carbonate at a depth of less than 20 inches. These soils are in positions similar to those of the Oktibbeha soil. Bellwood soils are acid throughout and do not have concretions of calcium carbonate in the profile. Hollywood soils have a thick black and very dark gray surface layer. Keiffer and Vaiden soils have a subsoil that is brownish throughout. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. In a few small areas, it is used as pastureland or homesites.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 76. Other trees commonly grown on this soil are shortleaf pine, southern red oak, white oak, post oak, sweetgum, hickory, and eastern redcedar. The main concerns in producing and harvesting timber are a moderate equipment use limitation, moderate seedling mortality, and moderate plant competition caused by the clayey subsoil. Soil droughtiness somewhat limits the growth of trees. Unsurfaced roads and skid trails are sticky when wet. Logging roads require surfaces that are suitable for year-round use. Replanting in areas where an adequate stand is not attained may be necessary due to seedling mortality caused by soil droughtiness. Site preparation, such as chopping, burning, applying herbicides, and bedding, reduces debris and controls immediate plant competition.

This soil is well suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil is moderately well suited to pasture. The main limitations are the moderate hazard of erosion, low fertility, and soil droughtiness. The main suitable pasture plants are common bermudagrass, improved bermudagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Where practical, seedbed preparation should be on the contour or across the slope to reduce erosion. Grazing when the soil is wet results in puddling of the surface layer, poor tilth, and excessive runoff. Fertilizer promotes good growth of forage plants. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil is moderately well suited to cultivated crops. It is limited mainly by steepness of slope, soil droughtiness, and low fertility. Erosion is a moderate hazard. Where the clayey subsoil is mixed into the plow layer, poor tilth can also be a problem. Conservation tillage and returning all crop residue to the soil or regularly adding other organic matter improves fertility and helps to maintain soil tilth and content of organic matter. Terraces and contour farming reduce the risk of sheet and rill erosion on the steeper slopes.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. The main limitations are very slow permeability, high shrink-swell potential, and low strength for roads and streets. Septic tank absorption fields do not function properly during rainy periods because of very slow permeability. Lagoons or self-contained disposal units can be used to dispose of sewage properly. If buildings are constructed on this soil, properly designing foundations and footings help to prevent the structural damage caused by shrinking and swelling. Roads can be designed to offset the limited ability of the soil to support a load.

This Oktibbeha soil is in capability subclass IIIe. The woodland ordination symbol is 7C.

OL—Oktibbeha silt loam, 5 to 15 percent slopes

This soil is strongly sloping and moderately well drained. It is on side slopes on uplands. The areas of this soil are generally irregular in shape and range from 15 to 100 acres. Fewer observations were made than in most other map units. The detail in mapping, however, is adequate for the expected use of the soil.

Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsoil to a depth of about 33 inches is red clay in the upper part and mottled red and grayish brown clay in the lower part. The substratum to a depth of about 67 inches is mottled red and yellowish brown clay in the upper part and olive, mottled clay in the lower part.

This soil has low fertility. Water and air move through this soil at a very slow rate. Water runs off the surface at a rapid rate. A seasonal high water table is more than 6 feet below the surface. The available water capacity is low to moderate. The shrink-swell potential is high in the subsoil.

Included with this soil in mapping are a few small areas of Bellwood, Hollywood, Keiffer, and Vaiden soils. Also included are areas of similar soils with slopes less than 5 percent and areas in which the soil contains concretions of calcium carbonate at a depth of less than 20 inches. These soils are in positions similar to those of the Oktibbeha soil. Bellwood soils are acid throughout and do not have concretions of calcium carbonate in the profile. Hollywood, Keiffer, and Vaiden soils have slopes of less than 5 percent. Hollywood soils have a thick black and very dark gray surface layer. Keiffer and Vaiden soils have a subsoil that is brownish throughout. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. In a few small areas, it is used as pastureland or homesites.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 76. Other trees commonly grown on this soil are shortleaf pine, southern red oak, white oak, post oak, sweetgum, hickory, and eastern redcedar. The main concerns in producing and harvesting timber are a moderate equipment use limitation, moderate seedling mortality, and moderate plant competition. Soil droughtiness somewhat limits the growth of trees. Unsurfaced roads and skid trails are sticky when wet. Logging roads require surfaces that are suitable for year-round use. Replanting in areas where an adequate stand is not attained may be necessary due to seedling mortality caused by soil droughtiness. Site preparation, such as chopping, burning, applying herbicides, and bedding, reduces debris and controls immediate plant competition.

This soil is well suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil is poorly suited to pasture. The main limitations are the severe hazard of erosion, low fertility, and soil droughtiness. The main suitable pasture plants are common bermudagrass, improved bermudagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Where practical, seedbed preparation should be on the contour or across the slope to reduce erosion. Grazing when the soil is wet results in puddling of the surface layer, poor tilth, and excessive runoff. Fertilizer promotes good growth of forage plants. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil generally is not suited to cultivated crops. The hazard of erosion is too severe for this use. Included areas of less sloping soils can be used as cropland if special conservation practices are used.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. The main limitations are very slow permeability, high shrink-swell potential, steepness of slope, and low strength for roads and streets. Septic tank absorption fields do not function properly during rainy periods because of very slow permeability. Lagoons or self-contained disposal units can be used to dispose of sewage properly. If buildings are constructed on this soil, properly designing foundations and footings help to prevent the structural damage caused by shrinking and swelling. Roads can be designed to offset the limited ability of the soil to support a load. Revegetating disturbed areas around construction sites as soon as possible helps to control soil erosion. Preserving the existing plant cover during construction also helps to control erosion.

This Oktibbeha soil is in capability subclass VIe. The woodland ordination symbol is 7C.

Os—Osier fine sandy loam, 0 to 2 percent slopes

This soil is nearly level and poorly drained. It is in heads of drainageways and in seep areas on terraces. The areas of this soil are generally long and narrow and range from 5 to 75 acres.

Typically, the surface layer is about 9 inches thick. It is very dark grayish brown fine sandy loam in the upper part and dark grayish brown fine sandy loam in the lower part. The underlying material to a depth of about 60 inches is grayish brown loamy fine sand in the upper and middle parts and olive gray fine sand in the lower part. It is mottled in the middle and lower parts. In some areas, the surface layer is loamy fine sand, loamy sand, or sand.

This soil has low fertility and moderately high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a rapid rate. Water runs off the surface at a very slow rate. A seasonal high water table is within 12 inches of the soil surface for 3 to 6 months or more from December to June of most years. The available water capacity is very low to moderate. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Guyton soils. Also included are areas of similar soils with slopes greater than 2 percent and areas in which the soil is underlain by clayey material below a depth of about 40 inches. Guyton soils are in lower positions than the Osier soil and are loamy throughout the profile. The included soils make up about 10 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat.

This soil is poorly suited to the production of loblolly pine. The site index for loblolly pine is 87, but management is very difficult. The main concerns in producing and harvesting timber on this soil are a severe equipment use restriction, severe seedling mortality, a severe windthrow hazard, and severe plant competition caused by wetness. Conventional methods of harvesting timber generally can be used during dry periods. However, mechanical site preparation and harvesting operations generally cannot be done during wet periods. Trafficability is very poor when this soil is wet. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Site preparation, such as chopping and burning, controls immediate plant competition. Applying herbicides to this soil to control undesirable woody vegetation can contaminate the ground water because of the rapid permeability and high water table. Trees should be planted during the drier periods to improve the rate of seedling survival.

This soil is moderately well suited to use as habitat for woodland and wetland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation or by propagating desirable plants. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil generally is not suited to use as pastureland, cropland, homesites, or urban development. It is too wet for these uses.

This Osier soil is in capability subclass Vw. The woodland ordination symbol is 9W.

Pe—Perry clay, occasionally flooded

This soil is level and poorly drained. It is in low positions on the flood plain of the Red River and subject to occasional, shallow to deep flooding. In places, this soil is subject to rare or frequent flooding. The areas of this soil are irregular in shape and range from 20 to 600 acres. Slopes are less than 1 percent.

Typically, the surface layer is brown clay about 9 inches thick. The subsoil to a depth of about 50 inches is dark gray, mottled clay in the upper and middle parts and dark reddish brown, mottled clay in the lower part. The substratum to a depth of about 72 inches is dark reddish brown, mottled clay.

This soil has medium fertility. Water and air move through this soil at a very slow rate. Water runs off the surface at a very slow rate. A seasonal high water table ranges from the soil surface to a depth of about 2 feet below the surface during December through June. This soil is subject to brief to very long periods of flooding during December through June. Floodwaters typically are 1.5 to 3 feet deep, and the depth exceeds 5 feet in places. Flood duration may exceed 1 month. The surface layer of this soil is very sticky when wet and dries slowly. The available water capacity is moderate to high. The shrink-swell potential is very high.

Included with this soil in mapping are a few small areas of Moreland and Yorktown soils. Moreland soils are in higher positions than the Perry soil and have a subsoil that is reddish throughout. Yorktown soils are in lower positions than the Perry soil and do not dry enough to crack below 20 inches. The included soils make up about 15 percent of the map unit.

This soil is used about equally as pastureland, cropland, and woodland. Some areas of this soil, formerly in crops, are now idle or are used as habitat for wetland wildlife.

This soil is moderately well suited to use as woodland. Trees commonly grown on this soil are Nuttall oak, water oak, green ash, sweetgum, honeylocust, sugarberry, and baldcypress. The site index for green ash is 75. The main concerns in producing and harvesting timber are a severe equipment use limitation, moderate seedling mortality, a moderate windthrow hazard, and severe plant competition caused by flooding and wetness. Only trees that can tolerate seasonal wetness should be planted. Conventional methods of harvesting timber generally can be used except sometimes during rainy periods, generally from December to June. If flooding is reduced, special site preparation, such as harrowing and bedding, will help to establish seedlings.

This soil is moderately well suited to use as habitat for woodland and wetland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife. Habitat for waterfowl and furbearers can be improved by constructing shallow ponds.

This soil is poorly suited to pasture. The main limitations are flooding and wetness. Medium fertility is a minor limitation. The main suitable pasture plant is common bermudagrass. Excess water on the surface can be removed by shallow ditches. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Fertilizer and lime are needed for optimum production of forage. During periods of flooding, cattle can be moved to pastures protected from flooding or to pastures at higher elevations.

This soil is moderately well suited to cultivated crops. It is limited mainly by flooding, wetness, and poor tilth. Medium fertility is a minor limitation. Planting dates are delayed and crops are destroyed by floods in some years. Suitable crops are soybeans, grain sorghum, and rice. This soil is difficult to keep in good tilth and can be worked only within a narrow range of moisture content. Proper row arrangement, field ditches,

and vegetated outlets are needed to remove excess surface water. Precision land leveling can also improve surface drainage. Flooding can be controlled, but only by major structures, such as levees and pumps. Returning crop residue to the soil or regularly adding other organic matter improves fertility and increases the water intake rate. Most crops respond well to fertilizer and lime.

This soil is poorly suited to urban development. It generally is not suited to homesites because of the hazard of flooding. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. The main limitations are wetness, very slow permeability, very high shrink-swell potential, and low strength for roads and streets. Major flood-control structures, along with extensive local drainage systems, are needed to protect this soil from flooding. Roads should be located above the expected flood elevation and designed to overcome the limited ability of the soil to support a load. If flooding is controlled, lagoons or self-contained disposal units can be used to dispose of sewage properly.

This Perry soil is in capability subclass IVw. The woodland ordination symbol is 3W.

Pg—Pits, gravel

This miscellaneous area consists of open excavations from which gravel and sand have been removed. The areas of this map unit are generally rough and steeply sloping, but some areas are smooth and gently sloping. These areas are generally oval or rectangular in shape and are generally less than 10 acres. The areas of this map unit are mainly near areas of Ruston and Smithdale soils.

Gravel pits are pits from which gravelly material has been excavated for use in roads, driveways, and parking areas. The material is also used as fill material in foundations for homes. Sand is also obtained from some pits.

Included in this map unit are areas of abandoned pits and areas of spoil, which generally consist of a mixture of coarse sands and gravel.

Most areas of Pits, gravel, are barren of vegetation. A few low quality trees and sparse stands of grass are on areas of abandoned pits.

This map unit generally is not suited to use as cropland, woodland, pastureland, or homesites.

This map unit is not in a capability subclass nor a woodland ordination group.

Pr—Pits, quarry

This map unit consists of one open excavation from which rock is being mined. The sides of the pit are vertical, and the bottom is nearly level. The rock is being removed from the cap rock of the Winnfield Salt Dome.

Gypsum anhydrite is the main rock which is removed from Pits, quarry. The rock is crushed and used mainly as a road surfacing material. The cap rock is several hundred feet thick, and the pit is about 250 feet deep.

This map unit is barren of vegetation, is being mined, and no other use is expected.

This map unit is not suited to use as cropland, pastureland, woodland, or homesites.

This map unit is not in a capability subclass nor a woodland ordination group.

Ra—Roxana silt loam, occasionally flooded

This soil is level and well drained. It is on flood plains and in high positions on the natural levee of the Red River. The areas of this soil are generally long and narrow and range from 50 to about 100 acres. Slopes range from 0 to 1 percent.

Typically, the surface layer is strong brown silt loam about 7 inches thick. The underlying material to a depth of about 72 inches is strong brown silt loam in the upper part, brown very fine sandy loam in the middle part, and reddish brown very fine sandy loam in the lower part. The lower part of the profile is calcareous and moderately alkaline.

This soil has high fertility. Water and air move through this soil at a moderate rate. Water runs off the surface at a slow rate. A seasonal high water table ranges from 4 to 6 feet below the surface during December through April. This soil is subject to occasional flooding, generally during late winter or spring. Floodwaters typically are 1 to 5 feet deep, but they are as much as 2 feet deep during some floods. Flood duration ranges from 10 to more than 30 days. The surface layer of this soil dries quickly after rains. The available water capacity is moderate to very high. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Moreland soils. Also included are areas of similar soils with surface layers of very fine sandy loam or silty clay loam. Moreland soils are in lower positions than the Roxana soil and are clayey throughout the profile. The included soils make up about 15 percent of the map unit.

This soil is used mainly as pastureland. A small acreage is used as cropland.

This soil is well suited to the production of hardwood trees. However, most areas have been cleared and are used as pastureland or cropland. This soil has few limitations for woodland management. However, plant competition is moderate. Suitable trees to plant are cherrybark oak, Shumard oak, and water oak. In some years, flooding can limit the use of equipment. Proper site preparation before planting helps to control unwanted understory plants.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by providing field borders or odd acres of grain left for food patches near good wildlife cover. A diversity of crops can be planted in narrow strips to improve habitat for doves, rabbits, quail, deer, and turkeys.

This soil is moderately well suited to pasture. It is limited mainly by occasional flooding. Suitable pasture plants are common bermudagrass, improved bermudagrass, tall fescue, ryegrass, and white clover. Proper grazing and weed control help to ensure maximum quality of forage. Additions of nitrogen and phosphorus fertilizer increase forage production. Lime generally is not needed. Livestock can be moved to protected areas during flood periods.

This soil is moderately well suited to cultivated crops. It is limited mainly by occasional flooding. The main suitable crops are soybeans, cotton, corn, grain sorghum, and wheat. This soil is friable and easy to keep in good tilth. It can be worked throughout a wide range of moisture content. A tillage pan forms easily if this soil is tilled when it is wet, but it can be broken by subsoiling when the soil is dry. Crop residue left on the surface helps to conserve moisture, maintain tilth, and control erosion. In some years, late spring flooding limits use to short season crops, such as soybeans or grain sorghum. Flooding can be controlled, but only by major structures, such as levees. Additions of nitrogen and phosphorus fertilizer improve the soil for crops. Lime generally is not needed.

This soil is poorly suited to urban development. It generally is not suited to homesites. Seasonal wetness is the main limitation, and flooding is the main hazard. Flooding can be controlled, but only by major flood-control structures.

This Roxana soil is in capability subclass IIw. The woodland ordination symbol is 12A.

Ro—Roxana silt loam, frequently flooded

This soil is gently undulating and well drained. It is on sandbars and in low positions on flood plains along the Red River. In places, this soil is subject to occasional rather than frequent flooding. The areas of this soil are generally long and narrow. Slopes are short and convex and range from 0 to 3 percent.

Typically, the surface layer is strong brown silt loam about 4 inches thick. The underlying material to a depth of about 60 inches is yellowish red very fine sandy loam.

This soil has high fertility. Water and air move through this soil at a moderate rate. Water runs off the surface slowly. A seasonal high water table ranges from about 4 to 6 feet below the surface during December through April. This soil is subject to brief to very long periods of flooding that generally occur in winter, spring, and early summer. However, flooding can occur any time that flood-control structures upstream are opened. Floodwaters typically are 5 to 10 feet deep, but the depth may exceed 20 feet. Flood duration may exceed 90 days. The available water capacity is moderate to very high. The shrink-swell potential is low.

This map unit has no inclusions.

This soil is used mainly as woodland and wildlife habitat.

This soil is moderately well suited to use as woodland. Native trees consist almost entirely of eastern cottonwood and black willow. This soil has high potential to produce eastern cottonwood, American sycamore, and green ash. The site index for eastern cottonwood is 115. Woodland management is difficult because of frequent flooding. Trees should be planted and harvested only during dry periods.

This soil generally is not suited to use as cropland, pastureland, or urban development. The hazard of flooding is too severe for these uses.

This Roxana soil is in capability subclass Vw. The woodland ordination symbol is 8W.

Rr—Roxana-Moreland complex, gently undulating, occasionally flooded

These soils are gently undulating and are on the flood plain of the Red River. The Roxana soil is well drained and is on convex ridges. The Moreland soil is poorly drained and is in swales. These soils are subject to brief to very long periods of flooding from December to June. Floodwaters typically are 1 to 5 feet deep, but they are as deep as 10 feet during some floods. Flood duration ranges from 2 to more than 30 days. This map unit is about 800 acres in size and contains about 50 percent Roxana soils and about 50 percent Moreland soils. The soils in this map unit are too intricately intermingled to be mapped separately at the selected scale. The landscape is one of low, parallel ridges and swales. The ridges are 3 to 5 feet high and 100 to 200 feet wide. The swales are 75 to 200 feet wide. Slopes range from less than 1 percent in the swales and from 0 to 3 percent on the ridges.

Typically, this Roxana soil has a surface layer of brown very fine sandy loam about 5 inches thick. The underlying material to a depth of about 62 inches is yellowish red very fine sandy loam. The underlying material is moderately alkaline throughout.

This Roxana soil has high fertility. Water and air move through this soil at a moderate rate. Water runs off the surface at a medium rate. A seasonal high water table ranges from 4 to 6 feet below the surface during December through April. The surface layer of this soil dries quickly after rains. The available water capacity is moderate to very high. The shrink-swell potential is low.

Typically, this Moreland soil has a surface layer of dark brown clay about 6 inches thick. The subsoil to a depth of 52 inches is reddish brown clay in the upper part and yellowish red, mottled clay in the lower part. The substratum to a depth of 65 inches is yellowish red clay.

The lower part of the subsoil and the substratum are calcareous and moderately alkaline.

This Moreland soil has high fertility. Water and air move through this soil at a very slow rate. Water runs off the surface at a slow rate. A seasonal high water table ranges from the soil surface to a depth of about 1.5 feet below the surface during December through April. In places, this soil is frequently flooded. The surface layer of this soil is very sticky when wet and dries slowly. The shrink-swell potential is very high.

Included with these soils in mapping are a few small areas of Yorktown soils in deep swales. Also included are areas of similar soils with surface layers of silty clay loam. The included soils make up less than 5 percent of the map unit.

These soils are used about equally as pastureland and woodland.

The Roxana soil in this map unit is well suited to the production of hardwood trees, and the Moreland soil is moderately well suited to the production of hardwood trees. Other trees commonly grown on the Roxana soil are sweetgum, water oak, willow oak, cherrybark oak, Nuttall oak, pecan, eastern cottonwood, and American sycamore. The main limitation for producing and harvesting timber on the Roxana soil is plant competition. Other trees commonly grown on the Moreland soil are green ash, water oak, Nuttall oak, honeylocust, sweetgum, sugarberry, and American sycamore. The main concerns in producing and harvesting timber on the Moreland soil are the clayey surface layer, flooding, wetness, a severe equipment use limitation, moderate seedling mortality, a moderate windthrow hazard, and severe plant competition. Conventional methods of harvesting timber can be used except sometimes during rainy periods, generally from December to April. Only species which can tolerate seasonal wetness should be planted. After harvesting, reforestation can be carefully managed to control undesirable understory plants. Controlling flooding and planting trees on bedded rows can improve the rate of seedling survival.

The soils in this map unit are well suited to use as habitat for woodland wildlife. The Roxana soil is well suited to use as habitat for openland wildlife, and the Moreland soil is moderately well suited to this use. Where the forest borders agricultural lands, field borders planted with shrubs or annual game-food mixtures will provide food and cover for wildlife. Small clear-cuts in irregular shapes provide maximum edge for use by deer.

These soils are moderately well suited to pasture. Wetness is the main limitation, and flooding is the main hazard. The main suitable pasture plants are common bermudagrass, improved bermudagrass, tall fescue, ryegrass, and white clover. Excess water can be removed by shallow ditches and suitable outlets. Proper stocking, pasture rotation, and fertilizer help to ensure optimum growth of forage plants. During flood periods, cattle can be moved to protected areas or to areas above expected flood elevations.

These soils are poorly suited to cultivated crops, mainly because of flooding, wetness, poor tilth, and short choppy slopes. Erosion is a moderate hazard on the ridges. Flooding can be controlled, but only by major structures, such as levees and water pumps. Land leveling and smoothing help to remove excess water, but in places large volumes of soil need to be moved. The Moreland soil in this map unit is difficult to keep in good tilth and can be worked only within a narrow range of moisture content. Planting dates are delayed and crops are damaged by floods in some years. Using conservation tillage and returning all crop residue to the soil help to maintain fertility, improve tilth, and reduce erosion.

These soils are poorly suited to urban development. They generally are not suited to homesites. Flooding is the main hazard for these uses. Major flood-control structures and extensive local drainage systems are needed to control flooding. Wetness, very slow permeability, very high shrink-swell potential, and low strength for roads and streets are additional limitations in areas of the Moreland soil.

The Roxana soil is in capability subclass IIw, and the Moreland soil is in capability subclass IVw. The woodland ordination symbol is 12A for the Roxana soil and 3W for the Moreland soil.

Rs—Ruston fine sandy loam, 1 to 5 percent slopes

This soil is gently sloping and well drained. It is on convex ridgetops on uplands. The areas of this soil are irregular in shape and range from 5 to 300 acres. Slopes are generally long and smooth.

Typically, the surface layer is dark grayish brown fine sandy loam about 6 inches thick. The subsurface layer is yellowish brown fine sandy loam about 8 inches thick. The subsoil extends to a depth of about 80 inches. From top to bottom, the layers are dark red sandy clay loam, red sandy clay loam, yellowish red sandy clay loam, yellowish red and yellowish brown fine sandy loam, and red sandy clay loam.

This soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a moderate rate. Runoff is medium, and the hazard of water erosion is moderate. A seasonal high water table is more than 6 feet below the surface throughout the year. The available water capacity is moderate to high. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Mahan, Osier, Sacul, Savannah, and Smithdale soils. Also included are areas of similar soils with slopes greater than 5 percent and areas in which the upper part of the subsoil is sandy clay. Mahan and Sacul soils are at a higher elevation than the Ruston soil and have a clayey subsoil. Osier soils are in drain heads and seepy areas and are poorly drained. Savannah soils are at a lower elevation than the Ruston soil and have a fragipan. Smithdale soils are on side slopes and do not have a bisequum in the profile. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

This soil is well suited to the production of loblolly pine. The site index for loblolly pine is 84. Other trees commonly grown on this soil are shortleaf pine, southern red oak, post oak, sweetgum, and hickory. This soil has few limitations for woodland management.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife. Where the forest borders agricultural lands, field borders planted with shrubs or annual game-food mixtures will provide food and cover for rabbits, quail, deer, turkeys, and other nongame birds and animals.

This soil is well suited to pasture. The main limitations are the hazard of erosion and low fertility. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Where practical, seedbed preparation should be on the contour or across the slope to reduce erosion. Fertilizer and lime can improve the soil for growing grasses and legumes. Proper stocking and pasture rotation help to keep the pasture in good condition.

This soil is moderately well suited to cultivated crops. It is limited mainly by the moderate hazard of erosion, low fertility, and high levels of exchangeable aluminum in the root zone. Terraces help conserve moisture and reduce runoff and the risk of erosion. Most crops respond well to fertilizer and lime, which improve fertility and reduce the high levels of exchangeable aluminum in the root zone.

This soil is moderately well suited to homesites and urban development. The main limitations are moderate permeability, the hazard of seepage, and low strength for roads and streets. Where septic tanks are used, the limitation of moderate permeability can be overcome by increasing the size of the absorption field. Seepage of effluent can be a problem where sewage lagoons are used. Local roads and streets can be designed to offset the limited ability of the soil to support a load. Cutbanks cave easily. Where shallow excavations are made, special retainer walls can be used to prevent cutbanks from caving.

This Ruston soil is in capability subclass IIIe. The woodland ordination symbol is 8A.

Sa—Sacul fine sandy loam, 1 to 5 percent slopes

This soil is gently sloping and moderately well drained. It is on convex ridgetops and side slopes on uplands. The areas of this soil are irregular in shape and range from 5 to several hundred acres. Slopes are generally long and smooth, but some are short and convex.

Typically, the surface layer is dark grayish brown fine sandy loam about 3 inches thick. The subsurface layer is pale brown fine sandy loam about 10 inches thick. The subsoil to a depth of about 61 inches is yellowish red clay in the upper part; light brownish gray, mottled clay in the middle part; and light brownish gray, mottled sandy clay in the lower part. The substratum to a depth of about 75 inches is stratified dark yellowish brown loam and light brownish gray clay.

This soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a slow rate. Runoff is moderate. A seasonal high water table ranges from about 2 to 4 feet below the surface during December through April. The available water capacity is moderate to high. The shrink-swell potential is high in the subsoil.

Included with this soil in mapping are a few small areas of Bellwood, Mahan, Osier, Ruston, Savannah, and Smithdale soils. Also included are areas of similar soils with slopes greater than 5 percent. Bellwood and Mahan soils are in positions similar to those of the Sacul soil and have a different mineralogy. In addition, Mahan soils do not have gray mottles in the upper part of the subsoil. Osier soils are in drain heads and seepy areas, are poorly drained, and have a sandy underlying material. Ruston, Savannah, and Smithdale soils are at a lower elevation than the Sacul soil and are loamy throughout the profile. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

This soil is moderately well suited to the production of

loblolly pine. The site index for loblolly pine is 84. Other trees commonly grown on this soil are shortleaf pine, longleaf pine, white oak, southern red oak, sweetgum, hickory, and post oak. The main concerns in producing and harvesting timber are a moderate equipment use limitation, a moderate windthrow hazard, and moderate plant competition. Unsurfaced roads and skid trails can be impassable during rainy periods because of wetness and the clayey subsoil. Conventional methods of harvesting timber generally can be used except sometimes during rainy periods, generally from December to May. Using specialized equipment during wet seasons or by logging during the drier seasons helps to reduce rutting and soil compaction. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Site preparation, such as chopping, burning, and applying herbicides, controls immediate plant competition.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil is moderately well suited to pasture. The main limitations are the severe hazard of erosion and low fertility. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Seedbed preparation should be on the contour or across the slope to reduce erosion. Fertilizer and lime are needed for optimum production of forage. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil is poorly suited to cultivated crops, mainly because of the severe hazard of erosion. Low fertility and high levels of exchangeable aluminum in the root zone are the main soil limitations. Terraces and contour farming reduce runoff and control erosion. Conservation tillage and returning all crop residue to the soil help to reduce erosion, maintain tilth, and increase organic matter content. Fertilizer and lime improve fertility and reduce the high levels of exchangeable aluminum in the root zone.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. The main limitations are wetness, low strength for roads and streets, slow permeability, and high shrink-swell potential. Slow permeability and the high water table increase the possibility for septic tank absorption fields to fail. Lagoons or self-contained disposal units can be used to dispose of sewage properly. Roads can be designed to offset the limited ability of the soil to support a load. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

This Sacul soil is in capability subclass IVe. The woodland ordination symbol is 8C.

SC—Sacul fine sandy loam, 5 to 20 percent slopes

This soil is strongly sloping to moderately steep and moderately well drained. It is on side slopes on uplands. The areas of this soil are irregular in shape and range from 5 to 200 acres. Slopes are generally short and convex. Many well-defined drainageways cross most areas of this soil. Fewer observations were made than in most other map units. The detail in mapping, however, is adequate for the expected use of the soil.

Typically, the surface layer is dark grayish brown fine sandy loam about 1 inch thick. The subsurface layer is light yellowish brown fine sandy loam about 4 inches thick. The subsoil extends to a depth of about 51 inches. From top to bottom, the layers are red clay; red, mottled clay; mottled light brownish gray and red sandy clay; and light brownish gray, mottled sandy clay. The substratum to a depth of about 60 inches is light yellowish brown, stratified loam and silty clay loam.

This soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a slow rate. Runoff is rapid. A seasonal high water table ranges from about 2 to 4 feet below the surface during December through April. The available water capacity is moderate to high. The shrink-swell potential is high.

Included with this soil in mapping are a few small areas of Bellwood, Guyton, Osier, Savannah, and Smithdale soils. Also included are areas of similar soils with slopes less than 5 percent or greater than 20 percent. Bellwood soils are in positions similar to those of the Sacul soil and have a different clay mineralogy. Guyton, Savannah, and Smithdale soils are loamy throughout the profile. Guyton soils are on narrow flood plains. Osier soils are in drain heads and seepy areas, are poorly drained, and have a sandy underlying material. Savannah and Smithdale soils are at a lower elevation than the Sacul soil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland.

This soil is moderately well suited to the production of

loblolly pine. The site index for loblolly pine is 84. Other trees commonly grown on this soil are shortleaf pine, longleaf pine, white oak, southern red oak, sweetgum, hickory, and post oak. The main concerns in producing and harvesting timber are a moderate equipment use limitation, a moderate windthrow hazard, and moderate plant competition. Unsurfaced roads and skid trails can be impassible during rainy periods because of wetness and the clayey subsoil. Conventional methods of harvesting timber generally can be used except sometimes during rainy periods, generally from December to May. This can be overcome by using specialized equipment during wet seasons or by logging during the drier seasons. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Site preparation, such as chopping, burning, and applying herbicides, controls immediate plant competition.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil is poorly suited to pasture. The main limitations are the severe hazard of erosion, steepness of slope, and low fertility. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Seedbed preparation should be on the contour or across the slope to reduce erosion. In places, the use of equipment is limited by steepness of slope. Fertilizer and lime are needed for optimum production of forage. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil generally is not suited to cultivated crops. The slopes are too steep and the hazard of erosion is too severe for this use. Included areas of less sloping soils can be used as cropland if special conservation practices are used.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. The main limitations are steepness of slope, wetness, low strength for roads and streets, slow permeability, and high shrink-swell potential. Erosion is a hazard in the steeper areas. Preserving the existing plant cover during construction helps to control erosion. Only the part of the site that is used for construction should be disturbed. Revegetating disturbed areas around construction sites as soon as possible helps to control soil erosion. Roads can be designed to offset the limited ability of the soil to support a load. Slow permeability and the high water table increase the possibility for septic tank absorption fields to fail. Lagoons or self-contained disposal units can be used to dispose of sewage properly. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

This Sacul soil is in capability subclass VIe. The woodland ordination symbol is 8C.

Sh—Savannah fine sandy loam, 1 to 5 percent slopes

This soil is gently sloping and moderately well drained. It is on slightly convex ridgetops and side slopes on terraces. The areas of this soil are irregular in shape and range from 10 to several hundred acres. Slopes are generally long and smooth.

Typically, the surface layer is dark grayish brown fine sandy loam about 5 inches thick. The subsurface layer is brown fine sandy loam about 5 inches thick. The subsoil to a depth of about 31 inches is strong brown sandy clay loam in the upper part and yellowish brown, mottled clay loam in the lower part. The next layer to a depth of about 64 inches is a yellowish brown, mottled sandy clay loam fragipan.

This soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a moderate rate in the upper part of the soil and at a moderately slow rate in the fragipan. Runoff is medium. A seasonal high water table is at a depth of about 1.5 to 3 feet during December through April. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Frizzell, Gore, Guyton, Ruston, Sacul, and Shatta soils. Also included are areas of similar soils with slopes greater than 5 percent, areas in which the soil does not have a fragipan, and areas in which the subsoil is clayey below a depth of about 36 inches. None of these soils has a fragipan, except the Shatta soils. Shatta soils contain less sand in the upper part of the subsoil than the Savannah soil. Frizzell and Shatta soils are in positions similar to those of the Savannah soil. Guyton soils are in lower positions, or they are on narrow flood plains. Ruston soils have more convex slopes than the Savannah soil. Sacul soils are at a higher elevation than the Savannah soil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. A small acreage is used as pastureland or homesites.

Figure 5.—Cattle grazing on improved bermudagrass in an area of Savannah fine sandy loam, 1 to 5 percent slopes.

This soil is well suited to the production of loblolly pine. The site index for loblolly pine is 81. Other trees commonly grown on this soil are shortleaf pine, longleaf pine, white oak, southern red oak, post oak, sweetgum, and hickory. The main concerns in producing and harvesting timber on this soil are a moderate windthrow hazard and moderate plant competition. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Site preparation, such as chopping, burning, and applying herbicides, controls immediate plant competition.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Prescribed burning every three years and rotated among several small tracts of land can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife. Small clear-cuts in irregular shapes provide maximum edge for use by deer.

This soil is moderately well suited to pasture (fig. 5). The main limitations are the moderate hazard of erosion, low fertility, wetness, and low to moderate available water capacity. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Seedbed preparation should be on the contour or across the slope to reduce erosion. Fertilizer and lime are needed for optimum production of forage. The low to moderate available water capacity of this soil can limit forage production during dry periods in some years. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil is moderately well suited to cultivated crops. The main limitations are low fertility, steepness of slope, and potentially toxic levels of exchangeable aluminum in the root zone. A tillage pan forms easily if this soil is tilled when wet, but it can be broken by chiseling or subsoiling. Using conservation tillage and returning all crop residue to the soil help to maintain organic matter content, conserve moisture, and reduce erosion. Crops respond well to lime and fertilizer, which improve fertility and reduce the levels of exchangeable aluminum.

This soil is moderately well suited to homesites. It has moderate limitations for building sites and local roads and streets and severe limitations for most sanitary facilities. The main limitations are wetness, slow permeability, and low strength. Septic tank absorption fields do not function properly during rainy periods because of wetness and moderately slow permeability. Lagoons or self-contained disposal units can be used to dispose of sewage properly. Roads can be designed to offset the limited ability of the soil to support a load. The hazard of erosion is increased if the soil is left exposed during site development. Excess water on the surface can be removed by shallow ditches or by providing the proper grade around structures. Irrigation, fertilizer, and lime help to establish lawn grasses and shrubs or trees.

This Savannah soil is in capability subclass IIe. The woodland ordination symbol is 8A.

Sk—Shatta very fine sandy loam, 1 to 5 percent slopes

This soil is gently sloping and moderately well drained. It is on slightly convex ridgetops and side slopes on terraces. The areas of this soil are generally irregular in shape and range from 25 to 350 acres. Slopes are generally long and smooth.

Typically, the surface layer is dark grayish brown very fine sandy loam about 6 inches thick. The subsurface layer is brown very fine sandy loam about 10 inches thick. The subsoil to a depth of about 34 inches is yellowish brown silty clay loam. It is mottled in the lower part. The next layer to a depth of about 60 inches is a yellowish brown, mottled loam fragipan. The subsoil to a depth of about 75 inches is mottled grayish brown and yellowish brown loam.

This soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a moderately slow rate in the upper part of the soil and at a slow rate in the fragipan. Runoff is medium. A seasonal high water table is at a depth of about 1.5 to 3 feet during December through April of most years. The available water capacity is moderate to high. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Cahaba, Frizzell, Guyton, and Savannah soils. Also included are areas of similar soils with slopes greater than 5 percent and areas in which the soil does not have a fragipan. None of these soils has a fragipan, except the Savannah soils. Savannah soils contain more sand in the upper part of the subsoil than the Shatta soil. Cahaba and Savannah soils are in positions similar to those of the Shatta soil. Frizzell and Guyton soils are in lower positions than the Shatta soil. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. In a few areas, it is used as pastureland or homesites.

This soil is well suited to the production of loblolly pine (fig. 6). The site index for loblolly pine is 83. Other trees commonly grown on this soil are shortleaf pine, sweetgum, southern red oak, white oak, and hickory. The main concerns in producing and harvesting timber are a moderate windthrow hazard and moderate plant competition. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Site preparation, such as chopping, burning, and applying herbicides, controls immediate plant competition.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Controlled burning can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Leaving small areas of mast-producing hardwoods scattered throughout the forest can benefit squirrels, deer, and turkeys. Seeding road sides and other small openings to grasses, clovers, and other plants can provide food and cover for deer, rabbits, turkeys, and quail.

This soil is well suited to pasture. The main limitations are steepness of slope and low fertility. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and crimson clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Use of fertilizer and lime help to promote good growth of forage. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil is moderately well suited to cultivated crops. The severe hazard of erosion, low fertility, and high levels of exchangeable aluminum in the root zone are the main limitations. Terraces and contour farming reduce runoff, conserve moisture, and control erosion. Crops respond

Figure 6.—Loblolly pine trees grow well on Shatta very fine sandy loam, 1 to 5 percent slopes.

well to lime and fertilizer, which improve fertility and reduce the high levels of exchangeable aluminum.

This soil is moderately well suited to homesites. It has moderate limitations for building sites, severe limitations for local roads and streets, and moderate to severe limitations for most sanitary facilities. The main limitations are wetness, moderately slow to slow permeability, and low strength for roads and streets. Moderately slow to slow permeability and the high water table increase the possibility for septic tank absorption fields to fail. Lagoons or self-contained disposal units can be used to dispose of sewage properly. Roads can be designed to offset the limited ability of the soil to support a load. Excess water on the surface can be removed by shallow ditches or by providing the proper grade around buildings and other structures.

This Shatta soil is in capability subclass IIIe. The woodland ordination symbol is 8A.

SM—Smithdale fine sandy loam, 5 to 20 percent slopes

This soil is strongly sloping to moderately steep and well drained. It is on side slopes on uplands. The areas of this soil are irregular in shape and range from 10 to 200 acres. Many well-defined drainageways cross most areas of this soil. Slopes are generally short and convex, but some are long and smooth. Fewer observations were made than in most other map units. The detail in mapping, however, is adequate for the expected use of the soil.

Typically, the surface layer is brown fine sandy loam about 7 inches thick. The subsoil to a depth of about 73 inches is yellowish red sandy clay loam in the upper and middle parts and yellowish red loam in the lower part.

This soil has low fertility and high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a moderate rate. Runoff is rapid. A seasonal high water table is greater than 6 feet below the surface throughout the year. The available water capacity is moderate to high. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Guyton, Ruston, Sacul, and Savannah soils. Guyton soils are on the narrow flood plains of drainageways and are poorly drained and grayish throughout the profile. Ruston soils are on convex ridgetops and have a bisequum in the profile. Sacul soils are in positions similar to those of the Smithdale soil and have a clayey subsoil. Savannah soils are at a lower elevation than the Smithdale soil and have a fragipan. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland. A small acreage is used as pastureland.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 80. Other trees commonly grown on this soil are shortleaf pine, longleaf pine, white oak, southern red oak, post oak, sweetgum, and hickory. The main concerns in producing and harvesting timber on this soil are steepness of slope and the hazard of erosion. Where slopes exceed 15 percent, logging trails should be on the contour and diversions constructed to control runoff and erosion. Roads and landings can be protected against erosion by constructing diversions and by seeding cuts and fills. Water bars or plant cover, or both, should be provided on yarding paths, skid trails, and firebreaks to reduce erosion.

This soil is well suited to use as habitat for woodland and openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Controlled burning can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey. Leaving small areas of mast-producing hardwoods can benefit squirrels, deer, and turkeys.

This soil is poorly suited to pasture. The main limitations are the severe hazard of erosion, steepness of slope, and low fertility. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, ryegrass, and crimson clover. Seedbed preparation should be on the contour or across the slope to reduce erosion. Use of lime and fertilizer help to overcome the low fertility and promote good growth of forage plants. Proper stocking and pasture rotation help to keep the pasture in good condition.

This soil generally is not suited to cultivated crops. The slopes are too steep and the hazard of erosion is too severe for this use. Included areas of less sloping soils can be used as cropland if special conservation practices are used.

This soil is moderately well suited to homesites and urban development. It has moderate limitations for building sites and local roads and streets and moderate to severe limitations for most sanitary facilities. The main limitation is steepness of slope. Steepness of slope is a concern where this soil is used as septic tank absorption fields. Seepage can be a hazard where sewage lagoons or sanitary landfills are used. Absorption lines can be installed on the contour to reduce seepage of effluent in downslope areas. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage. Preserving the existing plant cover during construction helps to control erosion. Roads can be designed to provide adequate cut-slope grade, and drains can be used to control surface runoff and keep soil losses to a minimum. Topsoil can be stockpiled and used to reclaim areas disturbed by cutting and filling.

This Smithdale soil is in capability subclass VIe. The woodland ordination symbol is 8R.

Va—Vaiden silty clay loam, 0 to 1 percent slopes

This soil is gently sloping and somewhat poorly drained. It is on broad ridgetops on uplands. The areas of this soil are irregular in shape and range from 5 to 200 acres. Slopes are generally long and smooth.

Typically, the surface layer is dark grayish brown silty clay loam about 3 inches thick. The subsoil to a depth of about 33 inches is yellowish brown, mottled clay in the upper part and mottled yellowish brown and light brownish gray clay in the lower part. The substratum to a depth of about 72 inches is mottled yellowish brown and light brownish gray clay in the upper part and mottled yellow and light gray clay in the lower part.

This soil has low fertility. Water and air move through this soil at a very slow rate. Water runs off the surface at a slow rate. A seasonal high water table is at a depth of about 1 to 2 feet from the soil surface during November through March of most years. The surface layer of this soil remains wet for long periods after heavy rains. The available water capacity is moderate. The shrink-swell potential is very high.

Included with this soil in mapping are a few small areas of Bellwood, Hollywood, Keiffer, Metcalf, and Oktibbeha soils. These soils are in positions similar to those of the Vaiden soil. Bellwood and Oktibbeha soils have a subsoil that is red in the upper part. Hollywood soils have a thick black and very dark gray surface layer. Keiffer soils have concretions of calcium carbonate throughout the profile. Metcalf soils have a subsoil that is loamy in the upper part. The included soils make up about 15 percent of the map unit.

This soil is used mainly as woodland and wildlife habitat. In a few areas, it is used as pastureland or homesites.

This soil is moderately well suited to the production of loblolly pine. The site index for loblolly pine is 79. Other trees commonly grown on this soil are shortleaf pine, southern red oak, white oak, willow oak, sweetgum, and eastern redcedar. The main concerns in producing and harvesting timber on this soil are a moderate equipment use limitation, moderate seedling mortality, and severe plant competition. Trafficability is poor when this soil is wet. Unsurfaced roads and skid trails are sticky and slippery when wet or moist and can be impassable during rainy periods. Replanting in areas where an adequate stand is not attained may be necessary due to seedling mortality caused by seasonal wetness and soil droughtiness. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Site preparation, such as chopping, burning, and applying herbicides, controls immediate plant competition.

This soil is well suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Controlled burning can increase the amount of palatable browse for deer and seed-producing plants for turkey and quail. Leaving mast-producing trees when harvesting timber and during site preparation can benefit many species of wildlife.

This soil is moderately well suited to pasture. The main limitations are low fertility and wetness. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, and white clover. Annual cool-season grasses, such as ryegrass, wheat, and oat, are suitable for winter forage. Use of lime and fertilizer help to overcome the low fertility and promote good growth of forage plants. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

This soil is moderately well suited to cultivated crops. It is limited mainly by seasonal wetness, low fertility, and poor tilth. Field ditches and adequate outlets help to remove excess surface water. This soil is difficult to keep in good tilth and can be worked only within a narrow range of moisture content. Returning crop residue to the soil, using conservation tillage, and tilling the soil when it is least susceptible to compaction help to maintain soil tilth. Fertilizer and lime increase soil fertility.

This soil is poorly suited to homesites and urban development. It has severe limitations for building sites, local roads and streets, and most sanitary facilities. Wetness, very slow permeability, very high shrink-swell potential, and low strength for roads and streets are the main limitations. Drainage is needed if roads and building foundations are constructed. Very slow permeability and the high water table increase the possibility for septic tank absorption fields to fail. Lagoons or self-contained disposal units can be used to dispose of sewage properly. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. Roads and streets should be designed to offset the limited ability of the soil to support a load. Excess water on the surface can be removed by providing the proper grade around buildings and other structures.

This Vaiden soil is in capability subclass IIIw. The woodland ordination symbol is 8C.

YO—Yorktown clay, frequently flooded

This soil is level and very poorly drained. It is in low backswamps on flood plains. The areas of this soil are generally oval and range from 90 to several hundred acres. Slopes are less than 1 percent. Fewer observations were made than in most other map units because of ponding and frequent flooding for long durations. The detail in mapping, however, is adequate for the expected use of the soil.

Typically, the surface is covered with a mat of very dark grayish brown muck about 2 inches thick. The surface layer is grayish brown clay about 6 inches thick. The subsoil to a depth of about 64 inches is gray clay in the upper and middle parts and reddish brown, mottled clay in the lower part.

This soil has high fertility. Water and air move through this soil at a very slow rate. A seasonal high water table ranges from 5 feet above the soil surface to 0.5 feet below the surface. This soil is ponded or frequently flooded most of the year by at least 6 inches of water and is saturated with water throughout the year in most years. The available water capacity is moderate to high. The shrink-swell potential is very high, but this soil seldom dries enough to shrink and crack.

Included with this soil in mapping are a few small areas of Perry soils, areas in which the surface layer is thick muck, and areas in which the subsoil is loamy. Perry soils are in higher positions than the Yorktown soil and generally are dry enough in most years to crack to a depth of 20 inches. The included soils make up about 15 percent of the map unit.

The entire acreage of this soil is in woodland and is used as habitat for wetland wildlife.

This soil is poorly suited to use as woodland. Baldcypress, water tupelo, green ash, and water hickory are the dominant trees grown on this soil. The site index for baldcypress is 70. Managing the soil for timber production is very difficult because of wetness and flooding. Special equipment is needed to harvest and remove timber from the forest. A windthrow hazard, seedling mortality, and plant competition are severe.

This soil is moderately well suited to use as habitat for wetland wildlife. Typically, it provides habitat for ducks, beaver, nutria, otter, and other wetland wildlife birds and animals. Habitat for wetland wildlife can be improved by providing open water areas for waterfowl.

This soil generally is not suited to use as cropland, pastureland, homesites, or urban development. Flooding and wetness are too severe for these uses.

This Yorktown soil is in capability subclass VIIw. The woodland ordination symbol is 3W.

Prime Farmland

In this section, prime farmland is defined, and the soils in Winn Parish that are considered prime farmland 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 food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. The moisture supply must be adequate, and the growing season must be sufficiently long. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources. Farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They are used for 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 receive 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 frequently flooded during the growing season. The slope ranges mainly from 0 to 5 percent.

The following map units are considered prime farmland in Winn 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 4. 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.

Some soils that have a high water table and all soils that are frequently flooded during the growing season qualify as prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. Only those soils are listed, however, that have few limitations and need no additional improvements to qualify as prime farmland.

The soils identified as prime farmland in Winn Parish are:

Ca Cahaba fine sandy loam, 1 to 3 percent slopes
Fz Frizzell-Guyton silt loams, 0 to 2 percent slopes
Ga Gallion silt loam, rarely flooded
Gc Glenmora silt loam, 1 to 3 percent slopes
Ha Harleston fine sandy loam, 1 to 3 percent slopes
Hw Hollywood silty clay loam, 1 to 5 percent slopes
Ke Keiffer loam, 1 to 5 percent slopes
Ko Kolin silt loam, 1 to 5 percent slopes
Ma Mahan fine sandy loam, 1 to 5 percent slopes
Me Metcalf silt loam, 0 to 2 percent slopes
Ok Oktibbeha silt loam, 1 to 5 percent slopes
Ra Roxana silt loam, occasionally flooded
Rs Ruston fine sandy loam, 1 to 5 percent slopes
Sa Sacul fine sandy loam, 1 to 5 percent slopes
Sh Savannah fine sandy loam, 1 to 5 percent slopes
Sk Shatta very fine sandy loam, 1 to 5 percent slopes
Va Vaiden silty clay loam, 0 to 1 percent slopes

Use and Management of the Soils

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

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

Information in this section can be used to plan the use and management of soils for crops and pasture; woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the 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

Charles M. Guillory, conservation agronomist, Natural Resources Conservation Service, helped to prepare this section.

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

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

About 24,374 acres in Winn Parish were in farms in 1987, according to the U. S. Census of Agriculture. Most of the acreage is used to produce annual forage and hay crops.

Differences in crop suitability and management needs result from differences in soil characteristics, such as fertility level, erodibility, organic matter content, availability of water for plants, drainage, and the hazard of flooding. Cropping systems and soil tillage are an important part of management. Each farm has a unique soil pattern; therefore, each has unique management problems. Some principles of farm management, however, apply only to specific soils and certain crops. This section presents the general principles of management that can be widely applied to the soils of Winn Parish.

Pasture and Hayland

About 10,800 acres in Winn Parish was used as pasture in 1987.

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

Common and improved bermudagrass and Pensacola bahiagrass are the most commonly grown summer perennials (fig. 7). Improved bermudagrass and Pensacola bahiagrass produce good quality forage. Tall fescue, the main winter perennial grass, grows well only on soils that have a favorable moisture content. All of these grasses respond well to fertilizer, particularly nitrogen.

White clover, crimson clover, vetch, and winter peas

Figure 7.—A pasture of improved bermudagrass in an area of Ruston fine sandy loam, 1 to 5 percent slopes. Irrigation increases production.

are the most commonly grown legumes. These legumes respond well to lime, particularly when grown on acid soils.

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

Some farmers obtain additional forage by grazing the understory native plants in woodland. About 1,000 acres of woodland is grazed in Winn Parish. Forage volume varies with the woodland site, the condition of the native forage, and the density of the timber stand. Although most woodland is managed mainly for timber, substantial volumes of forage can be obtained if these areas are properly managed. Stocking rates and grazing periods need to be carefully managed for optimum forage production and to maintain an adequate cover of understory plants to control erosion.

Fertilization and Liming

Winn Parish is mainly in the Western Coastal Plain Major Land Resource Area. Many of the soils are acid throughout. They are low in organic matter content and available nitrogen. Calcium content is very low or low. Most of the soils on terraces and uplands, such as the Cahaba and Glenmora soils, contain quantities of exchangeable aluminum that are potentially toxic to some crops. These soils generally need lime and a complete fertilizer for nonleguminous crops. Soils of the alluvial plains, such as the Moreland and Roxana soils, generally need only nitrogen fertilizer for nonleguminous crops. Some of these soils become deficient in potassium after many years of continuous row crops. Some of the soils on alluvial plains, such as Gallion and Perry soils, need lime and a complete fertilizer for nonleguminous crops. Exceptions are the Keiffer, Hollywood, Oktibbeha, and Vaiden soils. These soils generally do not need lime. The amount of fertilizer needed depends on the kind of crop to be grown, on past cropping history, on the level of yield desired, and on the kind of soil. The amount should be determined on the basis of soil test results. Information and instructions on collecting and testing soil samples can be obtained from the Cooperative Extension Service.

Organic Matter Content

Organic matter is an important source of nitrogen for crops. It also increases the rate of water intake, reduces surface crusting, and improves tilth. In Winn Parish, most soils used for crops are low in organic matter content. The level of organic matter can be maintained by growing crops that produce an extensive root system and an abundance of foliage, by leaving plant residue on the surface, by growing perennial grasses and legumes in rotation with other crops, and by adding barnyard manure.

Soil Tillage

Soils should be tilled only enough to prepare a seedbed and to control weeds. Excessive tillage destroys soil structure. Conservation tillage and no-till practices help to maintain soil tilth. The clayey soils in the parish become cloddy if cultivated when too wet or too dry.

A compacted layer, generally known as a traffic pan or plow pan, sometimes develops just below the plow layer in loamy soils. This condition can be avoided by not plowing when the soil is wet, by varying the depth of plowing, or by breaking the compacted layer by subsoiling or chiseling. Tillage implements that stir the surface and leave the crop residue in place protects the soil from beating rains, thereby helping to control erosion, reduce runoff and surface crusting, and increase infiltration.

Drainage

Some of the soils in the parish need surface drainage to make them more suitable for crops and pasture. A properly designed system of field ditches can remove excess water from seasonally wet soils, such as the Frizzell, Guyton, Metcalf, Perry, and Moreland soils.

Water for Plant Growth

The available water capacity of the soils in the parish ranges from very low to very high. In many years, sufficient water is not available at the critical time for optimum plant growth unless supplemental water is provided by irrigation. Rainfall is heavy in winter and spring. Sufficient rain generally falls in the summer and autumn of most years; however, during dry periods moisture deficits of two to four inches occur, and most of the soils do not supply sufficient water for optimum plant growth. This rainfall pattern favors the growth of early maturing crops.

Cropping System

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

A suitable cropping system varies according to the needs of the farmer and the characteristics of the soil. Producers of livestock, for example, generally use cropping systems that have higher percentages of pasture and annual forage than the cropping system used on cash-crop farms. Grass and legume cover crops may be grown during fall and winter.

Control of Erosion

Erosion is a major hazard on many soils in Winn Parish. It is an especially serious problem on soils on terraces and uplands. Erosion generally is not a serious hazard on soils on the flood plains, because the topography is mainly level to gently undulating and slopes are short. Sloping soils, such as Gore, Bellwood, Mahan, and Sacul, are highly susceptible to erosion if left without plant cover for extended periods. If the surface layer of the soil is lost through erosion, most of the available plant nutrients and organic matter are also lost. Soils that have a fragipan, such as Savannah and Shatta soils, especially need protection against erosion. Soil erosion also results in sedimentation of drainage systems and pollution of streams by sediments, nutrients, and pesticides.

Cropping systems in which a plant cover is maintained on the soil for extended periods reduce soil erosion. Conservation tillage, contour farming, terraces, stripcropping, grassed waterways, diversions, and cropping systems that rotate grass or close-growing crops with row crops help to control erosion on cropland and pastureland. Constructing water-control structures in ditches and drainageways to drop water to different levels can prevent gullying.

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

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

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

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

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

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

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for 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, or for engineering purposes.

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

Capability classes, the broadest groups, are designated by 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.

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.

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, *e, w,* or *s,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *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); and *s* shows that the soil is limited mainly because it is droughty.

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, woodland, wildlife habitat, or recreation. Class V contains only the subclasses indicated by *w*.

Woodland Management and Productivity

J. Donald Lawrence, area forester, Natural Resources Conservation Service, helped to prepare this section.

This section provides information on the relation between trees and their environment, particularly trees and the soils in which they grow. It includes information on the kind, amount, and condition of woodland resources in Winn Parish. This section also includes soils interpretations that can be used in planning.

Soils vary in their ability to produce trees. Available water capacity and depth of the root zone have major effects on tree growth. Fertility and texture also influence tree growth. Soil wetness and flooding are of particular importance in determining what species of trees are best adapted to the site.

Woodland Resources

Winn Parish has about 561,900 acres of commercial woodland or timberland *(17a, 36)*. These timbered acres make up about 94 percent of the total land area. Commercial woodland is defined as that producing or capable of producing crops of industrial wood and not withdrawn from timber use. Several wood-using or wood-associated industries are in Winn Parish (fig. 8). About 55 percent of the commercial woodland is owned by the forest industry, 1 percent by corporations, and 26 percent by individuals. About 18 percent is public land in the Kisatchie National Forest and in the Catahoula Wildlife Management Area.

These soil, climate, and landscape characteristics, in combination, largely determine the forest stand species composition and influence management and utilization decisions. Sweetgum, for example, is tolerant of many soils and sites but grows best on rich, moist, and alluvial loamy soils of river bottoms. Use of heavy logging and site-preparation equipment is more restricted on clay soils or soils with a clayey subsoil, such as the Bellwood soils, than on better drained sandy or loamy soils, such as the Boykin, Darden, Cahaba, or Ruston soils.

Trees, such as the oaks, grow on a variety of soils. White oak grows on well drained flood plains, terrace ridges, uplands, coves, and well drained second bottoms. This species grows best on well drained, loamy soils;

Figure 8.—A mill in an area of Frizzell-Guyton silt loams, 0 to 2 percent slopes. This mill is one of several mills producing multiple wood products in and near the survey area.

however, willow oak and water oak grow well on many alluvial soils and on well drained, loamy ridges. Swamp chestnut oak (cow oak) is widely distributed on well drained, loamy, first bottom ridges and thrives on well drained, loamy terraces and colluvial sites on the bottom lands of both large and small streams. At the other extreme, on uplands, southern red oak can grow well on dry, sandy soils, such as the Boykin and Darden soils; or it can grow on more clayey soils, such as the Mahan and Sacul soils. Post oak is well adapted to uplands and grows on rocky ridges, outcroppings of sand, and southern exposures.

Loblolly pine and shortleaf pine are the predominant and most widely grown trees in Winn Parish, in terms of board feet of sawtimber and cubic feet of growing stock. These species of pine trees grow well on a variety of soils and they can occupy similar sites. For these reasons, they are widely distributed and closely intermingled in the parish.

Loblolly pine grows best on soils with imperfect to poor surface drainage, a thick, medium-textured surface layer, and fine-textured subsoil. This pine attains its highest site index on soils of stream bottoms and terraces. Its poorest growth is on shallow soils, very wet sites, and eroded soils.

Shortleaf pine grows well on well drained sandy loams. The least productive sites are the shallow soils, wet sites, and eroded soils. Site indexes at age 50 on the better sites may exceed 80 and be as low as 66 on poorer sites. Shortleaf pine does not grow well on alkaline soils or soils that have a high content of calcium.

Commercial woodland may be divided into forest types *(35)*. Types can be based on tree species, site quality, or age. As used in this survey, forest types are stands of trees of similar character, composed of the same species, and growing under the same ecological and biological conditions. The forest types are named for the dominant trees.

The *longleaf-slash pine* forest type makes up about 5,400 acres of the forest land in Winn Parish. This acreage mainly is from natural growth.

The *loblolly-shortleaf pine* forest type makes up about 243,000 acres of the forest land in the parish. About 64 percent of this forest type is natural and 36 percent is planted. Loblolly pine generally is dominant except on drier sites. Scattered hardwoods, such as sweetgum, blackgum, southern red oak, post oak, water oak, white oak, mockernut hickory, and pignut hickory, can be mixed with pines on well drained soils. On the more moist sites, sweetgum, red maple, water oak, and willow oak can be mixed with the pines. American beach and ash are associated with this forest type along stream bottoms.

The *oak-pine* forest type makes up about 125,200 acres of the forest land in the parish. On the drier sites, the hardwood components tend to be post oak, southern red oak, and blackjack oak. On the more moist sites, the hardwood components are sweetgum, white oak, southern red oak, and blackjack oak. Red maple, blackgum, winged elm, and various hickory trees are associated with this type along stream bottoms.

The *oak-gum-cypress* forest type makes up about 59,400 acres of the forest land in the parish. This forest type is on the bottom lands of major streams. Dominant trees are blackgum, sweetgum, oak, and baldcypress. Associated trees are eastern cottonwood, black willow, ash, maple, hackberry, and elm.

The *oak-hickory* forest type makes up about 123,800 acres of the forest land in the parish. Upland oaks or hickory, singly or in combination, make up a plurality of the stocking. Common associates are maple and winged elm.

About 5,400 acres of the forest land in the parish is not placed in a forest type.

The volume of growing stock in Winn Parish is about 65 percent pine and 35 percent hardwood. The marketable timber is about 73 percent pine and 27 percent hardwood. About 50 percent of the forest acreage is sawtimber, 33 percent is seedlings and saplings, and 15 percent is pole timber. The remaining 32 percent is classified as "non-stocked areas."

The productivity of forest land is the amount of wood produced per acre per year measured in cubic feet. In Winn Parish about 11 percent of the forest land produces 165 cubic feet or more per acre, 37 percent produces 120 to 165 cubic feet per acre, 38 percent produces 85 to 120 cubic feet per acre, 12 percent produces 50 to 80 cubic feet per acre, and 2 percent produces less than 50 cubic feet per acre.

The importance of timber production to the economy of the parish is significant. Most of the upland pine sites are owned by the forest industry or are in the Kisatchie National Forest. These forests are generally well managed. However, the small, privately-owned tracts, and most of the bottom land areas are producing well below potential and would benefit if stands were improved by thinning out mature and undesirable species. Protection from grazing, fire, insects, and diseases; tree planting; and timber stand improvement are needed to improve stands.

Specific forestry practices that help conserve soil moisture, maintain soil fertility and aeration and soil organic matter content, and prevent compaction of the soil include: (1) using technical instead of mechanical methods for site preparation, (2) using the roller drum chopper instead of shear and windrow if mechanical site preparation is used, (3) postponing site preparation and harvesting on wet soils, (4) using logging slash to protect and conserve soil, (5) treating critically eroding areas, (6) leaving filter strips along streams, and (7) properly installing logging and access roads, water-control and drainage systems, and stream crossings.

The Natural Resources Conservation Service, Louisiana Office of Forestry, or the Louisiana Cooperative Extension Service can help determine specific woodland management needs.

Environmental Impact

Woodland is valuable for wildlife habitat, recreation, natural beauty, forage, and conservation of soil and water. The commercial forest land of Winn Parish provides food and shelter for wildlife and offers opportunity for sport and recreation to many users annually. Hunting and fishing clubs in the parish lease or otherwise use the forest land. Forests provide watershed protection, help to arrest soil erosion and reduce sedimentation, and enhance the quality and value of water resources.

Trees can be planted to screen distracting views of dumps and other unsightly areas, muffle the sound of traffic, reduce the velocity of winds, and lend beauty to the landscape. They produce fruits and nuts for use by people as well as wildlife. Trees and forests help filter out airborne dust and other impurities, convert carbon dioxide into life-giving oxygen, release moisture to the atmosphere, and provide shade from the sun's hot rays.

Woodland Production

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to applications of fertilizer than others, and some are more susceptible to landslides and erosion after roads are built and timber is harvested. Some soils require special reforestation efforts. In the section "Detailed Soil Map Units," the description of each map unit in the survey area suitable for timber includes information about productivity, limitations in harvesting timber, and management concerns in 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 table 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 affecting use and management. The letter *R* indicates a soil that has a significant limitation because of steepness of slope. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation. The letter *T* indicates a soil that has, within the root zone, excessive sodium salts that limit the development of desirable trees. The letter *C* indicates a soil that has a limitation because of the kind or amount of clay in the upper part of the profile. The letter *S* indicates a dry, sandy soil. The letter *A* indicates a soil having no significant limitations that affect forest use and management. If a soil has more than one limitation, the priority is as follows: R, W, T, C, and S.

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

Ratings of *seedling mortality* refer to the probability of the 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 to a seasonal high water table and the length of the periods when the water table is high, rock fragments in the surface layer, and rooting depth. The mortality rate generally is highest 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 a surface drainage system, and providing artificial shade for seedlings. Reinforcement planting is often needed if the risk is moderate or severe.

Ratings of *windthrow hazard* indicate the likelihood that trees will be uprooted by the wind. A restricted rooting depth is the main reason for windthrow. The rooting depth can be restricted by a high water table, a fragipan, or by a combination of such factors as 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 that care is needed in thinning or that the stand should not be thinned at all. Special equipment may be needed to prevent damage to shallow root systems in partial cutting operations. A plan for the periodic removal of windthrown trees and the maintenance of a road and trail systems may be needed.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. Plant competition is 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 hinders adequate natural or artificial reforestation but does not necessitate intensive site preparation and maintenance. The risk is *moderate* if competition from undesirable plants hinders 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* and a *volume* number. Common trees are listed in the order of their observed general occurrence. Generally, only two or three tree species dominate. The first tree listed for each soil 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.

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 trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The estimates of the productivity of the soils in this survey are 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 *productivity class* represents an expected volume produced by the most important trees, expressed in cubic meters per hectare per year calculated at the age of culmination of mean annual increment.

Trees to plant are those that are used for reforestation or, under suitable conditions, natural regeneration. They are suited to the soils and can produce a commercial wood crop. The desired product, topographic position (such as a low, wet area), and personal preference are three factors among many that can influence the choice of trees for use in 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, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

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

The information in the table can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

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 has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

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, are not subject to flooding during the period of use, and do not have slopes, stones, or boulders that increase the cost of shaping sites or of building access roads and parking areas.

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 free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over a hardpan should be considered.

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. They have moderate slopes and few or no stones or boulders on the surface.

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. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Richard W. Simmering, wildlife biologist, Natural Resources Conservation Service, helped to prepare this section.

The upland forests of pine or mixed pine and hardwoods, bottom land forests of hardwoods, and the many scattered open areas of pastureland provide habitat for a large and varied population of wildlife. The uplands are level to moderately steep and are dissected by numerous small stream bottoms. Wide flood plains subject to occasional or frequent overflow are adjacent to the Dugdemona River, the Red River, and other perennial streams. Most of the cropland in the parish is on the flood plain of the Red River. Small blocks of bottom land hardwoods and wooded swamps remain.

The interspersion of pine woodland, hardwood creek bottoms, and pastureland provide excellent habitat for many resident and nonresident wildlife species. Winn Parish has high populations of white-tailed deer, and populations of eastern wild turkey are increasing. High numbers of gray and fox squirrels, bobwhite quail, swamp rabbit, and eastern cottontail rabbit are also present. Woodlands that have a dense understory also provide good wintering habitat for migratory woodcock. Numerous songbirds and birds of prey also rely on woodlands for nesting and/or wintering habitat. Scattered colonies of the endangered red cockaded woodpecker also reside in pine forests throughout the parish. Red fox, gray fox, bobcat, and coyote are common predators in the parish.

Nuts, berries, acorns, seeds, and foliage produced by plants are utilized by wildlife for food and cover. Trees beneficial to wildlife that are common to the parish include red oak, white oak, water oak, willow oak, American beech, loblolly pine, and hickory. Some valuable understory shrubs and vines are Japanese honeysuckle, blueberry, flowering dogwood, french mulberry, greenbrier, blackberry, dewberry, and arrowhead. Pasture grasses and garden crops also enhance the habitat.

Sound forestry and wildlife management practices are essential to sustain and improve habitat and high wildlife populations. Using prescribed burning in pine forests, establishing food plots, and thinning tree stands are practices which will have a positive effect on habitat.

Proper pasture and hayland management will benefit many species of wildlife. Establishing winter annuals, such as ryegrass, oats, or rye, will provide food for deer, turkey and other wildlife during the winter months when native plants are dormant and food is scarce.

Numerous streams, rivers, farm ponds, and reservoirs support viable fisheries resources in the survey area. Castor Creek, the Dugdemona River, Saline Bayou, and the Red River support low to moderate populations of fish, such as largemouth bass, spotted bass, channel and blue catfish, bluegill, and black and white crappie. Many farm ponds are stocked with game fish. Saline Lake, a 8,900-acre impoundment, is being managed by the Louisiana Department of Wildlife and Fisheries. The lake supports moderate to high populations of largemouth bass, black and white crappie, and sunfish.

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 8, 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, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, and grain sorghum.

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

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

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, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, hawthorn, dogwood, hickory, blackberry, and dewberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are redbay, red mulberry, and mayhaw.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine and cedar.

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 waxmyrtle, American beautyberry, elderberry, and huckleberry.

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, 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 depth to bedrock, wetness, surface stoniness, slope, 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. 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, and beaver.

Engineering

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

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

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

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

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

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, 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 9 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 a very firm, dense layer; stone content; 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 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, and shrinking and swelling can cause the movement of footings. Depth to a high water table, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to a high water table, flooding, large stones, and slope 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 sodium affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 10 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.

The table also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and 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. Large stones interfere with installation.

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 are less than 4 feet below the base of the absorption field, if slope is excessive, 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.

The table 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, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope can cause construction problems, and large stones can hinder compaction of the lagoon floor.

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

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

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

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

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

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

Construction Materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* 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 to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. 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 or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. 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 a moderate shrink-swell potential, slopes of 15 to 20 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, or many stones. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

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 rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

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

Water Management

Table 12 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 and for embankments, dikes, and levees. 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, irrigation, terraces and diversions, and grassed waterways.

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. Excessive slope can affect the storage capacity of the reservoir area.

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 stones or boulders, organic matter, or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, and susceptibility to flooding. Excavating and grading and the stability of ditchbanks are affected by depth to large stones, slope, and 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 sodium. Availability of drainage outlets is not considered in the ratings.

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

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, and large stones affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, and slope affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

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

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

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

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

Engineering Index Properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 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 *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

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.

Rock fragments between 3 and 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

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

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

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of 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 and septic tank absorption fields.

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.

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 classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more 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. 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 the table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

Soil and Water Features

Table 15 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 infiltration 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 a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary 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.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year). *Frequent* means that flooding occurs often under normal weather conditions (the chance of flooding is more than a 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. 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. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence gathered during the survey and on 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 estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in the table are the depth to the seasonal high water table; the kind of water table, that is, *perched* or *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 the table.

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. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

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

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. 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.

Soil Fertility Levels

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This section contains information on both the environmental factors and the physical and chemical properties of the soils that affect their potential for crop production. It also lists the analytical methods that were used to determine the chemical properties of the sampled soils.

Factors Affecting Crop Production

Crop composition and yield are a function of many environmental, plant, and soil factors.

Environmental factors:
- Light—intensity and duration
- Temperature—air and soil
- Precipitation—distribution and amount
- Atmospheric carbon dioxide concentration

Plant factors (species and hybrid specific):
- Rate of nutrient and water uptake
- Rate of growth and related plant functions

Soil factors—physical properties:
- Distribution—texture
- Structure
- Surface area
- Bulk density
- Water retention and flow
- Aeration

Soil factors—chemical properties and soil fertility:
- Quantity factor. This describes the concentration of a nutrient ion absorbed or held in exchangeable form on the solid phase of the soil. This form of nutrient ion also is available for plant uptake.
- Intensity factor. This describes the concentration of a nutrient ion in soil solution. Since plant roots absorb nutrients directly from soil solution, this factor quantifies the amount of a nutrient element immediately available for uptake.
- Quantity/Intensity relationship factor. This describes the relationship between the quantity and intensity factors and is sometimes called the buffer power. As the plant root absorbs nutrients from soil solution, the concentration in solution is replenished by ions from the solid phase. If two soils have identical intensity factors, the soil with the greater quantity factor will provide more nutrients during the growing season since it will be able to maintain the intensity factor level for a longer period.
- Replenishment factor. This describes the rate of replenishment of the available supply of nutrients in the solid and solution phases by weathering reactions, fertilizer additions, and transport by mass flow and diffusion.

These factors are interdependent. The magnitude of the factors and the interactions among them control crop response. The relative importance of each factor changes from soil to soil, crop to crop, and environment to environment. The soil factors are only part of the overall system.

The goal of soil testing is to provide information for a soil and crop management program that establishes and maintains optimum levels and balance of the essential elements in soil for crop and animal nutrition and that protects the environment against the buildup of potentially toxic levels of essential and nonessential elements. Current soil tests attempt to measure the available supply of one or more nutrients in the plow layer. The available supply consists of nutrients characterized by both the intensity and quantity factors. Where crop production is clearly limited by available supply of one or more nutrients, existing soil tests can generally diagnose the problem, and reliable recommendations to correct the problem can be made. Soil management systems generally are based on physical and chemical alteration of the plow layer. Characteristics of this layer can vary from one location to another, depending upon management practices and soil use.

Subsurface horizons are less subject to change or change very slowly as a result of alteration of the plow layer. These horizons reflect the soil's inherent ability to supply nutrients to plant roots and to provide a favorable environment for root growth. If soil fertility recommendations based on current soil tests are followed, major fertility problems in the plow layer are normally corrected. Crop production is then limited by crop and environmental factors, physical properties of the plow layer, and physical and chemical properties of the subsoil.

Chemical Analysis Methods

Information on the available nutrient supply in the subsoil allows evaluation of the natural fertility levels of the soil. Soil profiles were sampled during the soil survey and analyzed for soil reaction; organic matter content; extractable phosphorus; exchangeable cations of calcium, magnesium, potassium, sodium, aluminum, and hydrogen; total acidity; and cation-exchange capacity. The results are summarized in Table 16. More detailed information on chemical analysis of soils is available *(1, 8, 9, 10, 23, 24, 25, 26, 27, 28, 33, 34, 41, 43)*. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods *(41)*.

Reaction (pH)—1:1 soil/water solution (8Cla).
Organic matter—acid-dichromate oxidation (6A1a).
Extractable phosphorus—Bray 2 extractant (0.03 molar ammonium fluoride-0.1 molar hydrochloric acid).
Exchangeable cations—pH 7, 1 molar ammonium acetate-calcium (6N2), magnesium (602), potassium (6Q2), sodium (6P2).
Exchangeable aluminum and hydrogen—1 molar potassium chloride (6G2).
Total acidity—pH 8.2, barium chloride-triethanolamine (6H1a).
Effective cation-exchange capacity—sum of bases plus exchangeable aluminum and hydrogen (5A3b).
Sum cation-exchange capacity—sum of bases plus total acidity (5A3a).
Base saturation—sum of cations/sum cation-exchange capacity (5C3).
Exchangeable sodium percentage—exchangeable sodium/sum cation-exchange capacity.
Aluminum saturation—exchangeable aluminum/effective cation-exchange capacity.

Characteristics of Soil Fertility

In general, four major types of nutrient distribution in soils of Louisiana can be identified. The first type includes soils that have relatively high levels of available nutrients throughout the profile. This type reflects the relatively high fertility status of the parent material from which soils developed and a relatively young age or a less intense degree of weathering of the soil profile. The Moreland, Perry, and Roxana soils in Winn Parish are in this group.

The second type includes soils that have relatively low levels of available nutrients in the surface layer, but generally have increasing levels with depth through the soil profile. These soils have relatively fertile parent material but are older soils that have been subjected either to weathering over a longer period of time or to more intense weathering. If the levels of available nutrients in the surface layer are low, crops may exhibit deficiency symptoms early in the growing season. Deficiency symptoms often disappear if the crops roots are able to penetrate to the more fertile subsoil as the growing season progresses. The majority of the soils in Winn Parish are in this group.

The third type includes soils that have adequate or relatively high levels of available nutrients in the surface layer but have relatively low levels in the subsoil. Such soils developed from low fertility parent material, or they are older soils that have been subjected to more intense weathering over a longer period of time. The higher nutrient levels in the surface layer generally are a result of fertilization in agricultural soils or biocycling in undisturbed soils. Soils such as the Boykin and Osier soils are in this group.

The fourth type includes soils that have relatively low levels of available nutrients throughout the soil profile. These soils developed from low fertility parent material, or they are older soils that have been subjected to intense weathering over a long period of time. Neither fertilization nor biocycling has contributed to nutrient levels in the surface layer of these soils. Darden soils are in this group.

Soil reaction and acidity, organic matter content, sodium content, and cation-exchange capacity also can provide evidence of the general nutrient distribution patterns in soils. Distribution patterns are the result of the interactions of parent material, weathering (climate), time, and to a lesser extent organisms and topography.

Nitrogen. Generally, over 90 percent of the nitrogen in the surface layer is in the form of organic nitrogen. Most of the nitrogen in the subsoil is in the form of fixed ammonium nitrogen. These forms of nitrogen are unavailable for plant uptake, but they can be converted to readily available ammonium and nitrate species.

Nitrogen generally is the most limiting nutrient element in crop production because of high plant demand. In most cases, nitrogen fertilizer recommendations are based on the nitrogen requirement of the crop rather than nitrogen soil test levels, because no reliable nitrogen soil tests have been developed for Louisiana soils.

Information on the nitrogen fertility status of a soil can be obtained by measuring several soil nitrogen parameters. These include the amount of readily available ammonium and nitrate nitrogen in the soil, the amount of organic nitrogen, the rate of mineralization of organic nitrogen to available forms of inorganic nitrogen, and the rate of conversion of fixed ammonium nitrogen to available forms of nitrogen. Unfortunately, since the amounts and rates of transformation of the various forms of nitrogen in the soils of Winn Parish have not been determined, no assessment of the nitrogen fertility status for these soils can be given. However, fertilizer nitrogen recommendations obtained from the Louisiana Cooperative Extension Service may be used to determine application rates.

Phosphorus. Phosphorus exists in soils as inorganic phosphorus in soil solution; as discrete minerals, such as hydroxyapatite, variscite, and strengite; as occluded or coprecipitated phosphorus in other minerals; as phosphorus retained on the surfaces of minerals, such as carbonates, metal oxides, and layer silicates; and in organic compounds. Soil solution concentrations of phosphorus are generally low. Since plant roots obtain almost all phosphorus from the soil solution, phosphorus uptake depends on the ability of the soil solid phase phosphorus to maintain phosphorus concentration in soil solution. Soil test procedures generally attempt to measure soil solution phosphorus, plus the readily available solid phase phosphorus that buffers the solution phase concentration.

The Bray 2 *(9)* extractant tends to extract more phosphorus than the commonly used Bray 1 *(9)*, Mehlich 1 *(25)*, and Olsen *(27)* extractants. The Bray 2 extractant provides an estimate of both the readily available and slowly available supply of phosphorus in soils. The Bray 2 extractable phosphorus content of most of the soils in Winn Parish is uniformly low throughout the soil profile except where addition of fertilizer phosphorus has raised the level of extractable phosphorus in the surface layer. Exceptions are the Gallion, Moreland, Perry, and Roxana soils which are medium or high in extractable phosphorus content throughout the profile. Low levels of available phosphorus are a limiting factor in crop production. Continual addition of fertilizer phosphorus to such soils is needed to build up and maintain adequate levels of available phosphorus for sustained crop production.

Potassium. Potassium exists in four major forms in soils. These are soil solution potassium, exchangeable potassium associated with negatively charged sites on clay mineral surfaces, nonexchangeable potassium trapped between clay mineral interlayers, and structural potassium within the crystal lattice of minerals. Exchangeable potassium in soils can be replaced by other cations and is generally readily available for plant uptake. To become available to plants, nonexchangeable potassium and structural potassium must be converted to exchangeable potassium through weathering reactions.

The exchangeable potassium content of the soils is an estimate of the supply available to plants. The available supply of potassium in the soils of Winn Parish is very low to low throughout the soil profile. Low exchangeable potassium levels indicate a general lack of micaceous minerals, which are a source of exchangeable potassium during weathering.

Crops respond to fertilizer potassium if exchangeable potassium levels are very low to low. Low levels gradually can be built up adding fertilizer potassium to soils that contain a sufficient amount of clay to hold the potassium. Exchangeable potassium levels can be maintained by adding enough fertilizer potassium to account for crop removal, fixation of exchangeable potassium to nonexchangeable potassium, and leaching losses. The soils in Winn Parish that have a sandier texture, such as Boykin and Darden soils, do not have a sufficient amount of clay to hold the potassium; therefore, they do not have a sufficiently high cation-exchange capacity to maintain adequate quantities of available potassium for sustained crop production. More frequent additions of potassium are needed to balance losses of potassium by leaching in these soils.

Magnesium. Magnesium exists in soil solution as exchangeable magnesium associated with negatively charged sites on clay mineral surfaces and as structural magnesium in mineral crystal lattice. Solution and exchangeable magnesium generally are readily available for plant uptake, whereas structural magnesium must be converted to exchangeable magnesium during mineral weathering reactions.

According to soil test interpretation guidelines, the exchangeable magnesium content of the soils of Winn Parish is low, medium, or high, depending upon soil texture. Low exchangeable magnesium levels are found throughout most of the soil profile in soils such as the Boykin and Darden soils. The Mahan and Guyton soils have low levels in the upper part of the profile and medium to high levels in the lower part. Variable levels throughout the profile are evident in the Glenmora soils. Higher levels of exchangeable magnesium in certain soil horizons are generally associated with higher clay content in those horizons.

The levels of exchangeable magnesium in most of the soils in Winn Parish are more than adequate for crop production, especially where the plant roots can exploit the high levels found in the subsoil. Because magnesium deficiencies in plants are normally rare, fertilizer sources of magnesium are generally not needed for crop production.

Calcium. Calcium exists in soil solution as exchangeable calcium associated with negatively charged sites on clay mineral surfaces and as structural calcium in mineral crystal lattices. Exchangeable calcium generally is available for plant intake while structural calcium is not.

Calcium deficiencies in plants are extremely rare. Calcium is normally added to soils from liming materials used to correct problems associated with soil acidity.

Some soils in Winn Parish, such as Oktibbeha and Vaiden soils, have low levels of exchangeable calcium in the upper part of the profile and medium to high levels in the lower part. Still other soils, such as Bellwood and Sacul soils, have variable levels throughout the soil profile. The higher levels of exchangeable calcium in the surface layer are normally associated with a higher soil reaction than in the subsoil and are probably the result of applications of lime to control soil acidity. Higher exchangeable calcium levels in the subsoil than in the surface layer generally are associated with a higher clay content in the subsoil.

Calcium is normally the most abundant exchangeable cation in soils; however, the exchangeable magnesium levels in the subsoil of the Frizzell, Glenmora, Ruston, Savannah, Shatta, and Smithdale soils are greater than the exchangeable calcium levels. In the other soils in the parish, exchangeable calcium levels are greater than, or about the same as, the exchangeable magnesium levels.

Organic Matter. The organic matter content of a soil greatly influences other soil properties. High organic matter content in mineral soils is desirable, while low organic matter content can lead to many problems. Increasing the organic matter content can greatly improve the soil's structure, drainage, and other physical properties. It can also increase the moisture-holding capacity, cation-exchange capacity, and nitrogen content.

Increasing the organic matter content is very difficult, because organic matter is continually subject to microbial degradation. This is especially true in Louisiana where higher soil temperatures and water content increase microbial activity. The rate of organic matter degradation in native plant communities is balanced by the rate of input of fresh material. Disruption of this natural process can lead to a decline in the organic matter content of the soil. Unsound management practices lead to a further decrease in organic matter content.

If no degradation of organic matter occurs, 10 tons of organic matter addition will raise the organic matter content in the upper 6 inches of soil by just 1 percent. Since breakdown of organic matter does occur in the soil, addition of large amounts of organic matter to the soil are needed over a period of several decades to produce a small increase in the organic matter content. Conservation tillage and use of cover crops slowly increase the organic matter content over time, or at least prevent further declines.

The organic matter content of most of the soils of Winn Parish is low. It decreases sharply with depth because fresh inputs of organic matter are confined to the surface layer. These low levels reflect the high rate of organic matter degradation, erosion, and use of cultural practices that make maintenance of organic matter at higher levels difficult.

Sodium. Sodium exists in soil solution as exchangeable sodium associated with negatively charged sites on clay mineral surfaces and as structural sodium in mineral crystal lattices. Because sodium is readily soluble and is generally not strongly retained by soils, well drained soils subjected to moderate or high rainfall do not normally have significant amounts of sodium. Soils in low rainfall environments, soils that have restricted drainage in the subsoil, and soils of the coastal marsh may have significant amounts of sodium. High levels of exchangeable sodium in soils are associated with undesirable physical properties, such as poor structure, slow permeability, and restricted drainage.

Elevated exchangeable sodium levels are at depth in some soils, such as the Brimstone and Frizzell soils. Higher than normal levels of exchangeable sodium in the soils are probably associated with restricted drainage in the subsoil. Levels of exchangeable sodium that make up more than 6 percent of the sum of the effective cation-exchange capacity in the rooting depth of summer annuals can create undesirable physical properties in soils, such as crusting of the surface, dispersion of soil particles, low water infiltration rates, and low hydraulic conductivity.

pH, exchangeable aluminum and hydrogen, and exchangeable and total acidity. The pH of the soil solution in contact with the soil affects other soil properties. Soil pH is an intensity factor rather than a quantity factor. The lower the pH, the more acidic the soil. Soil pH controls the availability of essential and nonessential elements by controlling mineral solubility, ion exchange, and absorption-desorption reactions at the surfaces of the soil minerals and organic matter. The pH also affects microbial activity.

Aluminum exists in soils as exchangeable polymeric hydrolysis species, aluminum oxides, and aluminosilicate minerals. Exchangeable aluminum in soils is determined by extraction with neutral salts, such as potassium chloride or barium chloride. The exchangeable aluminum in soils is directly related to pH. If the pH is less than 5.5, the soils have significant amounts of exchangeable aluminum that has a charge of plus 3. The species of aluminum is toxic to plants. The toxic effects of aluminum on plant growth can be alleviated by adding lime to the soil to convert exchangeable aluminum to nonexchangeable polymeric hydrolysis species. High levels of organic matter can also alleviate aluminum toxicity.

Sources of exchangeable hydrogen in soils include hydrolysis of exchangeable and nonexchangeable aluminum and pH-dependent exchange sites on metal oxides, certain layer silicates, and organic matter. Exchangeable hydrogen, as determined by extraction with such neutral salts as potassium chloride, is normally not a major component of soil acidity. Exchangeable hydrogen is not readily replaced by other cations unless accompanied by a neutralization reaction. Most of the neutral salt exchangeable hydrogen in soils apparently comes from aluminum hydrolysis.

Acidity from hydrolysis of neutral salt exchangeable aluminum plus neutral salt exchangeable hydrogen from pH-dependent exchange sites makes up the exchangeable acidity in soils. Exchangeable acidity is determined by the pH of the soil. Titratable acidity is the amount of acidity neutralized to a selected pH, generally pH 7 or 8.2, and constitutes the total potential acidity of a soil. All sources of soil acidity, including hydrolysis of monomeric and polymeric aluminum species and hydrogen from pH-dependent exchange sites on metal oxides, layer silicates, and organic matter, contribute to the total potential acidity. Total potential acidity in soils is determined by titration with base or incubation with lime; extraction with a buffered extractant followed by titration of the buffered extractant (pH 8.2, barium chloride-triethanolamine method); or equilibration with buffers followed by estimation of acidity from changes in buffer pH.

Most soils of Winn Parish have a low pH, contain significant quantities of exchangeable aluminum, and have high levels of total acidity in many of the soil horizons. Examples are Bellwood, Cahaba, Frizzell, Glenmora, Guyton, and Ruston soils. The high levels of exchangeable aluminum are a major limiting factor in crop production. High levels of exchangeable aluminum in the surface layer of the soils can be reduced by adding lime. No economical methods are presently available to neutralize soil acidity at depth. Some reduction of exchangeable aluminum levels at depth can be achieved by applying gypsum so that the calcium leaches through the soil and replaces the exchangeable aluminum.

Cation-exchange capacity. The cation-exchange capacity is a measure of the amount of nutrient and non-nutrient cations a soil can hold in an exchangeable form. The cation-exchange capacity depends on the number of negatively charged sites, both permanent and pH-dependent, present in the soil. Permanent charge cation-exchange sites occur because a net negative charge develops on mineral surface from substitution of ions within the crystal lattice. A negative charge developed from ionization of surface hydroxyl groups on minerals and organic matter produces pH-dependent cation-exchange sites.

Methods for determining cation-exchange capacity are available and can be classified as one of two types. These include methods that use unbuffered salts to measure the cation-exchange capacity at the pH of the soil and methods that use buffered salts to measure the cation-exchange capacity at a specific pH. These methods produce different results since the unbuffered salt methods include only a part of the pH-dependent cation-exchange capacity and the buffered salt methods include all the pH-dependent cation-exchange capacity up to the pH of the buffer (pH 7 and 8.2). Errors in the saturation, washing, and replacement steps can also cause different results.

The effective cation-exchange capacity is the sum of exchangeable bases, which includes calcium, magnesium, potassium, and sodium. Effective cation-exchange capacity is determined by extraction with 1 molar ammonium acetate at pH 7 plus the sum of neutral salt-exchangeable aluminum and hydrogen (exchangeable acidity). The sum cation-exchange capacity is the sum of exchangeable bases plus the total acidity determined by extraction with pH 8.2, barium chloride-triethanolamine. The effective cation-exchange capacity is generally less than the sum cation-exchange capacity and includes only that part of the pH-dependent cation-exchange capacity that is determined by exchange of hydrogen with a neutral salt. The sum cation-exchange capacity includes all of the pH-dependent cation-exchange capacity up to pH 8.2. If a soil contains no pH-dependent exchange sites, or the pH of the soil is about 8.2, the effective and sum cation-exchange capacity will be about the same. The larger the cation-exchange capacity, the larger the capacity to store nutrient cation.

The pH-dependent charge is a significant source of the cation-exchange capacity in most soils of Winn Parish. Since the pH-exchange cation-exchange capacity increases with pH, cation-exchange capacity of many of the soils can be increased by adding lime. This would result in a greater storage capacity for nutrient cations, such as potassium, magnesium, and calcium.

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. Many of 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 Characterization Laboratory, Louisiana Agricultural Experiment Station.

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 ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods *(41)*.

Sand—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1).

Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).

Water retained—pressure extraction, percentage of ovendry weight of less than 2 mm material; 1/3 or 1/10 bar (4B1), 15 bars (4B2).

Moist bulk density—of less than 75 mm material, saran-coated clods field moist (4A1a), 1/3 bar (4A1d), ovendry (4A1h).

Organic carbon—wet combustion, Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).

Extractable cations—ammonium acetate pH 7.0, atomic absorption; calcium (6N2e), magnesium (6O2d), sodium (6P2d), potassium (6Q2b).

Extractable acidity—barium chloride-triethanolamine IV (6H5a).

Cation-exchange capacity—ammonium acetate, pH 7.0, steam distillation (5A8b).

Base saturation—sum of cations, TEA, pH 8.2 (5C3).

Reaction (pH)—1:1 water dilution (8C1f).

Reaction (pH)—potassium chloride (8C1g).

Reaction (pH)—calcium chloride (8C1f).

Aluminum—potassium chloride extraction (6G9).

Iron—acid oxalate extraction (6C9a).

Available phosphorus—(Bray 2).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(40)*. 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. Eleven 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 flood plain, 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.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, 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 very-fine, montmorillonitic, nonacid, thermic Typic 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. An example is the Yorktown series, which is a member of the very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. 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" *(39)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(40)*. 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."

Bellwood Series

The Bellwood series consists of somewhat poorly drained, very slowly permeable soils that formed in loamy and clayey sediments of Tertiary age. These soils are on uplands. Gilgai micro-relief is common in most areas.

Slopes range from 1 to 15 percent. Soils of the Bellwood series are very-fine, montmorillonitic, thermic Aquentic Chromuderts.

Bellwood soils commonly are near Frizzell, Guyton, Keiffer, Hollywood, Mahan, Metcalf, Oktibbeha, Sacul, Savannah, and Vaiden soils. Frizzell, Guyton, and Savannah soils are at a lower elevation than the Bellwood soils and are loamy throughout the profile. Keiffer, Hollywood, Mahan, Metcalf, Oktibbeha, Sacul, and Vaiden soils are in positions similar to those of the Bellwood soils. Keiffer, Hollywood, Oktibbeha, and Vaiden soils contain concretions of calcium carbonate somewhere in the profile. Mahan soils have kaolinitic mineralogy. Metcalf soils are fine-silty. Sacul soils have mixed mineralogy.

Typical pedon of Bellwood loam, 1 to 5 percent slopes; about 7.5 miles northwest of Winnfield, 3 miles west on Louisiana Highway 505 from its intersection with U.S. Highway 167, 255 feet north of highway on logging road, 18 feet west of road in pine plantation; SE$^1/_4$SW$^1/_4$ sec. 17, T. 12 N., R. 3 W.; atlas sheet 18.

A—0 to 3 inches; dark brown (10YR 4/3) loam; weak fine granular structure; very friable; common coarse and medium roots and many fine and very fine roots; common fragments of ironstone; extremely acid; abrupt smooth boundary.

Bss1—3 to 12 inches; red (2.5YR 4/6) clay; weak coarse prismatic structure parting to moderate medium blocky; very firm, plastic; few coarse roots and common fine and medium roots; few slickensides; extremely acid; gradual wavy boundary.

Bss2—12 to 23 inches; red (2.5YR 4/6) clay; common medium prominent grayish brown (2.5Y 5/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; very firm, plastic; common fine and very fine roots; about 30 percent of vertical ped faces consists of medium and large slickensides that are 8 to 20 inches wide; a few slickensides intersect; strongly acid; gradual wavy boundary.

Bss3—23 to 43 inches; mottled grayish brown (10YR 5/2) and red (2.5YR 4/6) clay; few medium prominent strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm, plastic; common fine and very fine roots; few fragments of ironstone; about 50 percent of vertical ped faces consists of medium and large slickensides that are 3 to 8 inches wide; many slickensides intersect; extremely acid; gradual wavy boundary.

Bss4—43 to 53 inches; light brownish gray (2.5Y 6/2) silty clay; many medium prominent red (2.5YR 5/6) mottles and few medium prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; firm, plastic; about 20 percent of ped faces consists of medium and large slickensides that are 2 to 4 inches wide; extremely acid; clear smooth boundary.

BC—53 to 75 inches; light brownish gray (2.5Y 6/2) clay; weak coarse subangular blocky structure; firm; few fine roots; few patchy coatings of silt between horizontal strata; few thin strata of fine sandy loam; few continuous horizontal strata of strong brown (7.5YR 5/6) ironstone as thick as $^1/_2$ inch; some horizontal faces coated with red (2.5YR 5/6) and strong brown (7.5YR 4/6) material; extremely acid.

The solum thickness ranges from 50 to 80 inches or more. Base saturation ranges from 10 to 30 percent throughout the B horizons. Gilgai relief consists of micro knolls and micro depressions. Relief is 2 to 8 inches. The distance between centers of knolls and depressions ranges from 8 to 15 feet. Depth to intersecting slickensides ranges from 7 to 21 inches. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 3 or 4 and chroma of 1 to 4. It is 2 to 6 inches thick. Reaction ranges from extremely acid to moderately acid.

The upper part of the Bss horizon has hue of 5YR, 2.5YR, or 10R, value of 4 or 5, and chroma of 4 to 8. Mottles are in shades of gray and brown and range from none to common. The lower part of the Bss horizon and the BC horizon have hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 3. Red and brown mottles range from few to many or the horizon is mottled and multicolored. Texture of the BC horizon is clay or silty clay and has thin strata of fine sandy loam or loam.

Boykin Series

The Boykin series consists of well drained soils that formed in sandy and loamy sediments of Pleistocene age. Permeability is rapid in the upper part of the soil and moderate in the lower part. These soils are on ridgetops and side slopes on uplands. Slopes range from 1 to 20 percent. Soils of the Boykin series are loamy, siliceous, thermic Arenic Paleudults.

Boykin soils commonly are near Mahan, Osier, Sacul, Savannah, and Smithdale soils. Mahan, Sacul, and Smithdale soils are in positions similar to those of the Boykin soils. Mahan soils have montmorillonitic mineralogy. Sacul soils have a clayey subsoil. Osier soils are in drain heads and in seepy areas, are poorly drained, and have a sandy underlying material. Savannah soils are in lower positions than the Boykin soils and have a fragipan.

Typical pedon of Boykin loamy fine sand, 5 to 20 percent slopes; about 13 miles northwest of Winnfield, 2.4 miles west of Calvin on Louisiana Highway 156, 5 miles north on Gum Springs Road, 0.5 mile east on gravelled road, 25 feet south of road in woods; SE1/4SE1/4 sec. 13, T. 12 N., R. 5 W.; atlas sheet 17.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak medium granular structure; very friable; common fine and medium roots; very strongly acid; clear smooth boundary.

E—7 to 22 inches; brown (10YR 5/3) loamy fine sand; weak medium subangular blocky structure; very friable; common fine and medium roots; very strongly acid; clear smooth boundary.

Bt1—22 to 36 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; very friable; common fine and medium roots; common distinct clay films on faces of peds; extremely acid; gradual smooth boundary.

Bt2—36 to 48 inches; yellowish red (5YR 4/6) fine sandy loam; weak medium subangular blocky structure; very friable; common fine roots; few pockets of yellowish brown (10YR 5/6) fine sandy loam; few faint clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt3—48 to 88 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; very friable; few fine pores; few faint clay films on faces of peds; very strongly acid.

The solum thickness ranges from 60 to more than 80 inches. In at least one subhorizon within a depth of about 30 inches exchangeable aluminum makes up 20 to 60 percent of the effective cation-exchange capacity.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. Reaction ranges from very strongly acid to slightly acid. This horizon is 4 to 10 inches thick.

The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. Reaction of the E horizon ranges from very strongly acid to slightly acid.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. The clay content of the particle-size control section ranges from 18 to 28 percent. Mottles in shades of red, brown, or yellow range from none to common in the upper part of the Bt horizon. In the lower part of some pedons, the Bt horizon has a mottled matrix of these colors. Reaction ranges from extremely acid to moderately acid.

Brimstone Series

The Brimstone series consists of poorly drained, slowly permeable soils that are high in exchangeable sodium. These soils formed in loamy sediments of Pleistocene age. They are on low terraces along streams that drain the uplands. These soils are subject to occasional flooding. Slopes are less than 1 percent. Soils of the Brimstone series are fine-silty, siliceous, thermic Glossic Natraqualfs.

Brimstone soils commonly are near Cahaba, Frizzell, Guyton, and Shatta soils. None of these soils has a high content of sodium in the subsoil. Cahaba, Frizzell, and Shatta soils are in higher positions than the Brimstone soils. Guyton soils are in positions similar to those of the Brimstone soils.

Typical pedon of Brimstone very fine sandy loam, occasionally flooded; about 14 miles east of Winnfield, about 0.9 mile west on Louisiana Highway 124 from Louisiana Highway 1238, 96 feet south on logging road from highway, 42 feet east of logging road; SW1/4SW1/4 sec. 20, T. 11 N., R. 1 E.; atlas sheet 34.

A—0 to 6 inches; grayish brown (10YR 5/2) very fine sandy loam; weak medium granular structure; very friable; common fine and medium roots; moderately acid; clear smooth boundary.

Eng—6 to 23 inches; light brownish gray (2.5Y 6/2) very fine sandy loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; very friable; common fine and medium roots; few fine pores; few fine brown concretions; slightly alkaline; clear irregular boundary.

Btng/E—23 to 37 inches; about 70 percent grayish brown (10YR 5/2) silty clay loam (B) and 30 percent light brownish gray (2.5Y 6/2) silt loam (E); common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; friable; tongues of E material 3/4 inch to 1 1/2 inches wide extend vertically into the horizon; few fine roots; few fine pores; few distinct clay films on faces of peds; few fine brown concretions; strongly alkaline; gradual wavy boundary.

Btng1—37 to 51 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; few faint clay films on faces of peds; few fine brown concretions; moderately alkaline; gradual smooth boundary.

Btng2—51 to 60 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; few fine pores; few fine brown concretions; strongly alkaline.

The solum thickness ranges from 40 to 100 inches. Exchangeable sodium ranges from 15 to 30 percent within 6 inches of the top of the natric horizon and within 16 inches of the soil surface.

The A horizon has value of 3 to 5 and chroma of 1 or 2. Reaction ranges from strongly acid to moderately alkaline. This horizon is 4 to 7 inches thick.

The Eng horizon has value of 5 or 6 and chroma of 1 or 2. Mottles in shades of brown range from few to many. Texture is silt loam or very fine sandy loam. Reaction ranges from moderately acid to moderately alkaline. Tongues of the Eng horizon extend into the Btng horizon.

The Btng/E and Btng horizons have hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2. Mottles in shades of brown and gray range from few to many. Texture is silt loam or silty clay loam. Reaction ranges from neutral to strongly alkaline. Concretions of carbonate range from none to common. Some pedons have a BCg horizon that is similar to the Btng horizon.

Cahaba Series

The Cahaba series consists of well drained soils that formed in loamy and sandy sediments of Pleistocene age. Permeability is moderate in the upper part of the soil and moderately rapid to rapid in the lower part. These soils are on low terraces. Slopes range from 1 to 3 percent. Soils of the Cahaba series are fine-loamy, siliceous, thermic Typic Hapludults.

Cahaba soils commonly are near Brimstone, Frizzell, and Guyton soils. All of these soils are in lower positions than the Cahaba soils. Brimstone and Guyton soils are fine-silty, and Frizzell soils are coarse-silty.

Typical pedon of Cahaba fine sandy loam, 1 to 3 percent slopes; about 17 miles southeast of Winnfield, 0.15 mile west on U.S. Highway 84 from the LaSalle Parish line, 0.25 mile south on blacktop road, 0.85 mile south on gravelled road, 190 feet east on oil field road, 10 feet south of road in cutbank; SW¼NW¼ sec. 26, T. 10 N., R. 1 E.; inset to atlas sheet 40.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; very friable; common fine and medium roots; strongly acid; clear smooth boundary.

E—5 to 10 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure; very friable; common fine and medium roots; very strongly acid; gradual smooth boundary.

Bt1—10 to 23 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; common fine roots; few fine pores; common distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt2—23 to 33 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; few fine pores; common distinct clay films on faces of peds; few pockets of strong brown (7.5YR 5/6) fine sandy loam; very strongly acid; gradual smooth boundary.

BC—33 to 40 inches; strong brown (7.5YR 5/6) fine sandy loam; weak medium subangular blocky structure; very friable; few fine roots; very strongly acid; gradual smooth boundary.

C—40 to 60 inches; yellowish brown (10YR 5/4) loamy sand; massive; very friable; very strongly acid.

The solum thickness ranges from 36 to 60 inches. Reaction ranges from very strongly acid to moderately acid throughout the profile. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 3 to 5 and chroma of 2 to 4. It is 4 to 7 inches thick.

The E horizon, where present, has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4.

The Bt horizon has hue of 5YR, 2.5YR, or 10R, value of 4 or 5, and chroma of 6 or 8. Texture is sandy clay loam, loam, or clay loam. Clay content ranges from 18 to 35 percent, and silt content ranges from 20 to 50 percent.

The BC horizon is strong brown, yellowish red, or red. Texture is sandy loam or fine sandy loam. Mottles in shades of yellow or brown are in some pedons.

The C horizon ranges from yellowish brown to red. Texture is commonly interbedded or stratified with sand, loamy sand, and fine sandy loam. In some pedons, it is mottled in shades of yellow, brown, or gray.

Darden Series

The Darden series consists of excessively drained, rapidly permeable soils that formed in sandy sediments of Pleistocene age. These soils are on terraces along Saline Creek. Slopes range from 1 to 5 percent. Soils of the Darden series are thermic, coated Typic Quartzipsamments.

Darden soils commonly are near Frizzell, Guyton, and Shatta soils. Frizzell and Shatta soils are in positions similar to those of the Darden soils, and Guyton soils are in lower positions. Frizzell soils are coarse-silty, and Guyton and Shatta soils are fine-silty.

Typical pedon of Darden loamy fine sand, 1 to 5 percent slopes; about 15 miles northwest of Winnfield, 0.6 mile west of the intersection of Louisiana Highway 1233 and Louisiana Highway 156, about 400 feet north of highway on north bank of borrow pit; NW¼NW¼ sec. 28, T. 12 N., R. 5 W.; atlas sheet 12, inset B.

A1—0 to 9 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear smooth boundary.

A2—9 to 23 inches; brown (10YR 4/3) loamy fine sand; weak fine granular structure; very friable; common fine and medium roots; strongly acid; gradual smooth boundary.

Bw—23 to 72 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; loose; few fine and medium roots; strongly acid.

Thickness of sandy horizons exceeds 80 inches. The 10- to 40-inch control section contains 10 to 25 percent silt plus clay. Reaction ranges from very strongly acid to slightly acid in the A horizon and upper part of the Bw horizon and from very strongly acid to neutral in the lower part of the Bw horizon. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 20 to 50 percent of the effective cation-exchange capacity.

The A horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 3 to 6, and chroma of 2 to 6. Dark brown mottles are none to few. Texture of the A2 horizon is loamy fine sand or fine sand.

The Bw horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 8, and chroma of 3 to 8. Texture is mostly loamy fine sand, but some pedons have thin strata of fine sand, loamy sand, or sand. None to few mottles are in shades of brown or yellow. None to few thin discontinuous lamellae are below a depth of 40 inches. Pockets or strata of clean sand with chroma of 1 or 2 occur below 40 inches in some pedons.

Frizzell Series

The Frizzell series consists of somewhat poorly drained, slowly permeable soils that formed in loamy sediments of Pleistocene age. These soils are on terraces. Slopes range from 0 to 2 percent. Soils of the Frizzell series are coarse-silty, siliceous, thermic Glossaquic Hapludalfs.

Frizzell soils commonly are near Brimstone, Cahaba, Guyton, Harleston, Savannah, and Shatta soils. Brimstone and Guyton soils are in lower positions than the Frizzell soils, are poorly drained, and are fine-silty. Cahaba, Harleston, Savannah, and Shatta soils are in higher positions than the Frizzell soils. Cahaba and Savannah soils are fine-loamy, Harleston soils are coarse-loamy, and Shatta soils are fine-silty.

Typical pedon of Frizzell silt loam in an area of Frizzell-Guyton silt loams, 0 to 2 percent slopes; about 12 miles northwest of Winnfield, 2.3 miles south of Sanders Church at the intersection of Louisiana Highway 505 and a gravelled road, 90 feet west on logging road, 36 feet south from center of road; NE$^1/_4$NW$^1/_4$ sec. 10, T. 12 N., R. 4 W.; atlas sheet 13.

A—0 to 3 inches; brown (10YR 5/3) silt loam; weak medium granular structure; very friable; common fine and medium roots; strongly acid; clear smooth boundary.

B/E—3 to 39 inches; about 80 percent brown (10YR 5/4) silt loam (Bt) and 20 percent grayish brown (10YR 5/2) silt loam (E); common medium distinct yellowish brown (10YR 5/6) mottles and few fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; very friable; the E horizon occurs as common skeletons of grayish brown (10YR 5/2) silt loam about $^1/_{16}$ inch thick; common fine and medium roots; few fine pores; few faint clay films on faces of peds; few fine black and brown concretions; very strongly acid; gradual wavy boundary.

Bt1—39 to 45 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; few faint clay films on faces of peds; common brittle masses; few fine black and brown concretions; very strongly acid; gradual smooth boundary.

Bt2—45 to 54 inches; yellowish brown (10YR 5/6) silty clay loam; common coarse distinct grayish brown (10YR 5/2) mottles and common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine pores; few faint clay films on faces of peds; common brittle masses; few fine black and brown concretions; very strongly acid; gradual smooth boundary.

Bt3—54 to 85 inches; mottled yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) silty clay loam; few medium prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; few fine pores; few faint clay films on faces of peds; few fine brown and black concretions; very strongly acid.

The solum thickness ranges from 60 to 80 inches. Reaction ranges from very strongly acid to strongly acid throughout the solum, except for surface layers that have been limed. Base saturation of the lower part of the Bt horizon ranges from 35 to 60 percent. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 4 or 5 and chroma of 2 or 3. It is 2 to 4 inches thick. Reaction is very strongly acid or strongly acid.

The Bt part of the B/E horizon has value of 4 to 6 and chroma of 3 to 6, and the E part has value of 5 to 7 and chroma of 1 to 3. Texture of the B/E horizon is silt loam or loam. Mottles in shades of gray and brown range from few to many. Reaction is very strongly acid or strongly acid.

The Bt horizon has value of 4 to 6 and chroma of 3 to 6. Texture is silt loam, silty clay loam, loam, or clay loam. Mottles in shades of gray, brown, and red range from few to many. The content of very fine sand averages 10 to 30 percent. Reaction ranges from extremely acid to strongly acid.

The C horizon, where present, is yellowish brown or gray silt loam, silty clay loam, loam, or clay loam. It has few to many grayish mottles.

Gallion Series

The Gallion series consists of well drained, moderately permeable soils that formed in loamy alluvium. These soils occur on alluvial plains. They are subject to rare flooding. Slopes are generally less than 1 percent. Soils of the Gallion series are fine-silty, mixed, thermic Typic Hapludalfs.

Gallion soils commonly are near Moreland, Perry, and Roxana soils. Moreland and Perry soils are in lower positions than the Gallion soils and are clayey throughout the profile. Roxana soils do not have a well developed subsoil and are along the present channel of the Red River.

Typical pedon of Gallion silt loam, rarely flooded; about 18 miles west of Winnfield, 1.25 miles east on U.S. Highway 84 from the parish line to gravelled road; north on gravelled road 1.4 miles to intersection; left at intersection 1.5 miles to Allen Dam, 186 feet east along road from concrete abutment of Allen Dam, 30 feet south from middle of road in field; SE¼NE¼ sec. 14, T. 10 N., R. 6 W.; atlas sheet 35.

Ap—0 to 6 inches; brown (7.5YR 4/4) silt loam; weak medium granular structure; very friable; common fine and medium roots; strongly acid; abrupt smooth boundary.

Bt1—6 to 22 inches; yellowish red (5YR 4/6) silty clay loam; weak medium subangular blocky structure; very friable; common fine and medium roots; few fine pores; common distinct reddish brown (5YR 4/4) clay films on faces of peds; few fine black manganese concretions; moderately acid; gradual smooth boundary.

Bt2—22 to 37 inches; yellowish red (5YR 4/6) silt loam; weak medium subangular blocky structure; very friable; common fine and medium roots; few fine pores; common distinct reddish brown (5YR 4/4) clay films on faces of peds; few fine black manganese concretions; slightly acid; gradual smooth boundary

BC—37 to 46 inches; yellowish red (5YR 4/6) silt loam; weak medium subangular blocky structure; very friable; common fine and medium roots; few fine pores; few faint clay films on faces of peds; few fine black manganese concretions; neutral; gradual smooth boundary.

C—46 to 73 inches; yellowish red (5YR 4/6) silt loam; massive; very friable; few medium concretions of calcium carbonate; slightly effervescent; moderately alkaline.

The solum thickness ranges from 40 to 60 inches.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. It is 4 to 10 inches thick. Reaction ranges from strongly acid to neutral.

The Bt horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. Texture is silt loam, loam, clay loam, or silty clay loam. Reaction ranges from moderately acid to slightly alkaline.

The BC horizon is similar in color to the Bt horizon. Texture is silt loam or very fine sandy loam. Reaction ranges from moderately acid to moderately alkaline.

The C horizon is similar in color and texture to the BC horizon. In some pedons, it is stratified. Reaction ranges from slightly acid to moderately alkaline. Carbonate concretions are few to common.

Glenmora Series

The Glenmora series consists of moderately well drained, slowly permeable soils that formed in loamy sediments of Pleistocene age. These soils are on terraces. Slopes range from 1 to 3 percent. Soils of the Glenmora series are fine-silty, siliceous, thermic Glossaquic Paleudalfs.

The Glenmora soils in Winn Parish are taxadjuncts to the Glenmora series because they are Ultisols rather than Alfisols. This difference, however, does not significantly affect the use and management of the soils. In this survey area, Glenmora soils are fine-silty, siliceous, thermic Typic Paleudults.

Glenmora soils commonly are near Gore, Guyton, and Kolin soils. Gore and Guyton soils are in lower positions than the Glenmora soils. Gore soils have a clayey subsoil. Guyton soils are poorly drained and are grayish throughout the profile. Kolin soils are in positions similar to those of the Glenmora soils and have a subsoil that is clayey in the lower part.

Typical pedon of Glenmora silt loam, 1 to 3 percent slopes; about 18 miles southwest of Winnfield, 2.9 miles west on paved road from Louisiana Highway 34 at Wheeling to gravelled road, left on gravelled road about 0.1 mile to edge of clear-cut, 45 feet west of center of road on logging road, 33 feet north of logging road; NE¼SW¼ sec. 16, T. 9 N., R. 5 W.; atlas sheet 46.

A—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; very friable; common fine and few medium roots; few fine pores; very strongly acid; clear smooth boundary.

BE—7 to 11 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; few fine pores; very strongly acid; gradual smooth boundary.

Bt1—11 to 22 inches; yellowish brown (10YR 5/6) silty clay loam; weak medium subangular blocky structure; friable; common fine and few medium roots; few fine pores; few faint clay films on faces of peds; few fine brown concretions; very strongly acid; gradual smooth boundary.

Bt2—22 to 34 inches; yellowish brown (10YR 5/6) silty clay loam; few medium distinct grayish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine pores; few faint clay films on faces of peds; few fine and medium brown concretions; very strongly acid; clear smooth boundary.

B/E—34 to 42 inches; about 85 percent yellowish brown (10YR 5/6) silty clay loam (Bt) and 15 percent grayish brown (10YR 5/2) silt loam (E); common medium faint yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; the E material occurs as coatings 1/8 to 1/4 inch thick that surround prisms; few faint clay films on faces of peds; few fine pores; few medium prominent yellowish red (5YR 4/8) bodies; few fine and medium brown concretions; very strongly acid; gradual smooth boundary.

B't—42 to 60 inches; mottled yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) silty clay loam; moderate medium subangular blocky structure; friable; few fine pores; few fine, medium, and coarse brown concretions; strongly acid.

The solum thickness ranges from 60 to 100 inches. Reaction ranges from very strongly acid to moderately acid. Grayish mottles caused by wetness are within 30 inches of the surface. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 4 or 5 and chroma of 2 or 3. It is 4 to 7 inches thick.

The E horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. Texture is silt loam or very fine sandy loam.

The E part of the B/E horizon has value of 5 or 6 and chroma of 1 or 2. It makes up 5 to 15 percent of the horizon and occurs as pockets or coatings on ped faces. The Bt part of the B/E horizon has colors similar to those of the BE and Bt horizons.

The BE and Bt horizons have value of 5 and chroma of 3 to 6 or value of 6 and chroma of 3 or 4. Mottles in shades of gray, brown, or red range from none to common. Texture is silt loam or silty clay loam with 18 to 32 percent clay.

The B't horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma 1 to 8. It is mottled in shades of gray, brown, or red. In some pedons, plinthite and other brittle bodies make up as much as 4 percent of the horizon.

Gore Series

The Gore series consists of moderately well drained, very slowly permeable soils that formed in loamy and clayey sediments of Pleistocene age. These soils are on terraces. Slopes range from 1 to 15 percent. Soils of the Gore series are fine, mixed, thermic Vertic Paleudalfs.

Gore soils commonly are near Frizzell, Glenmora, Guyton, Kolin, Ruston, and Sacul soils. Typically, the Frizzell, Glenmora, Kolin, Ruston, and Sacul soils are at a higher elevation than the Gore soils. Frizzell soils are coarse-silty, Glenmora and Kolin soils are fine-silty, and Ruston soils are fine-loamy. Sacul soils have mixed mineralogy. Guyton soils are in low positions on terraces and on flood plains, are poorly drained, and are fine-silty.

Typical pedon of Gore silt loam, 1 to 5 percent slopes; about 19 miles southwest of Winnfield, 2.2 miles north on Louisiana Highway 477 from U.S. Highway 71 at St. Maurice, about 0.6 mile east on gravelled road to logging road, about 0.5 mile east on logging road, 30 feet north of tree line; SE1/4NE1/4 sec. 7, T. 9 N., R. 5 W.; atlas sheet 46.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; very friable; few fine and medium roots; moderately acid; abrupt smooth boundary.

Bt—4 to 15 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

Btss1—15 to 25 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; many medium prominent yellowish brown (10YR 5/4) mottles; firm; few fine roots; common distinct clay films on faces of peds; few slickensides; very strongly acid; gradual smooth boundary.

Btss2—25 to 40 inches; mottled red (2.5YR 4/6), yellowish red (5YR 5/6), and yellowish brown (10YR 5/4) clay; few fine and medium prominent gray (10YR 5/1) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; few slickensides; very strongly acid; gradual smooth boundary.

BC—40 to 56 inches; yellowish red (5YR 4/6) silty clay; moderate medium subangular blocky structure; firm; common black stains; few faint clay films on faces of peds; moderately acid; gradual smooth boundary.

C—56 to 72 inches; yellowish red (5YR 4/6) silty clay; few medium prominent grayish brown (2.5Y 5/2) mottles; massive; firm; neutral.

The solum thickness ranges from 40 to 60 inches. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 20 to 50 percent of the effective cation-exchange capacity.

The A horizon has value of 3 to 5 and chroma of 2 or 3. It is 1 to 4 inches thick. Reaction ranges from very strongly acid to moderately acid.

The E horizon, where present, has hue of 10YR, value of 5 to 7, and chroma of 2 or 3. Texture is silt loam or very fine sandy loam. Reaction ranges from very strongly acid to moderately acid.

The BE horizon, where present, has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 4 to 8. Texture is silty clay loam or silt loam. Reaction ranges from very strongly acid to moderately acid.

The Bt and Btss horizons have hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 4 to 6. The Btss horizon has colors similar to those of the Bt horizon; or it has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. Mottles in shades of red, brown, and gray range from none to many. Texture is clay, silty clay, or silty clay loam. Reaction ranges from very strongly acid to neutral.

The BC horizon has colors similar to those of the Bt horizon. Texture is silty clay or clay. Reaction ranges from very strongly acid to strongly alkaline.

The C horizon is a reddish clay or silty clay. Reaction ranges from moderately acid to strongly alkaline. Concretions of calcium carbonate range from none to common in the BC and C horizons.

Guyton Series

The Guyton series consists of poorly drained, slowly permeable soils that formed in loamy sediments of Recent and Pleistocene age. These soils are on terraces and on flood plains. The soils on flood plains are subject to frequent flooding. Slopes are less than 1 percent. Soils of the Guyton series are fine-silty, siliceous, thermic Typic Glossaqualfs.

Guyton soils commonly are near Brimstone, Cahaba, Frizzell, Osier, Savannah, and Shatta soils. Brimstone soils are in positions on terraces similar to those of the Guyton soils and contain a high content of sodium in the subsoil. Cahaba, Frizzell, Savannah, and Shatta soils are in higher positions on terraces than the Guyton soils and are better drained. Osier soils have a sandy underlying material and are in drain heads and in seepy areas.

Typical pedon of Guyton silt loam, frequently flooded; about 6 miles southeast of Winnfield, east on U.S. Highway 84 from Louisiana Highway 124, 1.3 miles to gravelled road, 1.4 miles south to pipeline, 1,100 feet west, 200 feet north of pipeline in woods; SE1/4SW1/4 sec. 36, T. 11 N., R. 2 W.; atlas sheet 33.

A—0 to 4 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable; few coarse roots and common fine and medium roots; very strongly acid; clear smooth boundary.

Eg1—4 to 10 inches; light brownish gray (2.5Y 6/2) silt loam; many medium prominent dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; very friable; few coarse roots and many fine and medium roots; few fine brown concretions; very strongly acid; clear smooth boundary.

Eg2—10 to 16 inches; grayish brown (2.5Y 5/2) silt loam; common medium prominent dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; few fine brown concretions; extremely acid; clear wavy boundary.

B/E—16 to 28 inches; about 80 percent grayish brown (2.5Y 5/2) silty clay loam (Bt) and 20 percent gray (10YR 6/1) silt loam (E); common fine and medium prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few faint clay films on faces of peds and in pores; the E material occurs as tongues between prisms; very strongly acid; clear smooth boundary.

Btg1—28 to 46 inches; grayish brown (10YR 5/2) silty clay loam; many fine and medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; extremely acid; clear smooth boundary.

Btg2—46 to 62 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few faint clay films on faces of peds; extremely acid; clear smooth boundary.

Cg—62 to 86 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; firm; extremely acid.

The solum thickness ranges from 50 to 100 inches. Sand content, which is dominantly very fine sand, makes up from 10 to 40 percent of the particle-size control section. Exchangeable sodium ranges from less than 5 percent to 40 percent in the lower part of the solum. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 4 or 5 and chroma of 2 or 3. Reaction ranges from extremely acid to moderately acid, except where lime has been added. Thickness ranges from 2 to 7 inches.

The Eg horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. Mottles in shades of brown or yellow range from few to many. Reaction ranges from extremely acid to moderately acid.

Some pedons have an E/B horizon, 6 to 15 inches thick. Most pedons have a thick B/E horizon. The Bt and E parts of the E/B and B/E horizons are similar in color, texture, and reaction to the Btg and Eg horizons.

The Btg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. Texture is silt loam, silty clay loam, or clay loam. Mottles in shades of brown and yellow range from few to many. Reaction ranges from extremely acid to moderately acid.

The BC horizon, where present, and the Cg horizon are similar in color to the Btg horizon. Texture is silt loam, silty clay loam, clay loam, or sandy clay loam. Reaction of the BC horizon ranges from extremely acid to moderately acid. Reaction of the Cg horizon ranges from strongly acid to moderately alkaline.

Harleston Series

The Harleston series consists of moderately well drained, moderately permeable soils that formed in loamy sediments of Pleistocene age. These soils are on terraces. Slopes range from 1 to 3 percent. Soils of the Harleston series are coarse-loamy, siliceous, thermic Aquic Paleudults.

Harleston soils commonly are near Cahaba, Frizzell, Guyton, and Savannah soils. Cahaba and Savannah soils are in positions similar to those of the Harleston soils and are fine-loamy. Frizzell and Guyton soils are in lower positions than the Harleston soils. Frizzell soils are coarse-silty, and Guyton soils are fine-silty.

Typical pedon of Harleston fine sandy loam, 1 to 3 percent slopes; about 4 miles north of Winnfield, 5 miles north on U.S. Highway 167 from U.S. Highway 84 in Winnfield, right on paved road 0.5 mile, left on paved road 0.2 mile, left of road about 66 feet from center of road; NW1/4NE1/4 sec. 26, T. 12 N., R. 3 W.; atlas sheet 23.

A—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; very friable; common fine and medium roots; few fine and medium brown concretions; very strongly acid; gradual smooth boundary.

E—3 to 8 inches; brown (10YR 5/3) fine sandy loam; weak medium subangular blocky structure; very friable; common fine and medium roots; few fine and medium brown concretions; very strongly acid; clear smooth boundary.

Bt1—8 to 20 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; few fine roots; few fine pores; few fine brown concretions; few faint clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt2—20 to 29 inches; yellowish brown (10YR 5/4) loam; few fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; few fine roots; few fine pores; few fine brown concretions; few faint clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt3—29 to 40 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine roots; few fine pores; common medium slightly brittle bodies; few fine brown concretions; few faint clay films on faces of peds; few polygonal cracks surrounding prisms filled with pale brown sandy loam; very strongly acid; gradual smooth boundary.

Bt4—40 to 48 inches; yellowish brown (10YR 5/6) sandy clay loam; common medium distinct strong brown (7.5YR 5/6), yellowish brown (10YR 5/8), and light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine pores; common medium brittle bodies; few fine brown concretions; few faint clay films on faces of peds; few polygonal cracks filled with grayish brown (10YR 5/2) sandy loam; very strongly acid; gradual smooth boundary.

Bt5—48 to 60 inches; mottled strong brown (7.5YR 5/6) and grayish brown (10YR 5/2) sandy clay loam; weak medium subangular blocky structure; friable; few fine pores; few fine brown concretions; few faint clay films on faces of peds; strongly acid.

The solum thickness exceeds 60 inches. Reaction ranges from extremely acid to strongly acid throughout the solum. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 20 to 50 percent of the effective cation-exchange capacity.

The A horizon has value of 3 to 5 and chroma of 1 to 3. It is 2 to 5 inches thick.

The E horizon has value of 4 to 6 and chroma of 2 to 4. Texture is loam, sandy loam, or fine sandy loam.

The Bt1 and Bt2 horizons have value of 5 or 6 and chroma of 4 to 8. Mottles with chroma of 2 or less range from few to many in the Bt2 horizon. Texture is sandy loam or loam.

The lower part of the Bt horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 5 or 6, and chroma of 4 to 8. Mottles with chroma of 2 or less range from few to many. Texture is sandy loam, loam, or sandy clay loam. Fine or medium concretions range from few to many.

Hollywood Series

The Hollywood series consists of moderately well drained, very slowly permeable soils that formed in loamy and clayey sediments of Tertiary age. These soils are on uplands. Slopes range from 1 to 5 percent. Soils of the Hollywood series are fine, montmorillonitic, thermic Typic Pelluderts.

Hollywood soils commonly are near Bellwood, Keiffer, Oktibbeha, and Vaiden soils. Bellwood, Keiffer, and Oktibbeha soils are in slightly higher positions than the Hollywood soils. Vaiden soils are in positions similar to those of the Hollywood soils. None of these soils has a mollic epipedon.

Typical pedon of Hollywood silty clay loam, 1 to 5 percent slopes; about 12 miles south of Winnfield, 3.4 miles south on Louisiana Highway 471 from Louisiana Highway 34, east 1.5 miles on gravelled road, 200 feet south on logging road, 87 feet east along ditch, 21 feet north of ditch; SW1/4SW1/4 sec. 13, T. 9 N., R. 4 W.; atlas sheet 48.

A1—0 to 6 inches; black (10YR 2/1) silty clay loam; moderate medium granular structure; friable; slightly sticky, very plastic; few coarse roots and many fine and medium roots; slightly acid; clear wavy boundary.

A2—6 to 22 inches; very dark gray (10YR 3/1) clay; common fine distinct brown mottles (10YR 4/4); moderate medium blocky structure; firm, very plastic, slightly sticky; few coarse roots and common fine and medium roots; common medium brown and black concretions; common shiny pressure faces; neutral; gradual wavy boundary.

A3—22 to 29 inches; very dark gray (10YR 3/1) clay; many medium distinct yellowish brown (10YR 5/4 and 10YR 5/6) mottles; moderate medium blocky structure; very firm, very plastic, slightly sticky; few fine and medium roots; common fine and medium brown and black concretions; common shiny pressure faces; moderately alkaline; clear wavy boundary.

ACkss1—29 to 52 inches; light olive brown (2.5Y 5/4) clay; common medium distinct yellowish brown (10YR 5/4) mottles and few fine faint grayish brown (10YR 5/2)mottles; very firm, slightly plastic, slightly sticky; few fine roots; common fine brown and black concretions; many fine and medium concretions of calcium carbonate; few pockets of powdery calcium carbonate; common intersecting slickensides; moderately alkaline; gradual wavy boundary.

ACkss2—52 to 72 inches; light olive brown (2.5Y 5/4) clay; many fine and medium distinct light brownish gray (2.5Y 6/2) mottles, few medium prominent yellowish brown (10YR 5/8) mottles, and common medium distinct brown (10YR 5/3) mottles; very firm, slightly plastic, slightly sticky; few fine roots; common fine brown and black concretions; common shiny pressure faces; many concretions of calcium carbonate; few pockets of powdery calcium carbonate; common intersecting slickensides; moderately alkaline.

Depth to the ACkss horizon ranges from 18 to 25 inches. Depth to secondary calcium carbonate accumulation ranges from 25 to 35 inches.

The A1 horizon has value of 2 or 3 and chroma of 1. Reaction ranges from slightly acid to neutral. The lower A horizons are similar in color to the A1 horizon. Reaction ranges from neutral to moderately alkaline. Texture is clay or silty clay.

The ACkss horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4; or it is mottled in shades of gray, brown, and yellow. Reaction ranges from neutral to moderately alkaline. Texture is clay or silty clay. Fossils of mollusks and other shellfish are common in the ACkss horizon.

Keiffer Series

The Keiffer series consists of well drained, slowly permeable soils that formed in loamy sediments of Tertiary age. These soils are on uplands. They are calcareous and alkaline throughout. Slopes range from 1 to 5 percent. Soils of the Keiffer series are fine-silty, carbonatic, thermic Rendollic Eutrochrepts.

Keiffer soils commonly are near Bellwood, Hollywood, Oktibbeha, and Vaiden soils. All of these soils are in positions similar to those of the Keiffer soils. Bellwood and Oktibbeha soils have a red hue in the upper part of the subsoil. Hollywood soils have a mollic epipedon. Vaiden soils have an acid solum.

Typical pedon of Keiffer loam, 1 to 5 percent slopes; about 11 miles west of Winnfield, 0.3 mile east from Sanders Chapel on Louisiana Highway 156, 1.5 miles south on gravelled road to prairie, 120 feet east of road in prairie; NE1/4SE1/4 sec. 13, T. 11 N., R. 5 W.; atlas sheet 26.

A—0 to 5 inches; very dark grayish brown (2.5Y 3/2) loam; weak medium granular structure; firm, very plastic, sticky; common fine roots; few fine rounded nodules of calcium carbonate; moderately alkaline, strongly effervescent; clear smooth boundary.

Bk1—5 to 18 inches; light olive brown (2.5Y 5/6) loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm, very plastic, very sticky; few fine roots; common fine and medium rounded nodules of calcium carbonate; moderately alkaline, strongly effervescent; gradual wavy boundary.

Bk2—18 to 35 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, very plastic, very sticky; common medium rounded nodules of calcium carbonate; moderately alkaline, strongly effervescent; gradual wavy boundary.

Bk3—35 to 54 inches; light yellowish brown (10YR 6/4) clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm, very plastic, very sticky; few coarse and common medium rounded nodules of calcium carbonate; moderately alkaline, strongly effervescent; gradual wavy boundary.

Bkss—54 to 72 inches; light yellowish brown (10YR 6/4) clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm, very plastic, very sticky; few slickensides; common medium rounded nodules of calcium carbonate; moderately alkaline, strongly effervescent.

The solum thickness ranges from 40 to 80 inches. The calcium carbonate equivalent ranges from 40 to 65 percent. Non-carbonatic clay content ranges from 16 to 38 percent.

The A horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 or 2. It is 4 to 8 inches thick. Reaction ranges from neutral to moderately alkaline.

The Bk horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 3 to 6. Texture is silt loam, loam, clay loam, silty clay loam, silty clay, or clay. Reaction is slightly alkaline or moderately alkaline.

The BKss horizon has hue of 10YR or 5Y, value of 5 or 6, and chroma of 2 to 8; or it is mottled in shades of yellow, brown, olive, or gray. Texture is clay loam, silty clay loam, silty clay, or clay. Reaction is slightly alkaline or moderately alkaline.

Kolin Series

The Kolin series consists of moderately well drained soils that formed in loamy and clayey sediments of Pleistocene age. Permeability is moderately slow in the upper part of the soil and very slow in the lower part. These soils are on terraces. Slopes range from 1 to 5 percent. Soils of the Kolin series are fine-silty, siliceous, thermic Glossaquic Paleudalfs.

Kolin soils commonly are near Glenmora, Gore, Guyton, Ruston, Savannah, and Smithdale soils. Glenmora, Gore, and Savannah soils are in positions similar to those of the Kolin soils. Glenmora and Savannah soils are loamy throughout the profile. Gore soils have a subsoil that is clayey throughout. Guyton soils are in low positions on terraces and on flood plains, are poorly drained, and are loamy throughout the profile. Ruston and Smithdale soils have more convex slopes than the Kolin soils and are loamy throughout the profile.

Typical pedon of Kolin silt loam, 1 to 5 percent slopes; about 19 miles southwest of Winnfield, 2.2 miles north on Louisiana Highway 477 from U.S. Highway 71 at St. Maurice, 0.6 mile east on gravelled road to logging road, 0.2 mile east on logging road, 15 feet south of road in pine plantation; SE$^1/_4$NE$^1/_4$ sec. 7, T. 9 N., R. 5 W.; atlas sheet 46.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; very friable; common fine and medium roots; few fine pores; strongly acid; clear smooth boundary.

E—4 to 9 inches; brown (10YR 5/3) silt loam; weak medium subangular blocky structure; very friable; common fine and medium roots; few fine pores; very strongly acid; clear smooth boundary.

Bt1—9 to 19 inches; strong brown (7.5YR 5/8) silty clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; few fine pores; very strongly acid; gradual smooth boundary.

Bt2—19 to 29 inches; strong brown (7.5YR 5/6) silty clay loam; common fine prominent yellowish red (5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine and medium roots; few fine pores; few distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

B/E—29 to 37 inches; yellowish brown (10YR 5/6) silty clay loam (Bt) and pale brown (10YR 6/2) silt loam (E); common medium prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; friable; E material consists of skeletons $^1/_{16}$ to $^1/_8$ inch thick that surround peds and make up about 15 percent of the horizon; common fine and medium roots; few fine pores; few faint clay films on faces of some peds; very strongly acid; clear wavy boundary.

2B't1—37 to 57 inches; mottled red (2.5YR 4/6) and light brownish gray (10YR 6/2) clay; moderate medium subangular blocky structure; firm; common faint clay films on faces of peds; very strongly acid; gradual wavy boundary.

2B't2—57 to 88 inches; yellowish red (5YR 4/6) silty clay; many coarse prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common faint clay films on faces of peds; very strongly acid.

The solum thickness ranges from 60 to 100 inches. Depth to the 2B't horizon ranges from 20 to 40 inches.

The A horizon has value of 3 or 4 and chroma of 1 to 3. It is 3 to 7 inches thick. Reaction ranges from strongly acid to slightly acid.

The E horizon has value of 5 or 6 and chroma of 1 to 3. Reaction ranges from very strongly acid to slightly acid.

The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 8. Texture is silt loam or silty clay loam. Reaction ranges from very strongly acid to moderately acid.

The Bt part of the B/E horizon is similar in color and texture to the Bt horizon. The E part has value of 6 or 7 and chroma of 1 or 2. Reaction of the B/E horizon ranges from very strongly acid to moderately acid.

The 2'Bt horizon has hue of 7.5YR, 10YR, 5YR, or 2.5YR, value of 4 or 5, and chroma of 4 to 8. Mottles in shades of gray and brown range from none to many. Reaction ranges from very strongly acid to slightly acid.

Mahan Series

The Mahan series consists of well drained, moderately permeable soils that formed in loamy sediments of Tertiary age. These soils are on uplands. Slopes range from 1 to 15 percent. Soils of the Mahan series are clayey, kaolinitic, thermic Typic Hapludults.

Mahan soils commonly are near Bellwood, Gore, Guyton, Ruston, Sacul, and Savannah soils. Bellwood and Sacul soils are in positions similar to those of the Mahan soils. Bellwood soils have montmorillonitic mineralogy, and Gore and Sacul soils have mixed mineralogy. Gore, Guyton, Ruston, and Savannah soils are at a lower elevation than the Mahan soils. Guyton soils are fine-silty, and Ruston and Savannah soils are fine-loamy.

Typical pedon of Mahan fine sandy loam, 1 to 5 percent slopes; about 11 miles northwest of Winnfield, west on Louisiana Highway 505 from U.S. Highway 167 to Hurricane Creek Church, 2.9 miles west of church to logging road, 312 feet south of highway on logging road in west road bank; SE$^{1}/_{4}$NE$^{1}/_{4}$ sec. 2, T. 12 N., R. 4 W.; atlas sheet 14.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; very friable; common fine and medium roots; few fine and medium platy fragments of ironstone; strongly acid; clear smooth boundary.

E—5 to 13 inches; dark brown (7.5YR 4/4) channery fine sandy loam; massive; very friable; common fine and medium roots; few fine pores; platy fragments of ironstone that are about $^{1}/_{8}$ to $^{3}/_{4}$ inch thick, $^{1}/_{2}$ inch to 3 inches wide, $^{1}/_{2}$ inch to 3 inches long, and make up about 20 percent of the horizon; moderately acid; clear smooth boundary.

Bt1—13 to 22 inches; red (2.5YR 4/8) clay loam, common medium prominent strong brown (7.5YR 5/8) mottles and few medium prominent light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; common fine and medium roots; few fine pores; common faint clay films on faces of peds; moderately acid; gradual smooth boundary.

Bt2—22 to 33 inches; red (2.5YR 4/8) clay loam; common medium prominent yellowish brown (10YR 5/4) and strong brown (7.5YR 5/8) mottles and few medium prominent light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; common fine and medium roots; few fine pores; common distinct clay films on faces of peds; strongly acid; gradual smooth boundary.

BC—33 to 43 inches; yellowish red (5YR 5/6) sandy clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; firm; common fine roots; few fine pores; few faint clay films on faces of peds; strongly acid; gradual wavy boundary.

C—43 to 60 inches; yellowish red (5YR 5/6) sandy loam; common medium distinct strong brown (7.5YR 5/8) mottles and few fine faint yellowish red (5YR 5/8) mottles; massive; very friable; common fine roots; horizontal seams of light brownish gray (2.5Y 6/2) clay are $^{1}/_{32}$ to $^{1}/_{8}$ inch thick and make up about 5 percent of the horizon; strongly acid.

The solum thickness ranges from 40 to more than 60 inches. Ironstone pebbles make up from 0 to 15 percent of the volume of the solum. A few larger fragments are in some pedons. Boulder-sized ironstones are on the soil surface in a few pedons. In some pedons, in at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 20 to 50 percent of the effective cation-exchange capacity.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 6. It is 3 to 8 inches thick. Reaction ranges from strongly acid to neutral.

The E horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. Texture is loamy fine sand, sandy loam, or fine sandy loam. Reaction is strongly acid or moderately acid.

The Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is clay, sandy clay, sandy clay loam, clay loam, or loam. Reaction ranges from very strongly acid to moderately acid.

The BC horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. Mottles in shades of brown and gray range from none to common. Texture is sandy loam, fine sandy loam, clay loam, sandy clay loam, or sandy clay. Reaction ranges from very strongly acid to moderately acid.

The C horizon typically is sandy clay loam, sandy loam, or clay loam. Loamy materials are reddish or brownish. Horizontal seams of grayish or whitish clay (kaolin) $^{1}/_{32}$ to $^{1}/_{4}$ inch thick range from none to many. Reaction ranges from very strongly acid to moderately acid.

Metcalf Series

The Metcalf series consists of somewhat poorly drained soils that formed in loamy and clayey sediments of Pleistocene age and the underlying clayey sediments of Tertiary age. Permeability is moderately slow in the upper part of the subsoil and very slow in the lower part. These soils are on uplands. Slopes range from 0 to 2 percent. Soils of the Metcalf series are fine-silty, siliceous, thermic Aquic Glossudalfs.

Metcalf soils commonly are near Bellwood and Vaiden soils. Bellwood and Vaiden soils are in positions similar to those of the Metcalf soils. Bellwood soils have a subsoil that is reddish in the upper part. Vaiden soils are clayey throughout the subsoil and have concretions of calcium carbonate in the substratum.

Typical pedon of Metcalf silt loam, 0 to 2 percent slopes; about 11 miles west of Winnfield, 1.3 miles west on U.S. Highway 84 from Gum Springs Recreation Area, right on paved road 2.1 miles, left on gravelled road 0.7 mile, left on woods road 0.1 mile, 30 feet east of road in woods; NW1/4NE1/4 sec. 30, T. 11 N., R. 4 W.; atlas sheet 31.

A—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; very friable; few coarse roots and common fine and medium roots; common fine and medium brown concretions; moderately acid; clear smooth boundary.

Bt1—7 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles and common medium faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; firm, slightly plastic, slightly sticky; few coarse roots and common fine and medium roots; few fine pores; few distinct clay films on faces of peds; common fine and medium brown concretions; moderately acid; gradual wavy boundary.

Bt2—17 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct strong brown (7.5YR 5/6) mottles and common medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm, slightly plastic, slightly sticky; few coarse roots and common fine and medium roots; few fine pores; few faint clay films on faces of peds; common fine and medium brown concretions; strongly acid; gradual wavy boundary.

B/E—28 to 34 inches; yellowish brown (10YR 5/4) silty clay loam (Bt); common medium prominent red (2.5YR 5/6) mottles and few medium distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm, slightly plastic, slightly sticky; common fine and medium roots; few fine pores; few faint clay films on faces of peds; E material consists of light brownish gray (10YR 6/2) silt in pockets and vertical seams 1/8 to 1/2 inch wide between prisms; common fine and medium brown concretions; strongly acid; gradual wavy boundary.

2B't3—34 to 60 inches; mottled red (2.5YR 4/6) and light brownish gray (10YR 6/2) silty clay; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; very firm, very plastic, very sticky; few fine and medium roots; strongly acid.

The solum thickness ranges from 60 to 80 inches. Depth to the clayey 2B't horizon ranges from 27 to 40 inches. Reaction ranges from extremely acid to moderately acid throughout the solum, except for surface horizons that have been limed.

The A horizon has value of 3 to 5 and chroma of 2 to 4. It is 5 to 8 inches thick.

The E horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. Texture is silt loam, very fine sandy loam, or loam.

The Bt horizon has value of 5 or 6 and chroma of 4 to 8. The lower part of the Bt horizon has few to common mottles that have chroma of 1 or 2. The Bt horizon is loam, silt loam, clay loam, or silty clay loam.

The Bt part of the B/E horizon is mottled and has value of 5 or 6 and chroma of 2 to 4. Texture is silty clay loam, silt loam, loam, or clay loam. The E part of the B/E horizon is grayish uncoated silt or very fine sand.

The 2B't horizon is mottled with shades of gray, red, and brown. Texture is silty clay, clay, silty clay loam, or clay loam and contains more than 35 percent clay.

Moreland Series

The Moreland series consists of somewhat poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are on the flood plain of the Red River and its distributaries. They are subject to flooding. Slopes range from 0 to 3 percent. Soils of the Moreland series are fine, mixed, thermic Vertic Hapludolls.

Moreland soils commonly are near Gallion, Perry, Roxana, and Yorktown soils. Gallion and Roxana soils are in higher positions than the Moreland soils and are loamy throughout the profile. Perry and Yorktown soils are at a lower elevation than the Moreland soils and are grayish in some parts of the subsoil.

Typical pedon of Moreland clay, occasionally flooded; about 21 miles southwest of Winnfield, 0.8 mile west on U.S. Highway 71 from the intersection of U.S. Highway 71 and Louisiana Highway 477, left into barn lot then east to end of pasture; SW1/4SE1/4 sec. 10, T. 9 N., R. 6 W.; atlas sheet 46.

Ap—0 to 7 inches; dark brown (7.5YR 3/2) clay; moderate medium granular structure; firm; common fine, medium, and coarse roots; slightly acid; clear smooth boundary.

Bw—7 to 22 inches; dark reddish brown (5YR 3/3) clay; moderate medium subangular blocky structure; firm; common fine and medium roots; common fine brown and black concretions; neutral; gradual smooth boundary.

Bss—22 to 32 inches; dark reddish brown (5YR 3/4) clay; few fine distinct grayish brown (10YR 5/2) mottles along root channels; moderate medium subangular blocky structure; firm; few fine roots; few slickensides;

common fine brown and black concretions; slightly effervescent; slightly alkaline; gradual smooth boundary.

BCkss—32 to 42 inches; dark reddish brown (5YR 3/4) clay; weak medium subangular blocky structure; firm; common fine and medium concretions of calcium carbonate; few fine black concretions; few slickensides; strongly effervescent; moderately alkaline; gradual smooth boundary.

Css—42 to 84 inches; dark reddish brown (5YR 3/4) clay; massive; firm; few medium and large concretions of calcium carbonate; few fine black concretions of manganese; common slickensides; moderately alkaline.

Depth to calcareous layers ranges from 10 to 40 inches. Slickensides are present within 40 inches of the surface.

The Ap horizon has hue of 5YR, value of 2 or 3, and chroma of 2 or 3; or hue of 7.5YR, value of 3, and chroma of 2. Reaction ranges from slightly acid to slightly alkaline. The Ap horizon is 5 to 10 inches thick.

The Bw horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 2 to 4. Texture is clay or silty clay. Reaction ranges from neutral to moderately alkaline.

The Bss horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 3 or 4. Few to common grayish mottles are within 30 inches of the surface. Texture is clay or silty clay. Slickensides that do not intersect are few to common. Reaction ranges from neutral to moderately alkaline.

The BCkss and Css horizons are similar in color to the Bss horizon. Texture is silty clay loam, silty clay, or clay. Some pedons have thin strata of silt loam or silty clay loam. Slickensides that do not intersect are few to common. Masses or concretions of calcium carbonate range from few to many. Reaction ranges from neutral to moderately alkaline.

Oktibbeha Series

The Oktibbeha series consists of moderately well drained, very slowly permeable soils that formed in loamy and clayey sediments of Tertiary age. These soils are on uplands. Slopes range from 1 to 15 percent. Soils of the Oktibbeha series are very-fine, montmorillonitic, thermic Vertic Hapludalfs.

Oktibbeha soils commonly are near Bellwood, Hollywood, Keiffer, and Vaiden soils. All of these soils are in positions similar to those of the Oktibbeha soils. Bellwood soils do not have calcareous horizons in the profile. Keiffer soils are fine-silty and have carbonatic mineralogy. Hollywood soils have a mollic epipedon. Vaiden soils have a brown hue throughout the subsoil.

Typical pedon of Oktibbeha silt loam, 1 to 5 percent slopes; about 9.5 miles northwest of Winnfield, 1.1 miles north on Louisiana Highway 501 from Louisiana Highway 156 to intersection, 400 feet north and 100 feet east of logging road; SW¼NW¼ sec. 34, T. 12 N., R. 4 W.; atlas sheet 22.

A—0 to 4 inches; dark brown (10YR 3/3) silt loam; weak medium granular structure; very friable; common fine and medium roots; common fine and medium brown concretions; moderately acid; clear smooth boundary.

Btss1—4 to 14 inches; yellowish red (5YR 4/6) clay; moderate medium subangular blocky structure; very firm, very plastic, very sticky; common fine and medium roots; few fine brown concretions; shiny ped faces; few slickensides; very strongly acid; gradual smooth boundary.

Btss2—14 to 26 inches; yellowish red (5YR 4/6) clay; common medium prominent yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; very firm, very plastic, very sticky; common fine and medium roots; shiny ped faces; few slickensides; few fine brown concretions; strongly acid; gradual smooth boundary.

Btss3—26 to 34 inches; mottled yellowish red (5YR 5/6) and yellowish brown (10YR 5/4) clay; few medium distinct light brownish yellow (10YR 6/4) mottles; moderate medium subangular blocky structure; very firm, very plastic, very sticky; few fine roots; shiny ped faces; few slickensides; slightly acid; clear wavy boundary.

Ckss—34 to 61 inches; light yellowish brown (2.5YR 6/4) clay; common fine, medium, and coarse distinct yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/6) mottles; massive; very firm, very plastic, very sticky; common black stains; small pockets of powdery calcium carbonate; common fine and medium concretions of calcium carbonate; slightly alkaline.

The solum thickness ranges from 30 to about 50 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is 3 to 6 inches thick. Reaction ranges very strongly acid to slightly acid. Some pedons have thin E horizons.

The Btss1 and Btss2 horizons have hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5, and chroma of 3 to 8. In some pedons, these horizons contain few to common brownish mottles. The lower part of the Btss2 horizon may have a few grayish mottles. Reaction ranges from very strongly acid to slightly acid.

The Btss3 horizon is similar in color to the Btss1 and Btss2 horizons and also includes hue of 10YR, value of 5 or 6, and chroma of 4 to 8. It has few to many mottles in shades of brown and gray, or the horizon is mottled in shades of brown, red, or gray. In some pedons, the matrix of the Btss3 horizon is gray. Reaction ranges from very strongly acid to slightly acid.

The Ckss horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 3 to 8. It has few to many mottles in shades of gray and brown. In some pedons, it is mottled in shades of olive, brown, and gray. Texture is clay or silty clay and contains few to many soft bodies and concretions of calcium carbonate. Reaction ranges from neutral to moderately alkaline.

Osier Series

The Osier series consists of poorly drained, rapidly permeable soils that formed in recent loamy and sandy alluvium and colluvium. These soils are in drain heads and in seepy areas on the terraces. Slopes range from 0 to 2 percent. Soils of the Osier series are siliceous, thermic Typic Psammaquents.

Osier soils commonly are near Guyton, Sacul, and Smithdale soils. Guyton soils are in lower positions than the Osier soils and are fine-silty. Sacul and Smithdale soils are in higher positions, are better drained, and have a reddish subsoil.

Typical pedon of Osier fine sandy loam, 0 to 2 percent slopes; about 8 miles northeast of Winnfield, north on Louisiana Highway 34 from U.S. Highway 84, 5.3 miles to logging road, 1.9 miles east on logging road, 267 steps north of logging road; SW1/4SE1/4 sec. 15, T. 12 N., R. 2 W.; atlas sheet 19.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine granular structure; very friable; many medium and coarse roots; moderately acid; clear wavy boundary.

A2—4 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; many medium and coarse roots; strongly acid; gradual wavy boundary.

Cg1—9 to 20 inches; grayish brown (10YR 5/2) loamy fine sand; weak fine granular structure; very friable; few fine and medium roots; very strongly acid; gradual wavy boundary.

Cg2—20 to 32 inches; grayish brown (2.5Y 5/2) loamy fine sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grained; loose; few fine roots; very strongly acid; gradual wavy boundary.

Cg3—32 to 47 inches; grayish brown (2.5Y 5/2) loamy fine sand; few fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; single grained; loose; few fine concretions; very strongly acid; gradual wavy boundary.

Cg4—47 to 60 inches; olive gray (5Y 5/2) fine sand; few fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; single grained; loose; few fine concretions; very strongly acid.

Reaction ranges from extremely acid to moderately acid in all horizons. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 20 to 50 percent of the effective cation-exchange capacity.

The A horizon has hue of 10YR or 2.5Y, value of 2 to 5, and chroma of 1 or 2. Where the value is 2 or 3, it is less than 10 inches thick. Texture of the A2 horizon is fine sandy loam, loamy fine sand, loamy sand, fine sand, or sand.

The Cg horizon has hue of 7.5YR, 10YR, 2.5Y, 5Y, or 5GY, value of 3 to 8, and chroma of 1 or 2; or it is neutral with value of 6 or 7. Brownish, yellowish, and grayish mottles range from none to common. Texture of the Cg1, Cg2, and Cg3 horizons is loamy fine sand, loamy sand, fine sand, or sand. Texture of the Cg4 horizon is fine sand, sand, or coarse sand. Most pedons have thin strata of material ranging from sand to sandy loam. In some pedons, the Cg horizon is underlain or interrupted by an Ab horizon. The Ab horizon, where present, has hue of 10YR to 5Y, value of 2 or 3, and chroma of 1 or 2. Texture is fine sand, loamy fine sand, or loamy sand. The silt plus clay content of the 10- to 40-inch zone is 5 to 15 percent.

Perry Series

The Perry series consists of poorly drained, very slowly permeable soils that formed in clayey alluvium of Recent age. These soils are on flood plains. They are subject to flooding. Slopes range from 0 to 1 percent. Soils of the Perry series are very-fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Perry soils commonly are near Moreland, Roxana, and Yorktown soils. Moreland soils are in higher positions than the Perry soils and have a subsoil that is reddish throughout, Roxana soils are in higher positions and are coarse-silty, and Yorktown soils are in lower positions and do not crack below 20 inches in most years.

Typical pedon of Perry clay, occasionally flooded; about 21 miles southwest of Winnfield, 0.4 mile north on Louisiana Highway 477 from U.S. Highway 71 at St. Maurice, north about 1.6 miles on gravelled road, 24 steps east of center of road; NW1/4NE1/4 sec. 11, T. 9 N., R. 6 W.; atlas sheet 46.

Ap—0 to 4 inches; brown (7.5YR 4/2) clay; strong medium granular structure; firm; common fine and medium roots; slightly alkaline; clear smooth boundary.

A2—4 to 9 inches; brown (7.5YR 4/2) clay; moderate medium subangular blocky structure; firm; common fine roots; neutral; clear smooth boundary.

Bssg1—9 to 21 inches; dark gray (10YR 4/1) clay, common fine and medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; common fine roots; few intersecting slickensides; neutral; gradual smooth boundary.

Bssg2—21 to 35 inches; dark gray (10YR 4/1) clay; common fine and medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; very firm, very plastic, very sticky; few fine roots; few intersecting slickensides; slightly alkaline; clear smooth boundary.

2BCss—35 to 50 inches; dark reddish brown (5YR 3/4) clay; few medium prominent gray (10YR 6/1) mottles; moderate medium subangular blocky structure; very firm, very plastic, very sticky; few fine roots; few slickensides; slightly alkaline; gradual smooth boundary.

2Ck—50 to 72 inches; dark reddish brown (5YR 3/4) clay; few medium prominent gray (10YR 6/0) mottles; massive; very firm, very plastic, very sticky; few fine concretions of calcium carbonate; violently effervescent; moderately alkaline.

The solum thickness ranges from 36 to 60 inches. Cracks 1/4 to 3/4 inch wide form to a depth of 20 inches or more in most years.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 1 or 2. It is 4 to 9 inches thick. Reaction ranges from very strongly acid to slightly alkaline.

The Bssg horizon has value of 4 to 6. Brownish mottles range from few to many. Reaction ranges from strongly acid to slightly alkaline.

The 2BCss horizon has value of 3 or 4 and chroma of 2 to 4. Gray mottles range from none to many. Reaction ranges from slightly acid to moderately alkaline.

The 2Ck horizon has hue of 5YR, 10YR, or 7.5YR, value of 4 or 5, and chroma of 1 to 4. It is calcareous and contains few to many concretions of carbonate. Gray mottles range from none to many. Reaction ranges from slightly acid to moderately alkaline.

Roxana Series

The Roxana series consists of well drained, moderately permeable soils that formed in recent loamy alluvium. These soils are on flood plains. They are subject to flooding. Slopes range from 0 to 3 percent. Soils of the Roxana series are coarse-silty, mixed, nonacid, thermic Typic Udifluvents.

The Roxana soils in Winn Parish are taxadjuncts to the Roxana series because they typically do not have an organic carbon content that decreases irregularly with depth or that is more than 0.2 percent at 50 inches deep. This difference, however, does not significantly affect the use and management of the soils. In this survey area, Roxana soils are coarse-silty, mixed, nonacid, thermic Typic Udorthents.

Roxana soils commonly are near Moreland soils and are similar to Gallion soils. Moreland soils are in lower positions than the Roxana soils and are clayey throughout the profile. Gallion soils are in positions similar to those of the Roxana soils and have an argillic horizon.

Typical pedon of Roxana silt loam, occasionally flooded; about 23 miles southwest of Winnfield, south on blacktop road 5 miles from the intersection of U.S. Highway 71 and Louisiana Highway 499 in St. Maurice; left on gravelled road then right at next intersection 2 miles to the point where gravelled road turns southwest, 25 steps south of gravelled road on farm road, 15 steps west to bank of Red River channel; SE1/4 Spanish Land Grant sec. 37, T. 9 N., R. 6 W.; atlas sheet 49.

Ap—0 to 7 inches; strong brown (7.5YR 4/4) silt loam; weak medium granular structure; very friable; common fine roots; moderately alkaline; clear smooth boundary.

C1—7 to 21 inches; strong brown (7.5YR 5/6) silt loam; massive, distinct bedding planes; very friable; common fine roots; moderately alkaline; clear smooth boundary.

C2—21 to 37 inches; brown (7.5YR 5/4) very fine sandy loam; massive, distinct bedding planes; very friable; common fine roots; strongly alkaline; clear smooth boundary.

C3—37 to 58 inches; reddish brown (5YR 4/4) very fine sandy loam; massive, distinct bedding planes; very friable; few fine roots; slightly effervescent; moderately alkaline; gradual smooth boundary.

C4—58 to 72 inches; reddish brown (5YR 4/4) very fine sandy loam; massive, distinct bedding planes; very friable; slightly effervescent; moderately alkaline.

Bedding planes are evident in the 10- to 40-inch control section.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 3, 4, or 6. Texture is silt loam or very fine sandy loam. Reaction ranges from slightly acid to moderately alkaline. This horizon is 3 to 8 inches thick.

The C horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4, 6, or 8. Texture is silt loam, very fine sandy loam, or loamy very fine sand. Some pedons have thin strata of finer or coarser textured material. Reaction ranges from neutral to strongly alkaline.

Ruston Series

The Ruston series consists of well drained, moderately permeable soils that formed in loamy sediments of Pleistocene age. These soils are on uplands. Slopes range from 1 to 5 percent. Soils of the Ruston series are fine-loamy, siliceous, thermic Typic Paleudults.

Ruston soils commonly are near Bellwood, Kolin, Mahan, Osier, Sacul, Savannah, and Smithdale soils. Bellwood, Mahan, and Sacul soils are at a higher elevation than the Ruston soils and have a clayey subsoil; and Kolin and Savannah soils are at a lower elevation. Kolin soils are fine-silty. Osier soils are in drain heads and in seepy areas and are poorly drained. Savannah and Smithdale soils do not have a bisequum in the profile. Smithdale soils are on side slopes.

Typical pedon of Ruston fine sandy loam, 1 to 5 percent slopes; about 16 miles southwest of Winnfield, 0.7 mile east on gravelled road from Wheeling, in road cut on south side of gravelled road; NE1/4SE1/4 sec. 24, T. 9 N., R. 5 W.; atlas sheet 50.

A—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; common fine and medium roots; strongly acid; clear smooth boundary.

E—6 to 14 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine granular structure; very friable; common fine and medium roots; very strongly acid; gradual smooth boundary.

Bt1—14 to 28 inches; dark red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; few fine pores; common distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt2—28 to 47 inches; red (2.5YR 4/8) sandy clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; few fine pores; common distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt3—47 to 59 inches; yellowish red (5YR 5/8) fine sandy loam; weak medium subangular blocky structure; very friable; few fine roots; few fine pores; few faint clay films on faces of peds; few dark stains; very strongly acid; clear smooth boundary.

B/E—59 to 68 inches; yellowish red (5YR 5/8) fine sandy loam (Bt); weak medium subangular blocky structure; very friable; pockets and streaks of yellowish brown (10YR 5/4) fine sandy loam (E) material make up about 15 percent of the horizon; very strongly acid; gradual wavy boundary.

B't—68 to 80 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; very strongly acid.

The solum thickness exceeds 60 inches. As much as 15 percent quartz gravel or ironstone fragments are in some pedons. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has hue of 10YR or 7.5YR, value of 4 to 5, and chroma of 2 to 4. It is 3 to 6 inches thick. Reaction ranges from very strongly acid to slightly acid.

The E horizon and the E part of the B/E horizon have value of 5 or 6 and chroma of 3 or 4. Texture is fine sandy loam, loamy sand, or sandy loam. The E part of the B/E horizon occurs in streaks and pockets that make up as much as 50 percent of the B/E horizon. Reaction of the E and B/E horizons ranges from very strongly acid to moderately acid.

The Bt horizon, the B't horizon, and the Bt part of the B/E horizon have hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 4 to 8. Texture is sandy clay loam, loam, or clay loam. In some pedons, the B't horizon is mottled in shades of gray, brown, red, or yellow. Reaction of the Bt horizon ranges from very strongly acid to moderately acid. Reaction of the B't horizon ranges from extremely acid to moderately acid.

Sacul Series

The Sacul series consists of moderately well drained, slowly permeable soils that formed in loamy and clayey sediments of Tertiary age. These soils are on uplands. Slopes range from 1 to 20 percent. Soils of the Sacul series are clayey, mixed, thermic Aquic Hapludults.

Sacul soils commonly are near Bellwood, Frizzell, Guyton, Mahan, Osier, Ruston, Savannah, and Smithdale soils. Bellwood and Mahan soils are in positions similar to those of the Sacul soils. Bellwood soils have montmorillonitic mineralogy, and Mahan soils have kaolinitic mineralogy. Ruston, Savannah, and Smithdale soils are fine-loamy. Frizzell soils are at a lower elevation than the Sacul soils and are coarse-silty. Guyton soils are on flood plains and on terraces, are poorly drained, and are fine-silty. Osier soils are in drain heads and in seepy areas, have a sandy underlying material, and are poorly drained.

Typical pedon of Sacul fine sandy loam, 5 to 20 percent slopes; about 8 miles east of Winnfield, 2.2 miles east on Louisiana Highway 124 from Louisiana Highway 1238, 25 feet north of road in woods; NW1/4SW1/4 sec. 23, T. 11 N., R. 1 E.; atlas sheet 30.

A—0 to 1 inch; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; very friable; common fine and medium roots; very strongly acid; clear smooth boundary.

E—1 to 5 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak medium subangular blocky structure; very friable; common fine and medium roots; very strongly acid; abrupt smooth boundary.

Bt1—5 to 15 inches; red (2.5YR 4/8) clay; moderate medium subangular blocky structure; firm; common fine and medium roots; very strongly acid; clear smooth boundary.

Bt2—15 to 24 inches; red (2.5YR 4/8) clay; common fine and medium light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common fine and medium roots; strongly acid; gradual smooth boundary.

Btg1—24 to 35 inches; mottled light brownish gray (2.5Y 6/2), red (2.5YR 4/8), and strong brown (7.5YR 5/8) sandy clay; weak medium subangular blocky structure; firm; few fine and medium roots; very strongly acid; gradual smooth boundary.

Btg—35 to 51 inches; light brownish gray (2.5Y 6/2) sandy clay; few medium prominent olive yellow (2.5Y 6/8) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine and medium roots; very strongly acid; gradual smooth boundary.

Cg—51 to 60 inches; light yellowish brown (2.5Y 6/3) stratified loam and silty clay loam; massive, common bedding planes; firm; few fine roots; very strongly acid.

The solum thickness ranges from 40 to more than 72 inches. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The A horizons that have value of 3 are less than 6 inches thick. Reaction ranges from very strongly acid to moderately acid.

The E horizon has value of 4 to 6 and chroma of 3 or 4. Texture is fine sandy loam, loam, sandy loam, or very fine sandy loam. Reaction ranges from very strongly acid to moderately acid.

The Bt1 horizon has hue of 5YR, 2.5YR, or 10R, value of 3 to 5, and chroma of 6 or 8. The Bt2 horizon has these matrix colors with mottles in shades of gray. Texture is clay, silty clay, or sandy clay. Reaction ranges from extremely acid to strongly acid.

The Btg horizon and the BCg horizon, where present, are mottled in shades of brown, red, and gray. Texture is sandy clay, silty clay loam, clay loam, or sandy clay loam. Reaction ranges from extremely acid to strongly acid.

The Cg horizon is mottled red, brown, or gray and is stratified. Texture is clay loam, sandy clay loam, loam, sandy loam, or silty clay loam. Reaction ranges from extremely acid to strongly acid.

Savannah Series

The Savannah series consists of moderately well drained, moderately slowly permeable soils that formed in loamy sediments of Pleistocene age. These soils are on terraces. Slopes range from 1 to 5 percent. Soils of the Savannah series are fine-loamy, siliceous, thermic Typic Fragiudults.

Savannah soils commonly are near Brimstone, Cahaba, Frizzell, Gore, Guyton, Sacul, Shatta, Ruston, and Smithdale soils. Brimstone and Guyton soils are in lower positions than the Savannah soils, are poorly drained, and are fine-silty. Cahaba, Ruston, and Smithdale soils have more convex slopes than the Savannah soils, are well drained, and have a red hue in the subsoil. Frizzell and Shatta soils are in positions similar to those of the Savannah soils. Frizzell soils are coarse-silty, and Shatta soils are fine-silty. Sacul soils are at a higher elevation than the Savannah soils and are fine-textured.

Typical pedon of Savannah fine sandy loam, 1 to 5 percent slopes; about 9.5 miles northeast of Winnfield, 0.65 mile west on Louisiana Highway 127 from the LaSalle-Winn Parish line, southwest 0.6 mile on woods road, 20 feet north of road; SW1/4NW1/4 sec. 25, T. 12 N., R. 1 E.; inset to atlas sheet 21.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; few fine roots; very strongly acid; clear smooth boundary.

E—5 to 10 inches; brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; very friable; few fine roots; strongly acid; clear smooth boundary.

Bt1—10 to 17 inches; strong brown (7.5YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable; few distinct clay films on faces of peds; few fine roots; strongly acid; clear smooth boundary.

Bt2—17 to 31 inches; yellowish brown (10YR 5/6) clay loam; few medium prominent yellowish red (5YR 5/6) mottles and few medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; few distinct clay films on faces of peds; moderately acid; gradual smooth boundary.

Btx1—31 to 39 inches; yellowish brown (10YR 5/6) sandy clay loam; common fine and medium distinct grayish brown (10YR 5/2) mottles and few medium prominent yellowish red (5YR 4/6) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle; seams of brown (10YR 5/3) fine sandy loam between prisms tapering downward; brittle material makes up about 60 percent of horizon; few fine brown concretions; common distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

Btx2—39 to 49 inches; yellowish brown (10YR 5/6) sandy clay loam; common fine and medium prominent red (2.5YR 4/6) mottles and common medium distinct brown (10YR 5/3) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle; seams of grayish brown (10YR 5/2) very fine sandy loam between prisms; brittle material makes up about 70 percent of horizon; common distinct clay films on faces of peds; strongly acid; gradual smooth boundary.

Btx3—49 to 64 inches; yellowish brown (10YR 5/6) sandy clay loam; common medium distinct brown (10YR 5/3) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle; seams of light brownish gray (10YR 6/2) very fine sandy loam between prisms; brittle material makes up about 80 percent of horizon; few fine brown concretions; common distinct clay films on faces of peds; strongly acid.

The solum thickness ranges from 50 to more than 80 inches. Depth to the fragipan ranges from 16 to 38 inches. Some pedons have a few small quartz pebbles in the solum. In most pedons, in at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A and E horizons have hue of 10YR, value of 4, and chroma of 2 or 3, or value of 5 and chroma of 3, 4, or 6, or value of 6 and chroma of 3; or hue of 2.5Y, value of 4, and chroma of 2 or value of 5 and chroma of 4 or 6. Texture is silt loam, loam, fine sandy loam, or sandy loam. Reaction ranges from very strongly acid to moderately acid.

The Bt horizon has hue of 7.5YR, 10YR, or 2.5Y and chroma of 4, 6, or 8. Texture is sandy clay loam, clay loam, silt loam, sandy loam, or loam. Clay content ranges from 18 to 32 percent, and silt content ranges from 20 to 50 percent. Reaction ranges from very strongly acid to moderately acid.

The Btx horizon is mottled in shades of yellow, brown, red, or gray, or the matrix is monocolored in chroma of 4 to 8 with mottles in shades of gray and red. Texture is sandy loam, sandy clay loam, clay loam, silt loam, or loam. Reaction ranges from extremely acid to moderately acid.

Shatta Series

The Shatta series consists of moderately well drained soils that formed in loamy sediments of Pleistocene age. Permeability is moderately slow in the upper part of the soil and slow in the fragipan. These soils are on terraces. Slopes range from 1 to 5 percent. Soils of the Shatta series are fine-silty, siliceous, thermic Typic Fragiudults.

Shatta soils commonly are near Cahaba, Darden, Frizzell, Guyton, Sacul, and Savannah soils. None of these soils, except the Savannah soils, has a fragipan. Savannah soils are fine-loamy. Cahaba, Darden, and Savannah soils are in positions similar to those of the Shatta soils, and Frizzell and Guyton soils are in lower positions. The Sacul soils are at a higher elevation than the Shatta soils.

Typical pedon of Shatta very fine sandy loam, 1 to 5 percent slopes; about 14 miles northwest of Winnfield, 2.3 miles west of Sanders Church on Louisiana Highway 156 to gravelled road, left on gravelled road to intersection then right 0.1 mile to lane, left on lane to gate at pipeline, 650 feet south of gate to the north bank of borrow pit; NW1/4SE1/4 sec. 34, T. 12 N., R. 5 W.; atlas sheet 22.

A—0 to 6 inches; dark grayish brown (10YR 4/2) very fine sandy loam; weak fine granular structure; very friable; many very fine and fine roots; very strongly acid; clear smooth boundary.

E—6 to 16 inches; brown (10YR 5/3) very fine sandy loam; weak fine granular structure; very friable; common fine and very fine roots; few fine concretions; very strongly acid; abrupt smooth boundary.

Bt1—16 to 25 inches; yellowish brown (10YR 5/6) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; few faint clay films on faces of peds; few fine brown concretions; very strongly acid; clear smooth boundary.

Bt2—25 to 34 inches; yellowish brown (10YR 5/8) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; common distinct clay films on faces of peds; very strongly acid; gradual wavy boundary.

Btx1—34 to 42 inches; yellowish brown (10YR 5/6) loam; few fine prominent red (2.5YR 4/6) mottles and common medium distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; few fine pores; firm and brittle B material makes up about 65 percent of the horizontal cross section; common vertical seams between prisms that are grayish brown (10YR 5/2) very fine sandy loam and 1/4 inch to 1 inch wide make up about 35 percent of the horizon; common distinct clay films on faces of peds; very strongly acid; gradual wavy boundary.

Btx2—42 to 60 inches; yellowish brown (10YR 5/6) loam; common medium prominent red (2.5YR 4/6) mottles and few medium distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; few fine pores; about 80 percent of the horizontal cross section is firm and brittle, and the remaining 20 percent is friable; common vertical seams of grayish brown (10YR 5/2) very fine sandy loam are 1/4 to 3/4 inch wide between prisms; common distinct clay films on faces of peds; very strongly acid; gradual wavy boundary.

BC—60 to 75 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) loam; few medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; very strongly acid.

The solum thickness ranges from about 60 to 90 inches. Depth to the fragipan ranges from 20 to 36 inches. Reaction ranges from very strongly acid to moderately acid throughout the solum, except where the surface layer has been limed. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 3 or 4 and chroma of 1 or 2 or value of 4 or 5 and chroma of 2 to 4. This horizon is 5 to 8 inches thick. It is less than 6 inches thick where the value is 3 or less.

The E horizon has value of 5 or 6 and chroma of 2 or 3. Texture is silt loam, loam, fine sandy loam, or very fine sandy loam.

Some pedons have a BE horizon. Where present, it has hue of 10YR, value of 5, and chroma of 4 to 8. Texture is silt loam or loam.

The Bt horizon has chroma of 4 to 8. In some pedons, reddish mottles are in the Bt horizon. Texture is clay loam, silty clay loam, loam, or silt loam. Content of sand is more than 25 percent. Less than 15 percent is coarser than very fine sand.

The Btx horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 8; or hue of 10YR, value of 4, and chroma of 4. In some pedons, the lower part of the Btx horizon is mottled in shades of brown, yellow, red, or gray. Texture is silt loam, loam, clay loam, or silty clay loam. Brittle and firm prisms average 4 to 8 inches in diameter.

The BC horizon is similar in color to the Btx horizon. Texture is very fine sandy loam, fine sandy loam, sandy loam, loam, or sandy clay loam.

Smithdale Series

The Smithdale series consists of well drained, moderately permeable soils that formed in loamy sediments of Pleistocene age. These soils are on uplands. Slopes range from 5 to 20 percent. Soils of the Smithdale series are fine-loamy, siliceous, thermic Typic Hapludults.

Smithdale soils commonly are near Bellwood, Guyton, Osier, Ruston, Sacul, and Savannah soils. Bellwood and Sacul soils are in positions similar to those of the Smithdale soils and have a clayey subsoil. Guyton soils are on flood plains and on terraces and are fine-silty. Osier soils are in drain heads and in seepy areas and are poorly drained. Ruston soils are on ridgetops and have a bisequum in the subsoil. Savannah soils are at a lower elevation than the Smithdale soils and have a fragipan.

Typical profile of Smithdale fine sandy loam, 5 to 20 percent slopes; about 15 miles south of Winnfield, north 1 mile on Louisiana Highway 1228 from the parish line, in road cut on west side of highway; SE$^1/_4$SW$^1/_4$ sec. 27, T. 9 N., R. 4 W.; atlas sheet 50.

A—0 to 7 inches, brown (10YR 4/3) fine sandy loam; weak medium granular structure; very friable; common fine roots; few chert pebbles $^1/_8$ to $^3/_4$ inch in diameter; moderately acid; clear smooth boundary.

Bt1—7 to 17 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; common fine roots; few fine and medium pores; common distinct clay films on faces of peds; few chert pebbles $^1/_8$ to $^3/_4$ inch in diameter; strongly acid; gradual smooth boundary.

Bt2—17 to 24 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; few fine and medium pores; common distinct clay films on faces of peds; common chert pebbles $^1/_8$ to $^3/_4$ inch in diameter; very strongly acid; gradual smooth boundary.

Bt3—24 to 45 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; few distinct clay films on faces of peds; few pockets of light olive brown (2.5Y 5/4) and strong brown (7.5YR 5/6) sand grains; few chert pebbles $^1/_8$ to $^3/_4$ inch in diameter; strongly acid; gradual smooth boundary.

Bt4—45 to 73 inches; yellowish red (5YR 5/6) loam; moderate medium subangular blocky structure; friable; few fine pores; few faint clay films on faces of peds; few pockets of light olive brown (2.5Y 5/4) and strong brown (7.5YR 5/6) sand grains; few chert pebbles $^1/_8$ to $^3/_4$ inch in diameter; very strongly acid.

The solum is more than 60 inches thick. Reaction ranges from very strongly acid to strongly acid throughout the solum, except for the surface layer in areas that have been limed. Content of chert or ironstone gravel ranges from none to 10 percent. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 3 or 4 and chroma of 2 or 3. It is less than 5 inches thick if the value is 3. This horizon is 3 to 10 inches thick.

The E horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. Texture is fine sandy loam, sandy loam, loamy fine sand, or loamy sand.

The upper part of the Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is clay loam, sandy clay loam, or loam. The lower part of the Bt horizon has the same color as the upper part, except that it has few to many pockets of pale brown or strong brown sand grains. Texture is loam or sandy loam.

Vaiden Series

The Vaiden series consists of somewhat poorly drained, very slowly permeable soils that formed in loamy and clayey sediments of Tertiary age. These soils are on uplands. Gilgai micro-relief is common in most areas. Slopes range from 0 to 1 percent. Soils of the Vaiden series are very-fine, montmorillonitic, thermic Vertic Hapludalfs.

Vaiden soils commonly are near Bellwood, Hollywood, Keiffer, Metcalf, and Oktibbeha soils. All of these soils are in positions similar to those of the Vaiden soils. Bellwood and Oktibbeha soils have a subsoil that is reddish in the upper part. Hollywood soils have a mollic epipedon. Keiffer soils are calcareous throughout the profile. Metcalf soils are fine-silty.

Typical pedon of Vaiden silty clay loam, 0 to 1 percent slopes; about 10 miles south of Winnfield, south 5.3 miles on Louisiana Highway 1228 from Louisiana Highway 34, west 0.55 mile on dirt road to cattle gap, 25 feet south of post on cattle gap; SE¼SE¼ sec. 7, T. 9 N. R. 3 W.; atlas sheet 48.

A—0 to 3 inches; dark grayish brown (10YR 4/2) silty clay loam; weak medium granular structure; friable; common fine roots; few fine black concretions; strongly acid; clear smooth boundary.

Btss1—3 to 13 inches; yellowish brown (10YR 5/4) clay; few medium prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; very firm, very sticky, very plastic; common fine roots; few fine black concretions; very strongly acid; gradual smooth boundary.

Btss2—13 to 33 inches; mottled yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) clay; common medium prominent yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; very firm, very sticky, very plastic; few slickensides; few fine black concretions; very strongly acid; gradual smooth boundary.

Css1—33 to 52 inches; mottled yellowish brown (10YR 5/6) and light brownish gray (2.5Y 6/2) clay; few fine prominent yellowish red (5YR 5/8) mottles; massive; very firm, very sticky, very plastic; few slickensides; few fine black concretions; moderately acid; gradual smooth boundary.

Ckss2—52 to 72 inches; mottled yellow (10YR 7/8) and light gray (2.5Y 7/2) clay; massive; very firm, very sticky, very plastic; common fine concretions and pockets of calcium carbonate; few fine black concretions; slightly alkaline.

Depth to alkaline material ranges from 3 to 8 feet. Reaction ranges from very strongly acid to moderately acid; the Ckss horizon ranges from very strongly acid to slightly alkaline. Slickensides at depths of 24 inches or more range from few to many.

The A horizon has value of 3 or 4 and chroma of 2 or 3.

The Btss horizon has value of 4 or 5 and chroma of 4 to 8. It is mottled in shades of gray, brown, or red. The Btss horizon is generally mottled in shades of yellow, brown, gray, or red. Texture is silty clay or clay. Clay content is greater than 60 percent.

The Css and Ckss horizons are mottled gray, yellow, brown, and red or have a matrix color of gray with mottles in shades of yellow, brown, or red. Texture is clay or silty clay. Calcium carbonate concretions in the Ckss horizon range from few to many.

Yorktown Series

The Yorktown series consists of very poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are in backswamps on flood plains. They are ponded most of the year and are frequently flooded. Slopes are less than 1 percent. Soils of the Yorktown series are very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents.

Yorktown soils commonly are near Moreland and Perry soils. Moreland and Perry soils are in higher positions than the Yorktown soils and crack to a depth of 20 inches or more during dry periods in most years.

Typical pedon of Yorktown clay, frequently flooded; about 20 miles southwest of Winnfield, 0.4 mile east on Louisiana Highway 477 from U.S. Highway 71 in St. Maurice, north on gravelled road 1.8 miles, east of road 850 feet in edge of woods; NW¼SE¼ sec. 2, T. 9 N., R. 6 W.; atlas sheet 46.

Oa—0 to 2 inches; very dark grayish brown (10YR 3/2) muck; very fluid; common fine roots; strongly acid; clear wavy boundary.

A—2 to 8 inches; grayish brown (10YR 5/2) clay; massive; firm, very plastic, very sticky; few coarse roots and common fine and medium roots; strongly acid; clear smooth boundary.

Bg1—8 to 24 inches; gray (10YR 5/1) clay; common medium prominent strong brown (7.5YR 5/6) mottles; massive; firm, very plastic, very sticky; few coarse roots and common fine and medium roots; moderately acid; gradual wavy boundary.

Bg2—24 to 39 inches; gray (5Y 5/1) clay; common medium prominent strong brown (7.5YR 5/6) mottles; massive; firm, very plastic, very sticky; few fine and medium roots; moderately acid; gradual wavy boundary.

Bg3—39 to 57 inches; gray (5Y 5/1) clay; common medium prominent strong brown (7.5YR 5/6) mottles; massive; firm, very plastic, very sticky; slightly acid; abrupt wavy boundary.

BC—57 to 64 inches; reddish brown (5YR 4/4) clay; common fine prominent gray (10YR 5/1) mottles; massive; firm, slightly sticky, slightly plastic; moderately alkaline.

The solum thickness ranges from 50 to 80 inches. Depth to the BC horizon ranges from 40 to 60 inches. Clay content in the particle-size control section ranges from 60 to 85 percent.

The A horizon has hue of 5Y, value of 4 to 6, and chroma of 1; hue of 10YR, value of 4 to 6, and chroma of 1 or value of 5 and chroma of 2; hue of 2.5Y, value of 5, chroma of 2; or it is neutral in hue of 2.5Y and value of 4 to 6. This horizon is 4 to 10 inches thick. Reaction ranges from strongly acid to neutral. A thin layer of muck or partially decayed plant material is on the surface of most pedons.

The Bg1 and Bg2 horizons have hue of 10YR to 5Y and value of 4 to 6, or they are neutral with value of 4 or 5. Yellowish red and strong brown mottles range from few to many. Reaction ranges from moderately acid to neutral.

The Bg3 horizon has hue of 5G, 5BG, 5Y, or 10YR and value of 5 or 6; or it is neutral in hue of 10YR or 2.5Y and value of 4 or 5. Reddish and brownish mottles are common to many and fine to coarse. Fine or medium weakly cemented black and strong brown bodies range from none to many. Reaction ranges from moderately acid to neutral.

The BC horizon has hue of 5YR, value of 3 to 5, and chroma of 3 or 4; or hue of 2.5YR, value of 3 or 4, and chroma of 4. Mottles in shades of gray range from few to many. Greenish gray root channel fillings range from none to common. Reaction is slightly alkaline or moderately alkaline.

Genesis of the Soils

W. H. Hudnall, Agronomy Department, Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, prepared this section.

This section explains soil genesis and the processes and factors of soil formation as they relate to the soils of Winn Parish.

Soil genesis is the phase of soil science that deals with the processes and factors of soil formation *(5)*. It is the study of the formation of soils on the land surface and of changes in soil bodies. It is the science of the evolution of soils that are conceived of as natural units *(11, 29)*.

Internal and external forces influence soils. Generally, the internal forces are synonymous with soil-forming processes, and the external forces are synonymous with soil-forming factors. Soils generally are perceived to be a stable component of our environment; unless the soils are disturbed, they show very little change. Soil scientists, however, view soils as a dynamic system and can observe minute but important changes in the composition of the soil, depending upon when and how samples are taken *(23)*. The following information can give a better understanding of how the soil survey can be used and how interpretations can be derived from it.

Processes of Soil Formation

The complex soil-forming processes are the gains, losses, translocations, and transformations that occur in the soil. These also influence the kind and degree of development of soil horizons *(32)*. Soil-forming processes result in either additions to or losses from the soil of organic, mineral, and gaseous materials; translocations of materials from one point to another within the soil; and physical and chemical transformations of mineral and organic materials within the soil.

The addition of organic material to the soil is an important process that occurs to some extent in all soils. However, more organic matter accumulates in some soils than in others. Organic matter increases the available water and cation-exchange capacities of the soil, helps granulate the soil, and releases plant nutrients in the soil. Organic matter accumulates mainly in and above the surface horizon; consequently, the surface horizon is higher in organic matter content and is darker than the lower horizons. The accumulation of organic matter has been significant in the Osier and Yorktown soils in Winn Parish. Osier soils occur at the toeslope outflow position. The soils are sandy and remain saturated. Unique ferns and mosses are the dominant vegetation that give rise to the high organic matter content. Yorktown soils occur in swamps and have an organic surface. Accumulated organic matter has only slightly darkened the surface layer of most of the soils in the parish.

Leaving crop residue and allowing leaf litter and other organic material to accumulate on the surface will maintain or increase the content of organic matter in the soil. Living organisms, through their activities, decompose these accumulations and mix them into the soil. Increasing the content of organic matter in the soil helps to control erosion.

The addition of mineral material on the surface has been important in the formation of some soils in Winn Parish. The added material, generally in the form of alluvium, provides new parent material in which the processes of soil formation can occur. In many cases, new material has accumulated faster than the processes of soil formation could appreciably alter the material. As a result, depositional strata formed in the lower horizons of many of the alluvial soils. Depositional strata are evident in the lower horizons of the Roxana soils. These soils have been forming in relatively young alluvial sediments. Liquids or gases added to the soil are generally compounds or nitrates and sulfates dissolved or trapped in rainwater.

The loss of components from the soil is also important in the overall process of soil development, although it is generally less noticeable than the addition of materials to the soils during soil formation. For example, as organic matter is decomposed, carbon dioxide is emitted into the atmosphere. Water also escapes from the soil by evaporation and transpiration from plants. On some soils, erosion has removed both mineral and organic materials. These losses are natural, to some extent, but in some places they are accelerated by human activities. In Winn Parish, moving water is the greatest cause of erosion.

Leaching removes many water soluble compounds and elements from the soil. Water moving through the soil carries these soluble elements out of the soil. In many soils, the soluble elements have been moved completely out of the soil profile. Loamy soils, such as the Boykin and Cahaba soils, are permeable, and most soluble bases are leached in a relatively short time. The more clayey soils, such as the Bellwood and Perry soils, are less permeable, and slowly moving water leaches smaller amounts of soluble elements. In some soils which formed from carbonate-containing parent materials, such as the Mahan soils, the carbonates have been leached from the profile. This is due to the relative high rainfall and the length of time these parent materials have been exposed to weathering. Clayey soils, such as the Hollywood, Oktibbeha, and Vaiden soils, formed in carbonate-rich materials. These soils have an accumulation of carbonates in the lower horizons because of slow downward water movement. Relatively young soils that were initially high in bases show the least amount of leaching.

The translocation of material in the soil, either in eluviation or illuviation, has been an important process in the development of most of the soils in the parish. Eluviation is the moving of solids out of part of the soil profile, and illuviation is the moving of solids into a lower part of the soil profile. In soils that have large pores, soil material that is small enough to go through these pores can be suspended in water as it moves downward. The translocation and accumulation of clay in the profile is evident in most of the soils in Winn Parish.

In many soils in the parish, iron and manganese move to and accumulate in the lower part of the profile. These accumulations result from alternating oxidizing and reducing conditions related primarily to the fluctuations of water-saturated zones within the soils. Reduction occurs when water saturates the soil for relatively long periods and when low amounts of oxygen are in the soil. It results in gray compounds of iron and manganese characteristic of the Btg and Cg horizons in Guyton soils. Prevailing reduced conditions and a fluctuating water table can translocate iron and manganese to a lower horizon and can precipitate them at the top of the saturated zone. Bellwood, Frizzell, and Sacul soils commonly have brownish or reddish mottles.

The transformation of mineral and organic substances in soils is also a major process of soil formation. Transformation processes include oxidation, reduction, hydration, solution, and hydrolysis. Oxidation is a geochemical reaction in well aerated soils and parent material. Its effect is easily recognized in the Mahan soils as the oxidation of the ferrous ion to the ferric materials. Ferrous iron is contained in the mineral or hornblende and pyroxene of the primary mineral group and is a component of soils that formed in glauconite or siderite, such as the Mahan soils.

Hydration occurs when water molecules or hydroxyl groups are united with minerals without their being a part of the mineral itself. It generally occurs on the surfaces or edges of mineral grains or, partly, as the structure in simple salts. For example, after hydration, anhydrite mineralizes. Gypsum is commonly in clayey soils that contain sulfate, presumably from marine sediments, and calcium, either from marine sediments or mineral weathering. The Hollywood and Vaiden soils in Winn Parish may contain gypsum.

Hydrolysis is the chemical reaction of the hydrogen ion with individual elements within crystal structures. The highly reactive hydrogen ion replaces one of the basic ions in the structure of the mineral. Hydrolysis generally is the most important chemical weathering process. It completely disintegrates primary minerals in all soils, thus making plant nutrients available to plants.

Solution is the simple process of water as the dissolving agent of salts, such as carbonates and sulfates. In solution, salts move through the soil and are either removed from the soil profile or deposited at a lower depth. In some soils, such as the Brimstone, soluble sodium is not leached out of the profile and is concentrated in the Btn horizons. The sodium becomes a major cation on the exchange complex, and the soil exhibits major physical problems, such as dispersion and extremely slow permeability.

A soil-forming process that is not fully understood is the formation of fragipans. Fragipans are dense, brittle layers in the subsoil of some soils. The Savannah and Shatta soils have a fragipan. Fragic material is dense and has many vesicular pores, but it does not readily allow water to move through it. Several hypotheses have been offered to explain the formation of fragipans. Either chemical or physical reactions or a combination of both reactions have resulted in their formation.

Factors of Soil Formation

External factors control the character and development of soils *(15)*. These factors are important in understanding soil genesis. They may be an agent, force, condition, relationship, or a combination of these that influence parent material *(11)*. The five factors of soil formation are climate, organisms, parent material, relief, and time *(21)*. They determine the characteristics of the soil, but not in terms of processes, causes, or forces active in the system. They can vary either singly or collectively.

Climate

Detailed information on the climate in Winn Parish is given in the section "General Nature of the Parish."

Rainfall and temperature are the most commonly measured features of climate and have been the most closely correlated to soil properties *(11)*. Although average climatic conditions are often given for a region, the extremes of climate in that region may have more influence in the development of certain soils properties. Rainfall and temperature can change, depending upon the relief or elevation within a general area.

Rainfall is relatively uniform throughout Winn Parish. Major differences within the soils in the parish are not a result of variances in rainfall amounts. Boykin and Cahaba are some of the most highly leached soils, but they are different because they have different parent material. The solubility of elements in minerals increases as the temperature rises in summer. When temperatures are below freezing, the physical action of water, primarily in the form of ice, plays an important role in the physical destruction of the soil. This process has minimal influence in Winn Parish, however, which does not experience extremely cold conditions. To a degree, the intensity and annual distribution of rainfall are more important than the absolute amount of rainfall. Rainfall in the parish is not equally distributed throughout the year, and some storms are severe. The intensity of rainfall has an effect on the type and rate of reactions.

Water erodes and deposits soil material, but its most important functions are within the soil profile. Some morphological characteristics result from excessive or inadequate amounts of water. In soils that are highly leached and acid, excessive amounts of water are indicated by grayish colors in the profile. The gray color is caused by reduction. Inadequate amounts of water are indicated by the tendency of very clayey soils to shrink as they dry and swell when they become wet, such as the Bellwood, Hollywood, and Vaiden soils.

Temperature is considered an independent soil-forming factor that influences reactions in the soil-forming process. It is the driving force in most models of evapotranspiration. The combination of evapotranspiration and uneven rainfall distribution is perhaps the most important climatic factor in the soil-forming process. For every 10-degree rise in temperature, the speed of a chemical reaction increases by a factor of 2 to 3 *(42)*. Solar radiation generally increases with increasing elevation. It increases at the most rapid rate in the lower, dust-filled layers of the air. The absorption of solar radiation at the surface is affected by many variables, such as soil color, plant cover, and aspect. South-facing slopes are always warmer than north-facing slopes. Temperature, unlike solar radiation, generally decreases with increasing elevation. The changes in elevation in Winn Parish are not sufficient to have a significant effect on the mean annual soil temperature.

Organisms

The effect of organisms as a soil-forming factor is indicated by the presence or absence of major horizons in the soil profile. Properties associated with living organisms are also important to soil formation. For example, living organisms play a significant role in the cycling of carbon.

The carbon cycle takes place mainly in the biosphere. In photosynthesis, the sun's energy is used to transform carbon and other elements, such as nitrogen and sulfur, to produce organic material. As organic matter decomposes, it releases nitrogen for plant use and returns carbon dioxide directly to the atmosphere. Humus, a somewhat resistant organic material, stays in the soil. Because of its size and chemical composition, humus increases infiltration, available water capacity, and cation-exchange capacity and the absorption and storage capabilities of such nutrients as calcium, magnesium, and potassium. It also improves soil tilth.

The natural vegetation in Winn Parish is quite diverse. The low flats and drainageways are primarily in hardwoods. The gently sloping areas are in mixed hardwoods and pine, and areas on the upper slopes and ridges are in pine and a few hardwoods. In soils with the same parent material, generally the reaction of soils in areas of hardwoods is slightly higher than that of soils in areas of pine. Soils that formed under hardwoods, pines, and mixed pines and hardwoods generally are thicker in the eluvial horizon than those that formed under prairie vegetation. In soils that developed under grass, the surface horizon is generally thicker and has more organic matter than in those that formed under pine or under mixed hardwoods and pine. The amount of organic matter accumulated in the soils depends on other factors, such as temperature and rainfall. Under optimal conditions for microbial activity, the production and decomposition of organic matter are in equilibrium. Accumulation of organic matter will not occur without a change in the factor controlling the equilibrium. The content of organic matter increases when its annual production is high and conditions are not favorable for its decomposition. In Winn Parish, most soils exist in an ecosystem in which the rate of decomposition of organic matter exceeds the ability of the vegetation to return organic matter to the soils; therefore, the soils are low in organic matter. The Osier and Yorktown soils are continuously saturated; therefore, organic matter decomposes (oxidizes) slowly in these soils.

Parent Material

Parent material has been defined as "the state of the soil system at time zero of soil formation" *(21)*. It is that physical body and its associated chemical and mineralogical properties at the starting point that are changed by the other soil-forming factors over time. The influence of parent material on soil properties is greater on the younger soils than on the older soils. For example, the young Roxana soils exhibit more properties associated with the initial deposits than the much older Ruston soils, which may have very few properties in common with the initial parent material. In weathered soils, however, the influence of the parent material may be visible and the parent material can still be an independent factor in soil formation. The nature of the parent material can be expressed in the color, texture, and mineralogy of the soils. These properties can be related to physical and chemical properties, such as heat absorption, susceptibility to erosion, shrink-swell potential, and cation-exchange capacity. The characteristics associated with parent material in the parish are described in the section "Landforms and Surface Geology."

Relief

The relief in Winn Parish ranges from low on flood plains to moderate in the uplands. Relief associated with the physiographic and geologic units within the parish is described in more detail in the section "Landforms and Surface Geology."

Relief and the geologic physiographic units influenced soil formation as a result of their effects on drainage, runoff, and erosion. Within specific geographic regions, several soil properties associated with relief are depth of the solum, thickness of the A horizon and its content of organic matter, wetness or dryness, color of the profile, degree of horizon differentiation, soil reaction, and content of soluble salts.

Relief also affects the moisture relationships in the soil, either in the form of ground water or in the amount of water available for photosynthesis. The water table is closer to the surface in depressions than on high points on the landscape. In soils with the same parent material, the seasonal high water table is more commonly close to the surface in soils in areas of low relief than in soils on convex landscapes. If the parent material is clayey and has low relief, the soils on ridgetops may be the wettest on the landscape.

Time

When considering soil formation, a pedologist normally does not think in terms of depth in inches or centimeters but rather in terms of horizons, sola, and profile development. Rather than absolute time, the rate of change is what affects soil properties. Time as a rate of change is what affects soil properties. Time as a rate of change can be described in terms of relative stages of development, absolute dating of horizons and profiles, the rate of soil formation, and the relation to the age and slope of the landform and associated weathering complex *(17, 19)*.

Several hypotheses or models in regard to time have been developed. The hypothesis of the continuous steady state system determined that time is uninterrupted and soil development begins at time zero *(7, 22)*. The continuous steady state model shows that once a process or feature has begun, it continues to develop over time until one of the soil-forming factors greatly changes. Assuming no major change, the morphological feature in time would develop to the maximum extent without giving way to other features. At time zero, for example, the Roxana soils have no subhorizons. As the processes of soil development begin, a cambic horizon would develop over time until it reached its maximum. According to this theory, no additional change takes place in the other soil-forming processes, and time is the only thing that changes. Because soils represent a dynamic system, however, the continuous steady state hypothesis probably errs in the way it relates time to pedogenic development.

Another hypothesis of soil formation is the sequential model *(4, 12)*. In this model all stages of soil development operate concurrently. Some processes of soil development proceed so slowly that they have very little effect, whereas others are so rapid that they determine the dominant features of the soil. As long as the relative rates of the process continue unchanged, a given set of properties expresses soil development. The sequential model, sometimes referred to as polygenesis, has two major characteristics. First, a soil morphological entity may be a consequence of a combination of several genetic factors. Second, the morphological expression of soil processes may be a result of several pathways. For example, a given soil begins to form in loamy parent material on gently sloping uplands covered with pine forest under a climate similar to that of the present. A darkened surface horizon may form because of the accumulation of organic carbon. Subsequently, an E horizon and an argillic horizon may form. The result is a soil similar to the Ruston soils. As long as the parent material, climate, organisms, and relief did not change substantially over time, the soil would have formed sequentially. The factors, however, possibly could have changed. When some major factor changes, time as a factor of soil formation returns to zero. Because the changes made in a soil by any particular factor remain even after that factor changes, the total amount of time that the factors of soil formation were acting on the soil might not appear to differ from one soil to another.

Several methods can be used to determine the actual age of soils. Morphological properties, however, are most commonly used as a basis for dating the soils. For example, the Boykin soils, which have a thick E horizon, would normally be considered older than the Sacul soils, which have a relatively thin E horizon. Other factors, however, such as parent material, climate, and living organisms, also are important in determining horizon thickness. Although geology can indicate in gross terms the relative age of the soil, pedogenic time returns to zero each time major or catastrophic events affect the landscape. These events generally begin a major geologic period.

The rate of change in weathering decreases over time *(14)*. It becomes constant only when the soil material has been weathered to the maximum extent possible under the effects of a given combination of soil-forming factors. Soil formation is seldom a uniform process over time. Minor fluctuations can constantly readjust the environmental conditions in the system. The relative ages of the soils and their parent materials are described in the section "Landforms and Surface Geology."

Landforms and Surface Geology

William H. Boyd, Soil Scientist, Natural Resources Conservation Service, prepared this section.

The soils of Winn Parish formed in several kinds of unconsolidated parent material. This parent material can be placed in the following general groups based upon its age—recent alluvium, Pleistocene sediment, and Tertiary age marine sediment.

In this soil survey, emphasis was placed upon correlating soil series with specific geologic groups. Therefore, each catena of soils is restricted to a specific geologic age group. The geomorphological surface features, geologic structure, and relative ages of the parent material of the soils in this survey are discussed in the following paragraphs.

Recent Alluvium

The recent alluvium in Winn Parish is from two sources, the Red River and the local streams. Recent alluvium makes up about 18 percent of Winn Parish.

Red River alluvium. The Red River alluvium originates from the Permian red bed areas of several of the western states that are within the drainage basin of the Red River. Soils on the Red River alluvial plain make up about 1 percent of Winn Parish. The area of these soils corresponds to the Moreland-Perry-Roxana general soil map unit.

Differences in soils within the Red River system resulted mainly from the partial sorting of the sediments during deposition. The sediments were partly sorted each time the waters of the river overflowed the stream banks. As the water velocity slowed, the larger sand-sized particles were deposited, then silt, and finally the clay-sized particles were deposited. Thus, the alluvium on the natural levees near the stream channels has a high content of sand; and the alluvium in the backswamps, deposited in still water, has a high content of clay-sized particles. This depositional pattern results in the formation of long, nearly level slopes that extend from the higher natural levees near the stream to the lower clayey backswamps. The gently undulating ridge and swale topography of some areas is formed by the meandering processes of the Red River within its alluvial plain.

In Winn Parish, the Roxana and Gallion soils formed in loamy alluvium on the natural levees of the Red River system. The Moreland, Perry, and Yorktown soils formed in clayey alluvium in lower positions on the flood plain.

Elevations on the Red River alluvial plain range from a maximum of about 112 feet above sea level on the highest parts of the natural levee along Saline Bayou to about 100 feet on the lower parts of the flood plain. Elevations along the natural levee of Saline Bayou are somewhat higher than those along the Red River. The sandbars within the Red River channel are slightly less than 60 feet above sea level.

Geomorphic landscape features recognized on the Red River alluvial plain include point bars, cutbanks, oxbow lakes, natural levees, backswamps, and abandoned channels. St. Maurice Lake is an example of an oxbow lake, the adjacent Quinn Brake is a backswamp, and Saline Bayou is an abandoned channel.

Local alluvium. The alluvial plains of the streams that drain the Coastal Plain uplands of Winn Parish are primarily composed of silt-sized particles. Sandy alluvium is minor and occurs within the confines of the small creek channels. Sandy colluvium occurs in narrow drain heads. No significant areas of clayey alluvium were observed. Clayey alluvium was evidently carried further downstream and deposited in or near Catahoula Lake or into the Red River system. The local stream alluvium is derived by natural geologic erosion of soils of the nearby terraces and uplands.

The acid Guyton and alkaline Brimstone soils formed in the silty alluvium on the flood plains of local streams. The acid Osier soils formed in sandy colluvium at the heads of drainages. These soils make up about 17 percent of the parish. Areas of the Guyton and Brimstone soils correspond to areas of the Guyton general soil map unit. The Osier soils are mainly included in the Sacul-Savannah and Ruston-Savannah general soil map units.

Huner related the alkaline soils and saline prairies to subsurface salt domes in Winn Parish *(20)*.

Several saline prairies occur on the flood plains in Winn Parish. The largest of these prairies is located in the SW1/4 sec. 15, T. 10 N., R. 1 E. Only salt-tolerant grasses and forbs grow in these areas. The areas are identified on the soil survey atlas sheets with a special ad hoc symbol. They are included in the Brimstone very fine sandy loam, occasionally flooded, detailed map unit.

The elevation on the flood plains of streams draining the terraces and uplands ranges from about 55 feet above sea level along the Dugdemona River and Castor Creek near the Grant Parish line to about 200 feet above sea level on the flood plains of several smaller streams.

Major streams that cross the terraces and uplands of Winn Parish include Antwine Creek, Bear Creek, Beaucoup Creek, Beech Creek, Big Creek, Castor Creek, Couley Creek, the Dugdemona River, Flat Creek, Iatt Creek, Kiesche Creek, Kyiaies Creek, Nantachie Creek, and Saline Bayou. Many other smaller named creeks and unnamed drainageways contribute to the erosional and depositional processes occurring in the parish.

Pleistocene Sediment

Pleistocene sediments in Winn Parish were carried and deposited by water. No deposits of loess were recognized in the survey area.

The Pleistocene terraces of Winn Parish are characterized by: (1) brownish soils of late Pleistocene age, occurring on the T1 and T2 terrace levels; and (2) reddish soils of early Pleistocene age, occurring on the generally higher positions of the T3 terrace level. This terrace concept correlates as follows with other Pleistocene terrace concepts: T1—Prairie terrace; T2—Montgomery and intermediate terraces; T3—Bently, Williana, and Citronelle terraces and Upland Graveliferous Terrace Complex *(6, 13, 18, 30, 31a)*.

Soils of the T1 and T2 terrace levels were recognized as being of the same relative age, i.e. late Pleistocene, because (1) Munsell soil colors in brownish hues of 10YR and 7.5YR indicate the same relative oxidation state and, thus, the same relative age; and (2) the physical mechanism that eroded, sorted, and deposited the sediments of the T1 and T2 terrace levels was the same.

The physical mechanism for the formation of the T1 and T2 terraces is as follows. The generally coarser sediments, fine sand and clayey aggregates, were deposited as colluvium after being eroded by water from higher T3 and/or Tertiary landscapes. This colluvium is now the T2 terrace. Water laden with finer sediments, such as very fine sand, silt, and clay, continued downslope to merge, eventually with other water, forming alluvial braided-stream systems in the major drainageways. This alluvial braided-stream material is now the T1 terrace.

This erosional/depositional process is believed to have formed the existing landscape in Winn Parish at some time after cessation of deposition of the T3, early Pleistocene material, and the beginning of the Holocene. It probably occurred in conjunction with climatic changes associated with the waxing and waning of glacial activity during the Pleistocene.

Late Pleistocene sediment. The differences among soils formed in late Pleistocene sediments on the T1 and T2 terraces result primarily from differences in topography and the processes that sorted the sediments during deposition. Sediments characterized by sands coarser than very fine were deposited by fast flowing waters. These sediments are in high positions, the T2 terrace, on landscapes with steep gradients. Finer sediments characterized by very fine sand and silt were then deposited downslope by slow flowing water, the T1 terrace, on landscapes with less gradient. Clayey late Pleistocene sediments were carried further downstream and were not deposited in Winn Parish.

Soils in the parish that formed in late Pleistocene sediments include those of the Darden, Frizzell, Glenmora, Harleston, Kolin, Metcalf, Savannah, and Shatta soil series. These soils make up about 28 percent of the parish. Areas of the Darden, Frizzell, Glenmora, Harleston, and Shatta soils correspond to areas of the Frizzell-Guyton-Glenmora general soil map unit. Areas of the Kolin soils correspond to areas of the Gore-Kolin general soil map unit. The Metcalf soils are included in the Bellwood-Savannah-Vaiden general soil map unit.

The sands in which the Darden soils formed were eroded from uplands in Bienville Parish. They were deposited by fast flowing waters along Saline Bayou in western Winn Parish. The Frizzell, Guyton, and Shatta soils formed in the silty braided-stream deposits of the T1 terrace along the major drainageways. The Savannah soils are at higher elevations on the T2 terrace and formed in material thought to be pedisediments or colluvial sediments eroded from Tertiary age and early Pleistocene age surfaces. The Glenmora soils formed in silty material that is several feet thick and overlies what is thought to be Tertiary age clays of the Jackson Formation. The Harleston soils formed in loamy alluvial sediments that were eroded from higher positions and then deposited as the T1 terrace. The Kolin soils formed in thin deposits of silty late Pleistocene age material that overlies early Pleistocene age clays. The Metcalf soils formed in thin deposits of silty late Pleistocene age material that overlies Tertiary age clays. The silty material of both soils was eroded from surfaces at higher elevations and deposited on the nearly level clayey surfaces.

The Cahaba soils are on terraces along major streams and are at the same elevation as soils of the T1 terrace. However, the Cahaba soils are on landforms which are remnants of the T3 terrace. They formed in sediments of early Pleistocene age.

The T1 terrace in Winn Parish is the first terrace above the alluvial plain of major creeks that drain the Coastal Plain uplands. This broad, flat terrace is considered to be alluvial in origin and was a braided-stream deposit. It was possibly formed during interglacial periods of the Pleistocene when large volumes of silty sediment eroded from surrounding uplands and developed a braided-stream system in the major drainageways.

The sediment of the T1 terrace is characteristically low in clay content, generally less than 18 percent, and is mostly very fine sand and silt. The landscape of the T1 terrace is relatively uneroded. However, a dendritic drainage pattern has formed on the terrace, primarily in areas close to an alluvial plain where the hydraulic gradient is relatively steep.

The T1 terrace parallels major streams and narrows with distance upstream. The terrace eventually merges with the alluvial plain and disappears. The difference in elevation between the T1 terrace and the alluvial plain also decreases with distance upstream. The present alluvial plain has a slightly steeper gradient than the T1 terrace. This relationship is especially evident on the alluvial plain and adjacent terrace along the Dugdemona River.

The T2 terrace in Winn Parish consists of gently rolling hills dissected by numerous small drainageways. The T2 terrace is not a true terrace. It has no gradient and does not parallel major drainages to the extent that the T1 terrace does. Sediment of the T2 terrace was deposited as local colluvium. It was eroded from higher lying Tertiary age and/or early Pleistocene age surfaces during interglacial periods of the Pleistocene Epoch. This sediment is considered to be colluvial in nature and, as such, is different from the T1 sediment which was transported by streams. The sediment of the T2 terrace also differs from that of the T1 terrace in having a higher clay content, lower silt content, and a higher percentage of fine sand.

The Savannah soils were mapped on the T2 terrace. Areas of the Savannah soils correspond primarily to areas of the Sacul-Savannah and Ruston-Savannah general soil map units. The Savannah soils are also minor inclusions in the Bellwood-Savannah-Vaiden and Mahan general soil map units.

The T2 terrace in Winn Parish is higher in elevation than the T1 terrace. In most places, the T2 terrace is immediately adjacent to the T1 terrace. In other places, Tertiary age escarpments separate the T1 from the T2. The T2 terrace sediment commonly occurs stratigraphically on top of the Tertiary sediment, sometimes as thin deposits. In a road cut in the NE¼SE¼ sec. 25, T. 12 N., R. 1 E., about 1,000 feet west of the parish line on Louisiana Highway 127, it is less than 4 feet thick. In places, the brown T2 terrace sediment overlies the red T3 terrace sediment. This situation can be observed in a road cut along Louisiana Highway 499 in the southwest corner of sec. 33, T. 13 N., R. 1 W. Also, in places, post-depositional erosion has entirely removed the T2 terrace sediment from side slopes, exposing Tertiary clays, and leaving only the ridgetops capped with T2 terrace material.

Early Pleistocene sediment. The alluvial material deposited in the early Pleistocene which formed the T3 terrace differed from that deposited in the late Pleistocene which formed the T1 and T2 terraces. This material may have been eroded from Appalachian sources and transported by ancestral Tennessee and/or Ohio River systems *(16, 31)*. Fisk suggested an origin to the north and west *(18)*. This depositional material is referred to as the Citronelle by some early authors *(13)*. It was recently referred to as the "Upland Graveliferous Complex" *(6)*.

The sediment of the early Pleistocene is most abundant east of the Mississippi alluvial valley. It extends from Illinois to southeast Louisiana. It also extends in a westward widening belt across central Louisiana from Sicily Island to the Texas border *(6)*. This sediment occurs in Winn Parish as erosional remnants of this once regionally extensive blanket that unconformably overlies the Tertiary formations. Huner referred to these sediments as those of the Williana and Bently terraces. He described these sediments as 25 to 80 feet thick in Winn Parish *(20)*.

Controversy exists among geologists as to the age of these deposits. Most agree that they are either Pliocene or Pleistocene in age. A recent theory places the origin of these deposits as late Tertiary *(6)*. In acknowledgement of the vast volume of material that has been removed by geologic erosion from the initial upland graveliferous deposit, the earlier age is feasible. This time frame allows more time during the Pleistocene for the nearly total removal by erosion of the sediment of the early Pleistocene.

The differences among soils formed in early Pleistocene sediments result from differences primarily in the partial sorting of sediments during deposition. Some of the sediment contained large amounts of gravel, cobbles, and stones; thus, it could only be transported by fast flowing water. In other areas, the sediment is quite sandy, but it contains no gravel. This sediment was evidently transported by slower flowing water. Most of the sediments are quite sandy, but some are clayey. The red clayey soils in the southwestern and south-central parts of the parish were thought to be formed in clayey sediments of early Pleistocene age. These clayey sediments are referred to as Red River terrace deposits by some authors and were designated as sediment of the Prairie and Montgomery terraces by Huner *(20)*. Even though study of this depositional period has been focused on these graveliferous and sandy sediments, the waters that deposited them unquestionably also carried clay-sized particles. These clayey headwater sediments filled the Tertiary age Red River valley and other low lying areas and were overlain by the later deposited sandy and graveliferous sediments.

The early Pleistocene sediments were deposited on the eroded surface of Tertiary age formations. This relationship is also evident in other soil survey areas where the red graveliferous sediments overlie formations of Tertiary age *(37, 38)*. In Winn Parish, the graveliferous sediments overlie Tertiary surfaces of the Jackson, Cockfield, Cook Mountain, and Sparta Formations.

Soils in Winn Parish that formed in early Pleistocene age sediments include the Boykin, Cahaba, Gore, Kolin, Ruston, and Smithdale soils. Areas of the Boykin, Ruston, and Smithdale soils correspond to areas of the Ruston-Savannah general soil map unit and are also included in the Bellwood-Savannah-Vaiden and Sacul-Savannah general soil map units. The Cahaba soils are included in the Frizzell-Glenmora-Guyton general soil map unit. Areas of the Gore and Kolin soils correspond to areas of the Gore-Kolin general soil map unit.

The Boykin, Cahaba, Ruston, and Smithdale soils formed in loamy sediments that contained varying amounts of clay. The Boykin soils formed in loamy sediments that contained less clay than the sediments in which the Cahaba, Ruston, and Smithdale soils formed. The Ruston soils have a profile with a bisequum. Some pedologists believe this indicates the soils formed in sediment from two depositional events. The Ruston soil may have developed an argillic horizon in the underlying sediment; then more sediment was deposited on top of it, and the soil formed an argillic horizon in the upper sediment. Other pedologists believe the Ruston soils formed in only one layer of sediment. The Gore soils formed in the clayey headwater sediments after the sandier sediments were removed by erosion. The Kolin soils formed in thin deposits of silty late Pleistocene age material that overlies the early Pleistocene age clays. The silty material was eroded from surfaces at higher elevations and deposited on the nearly level clayey surfaces.

The T3 terrace in Winn Parish was thought to be the Citronelle Formation as described by Chawner in Catahoula Parish *(13)*. This same terrace was designated as Bently and Williana age Pleistocene terraces by Huner *(20)*. Recently, it was referred to as the "Upland Graveliferous Complex" by Autin, et al. *(6)*. Sediment of the T3 terrace is characterized by its highly oxidized, reddish color; mixtures of chert gravels; and by fine- to coarse-grained cross-bedded sands, silts, and clays.

The surface of the T3 terrace generally is at a higher elevation than the T2 terrace and the Tertiary age uplands. An area of the T3 terrace in the SE¼SE¼ sec. 20 T. N., R. 4 W., has an elevation of slightly more than 350 feet. It is the highest point in Winn Parish.

In some areas, the T3 terrace is adjacent to the T2 terrace. In others, the T3 terrace occurs as islands surrounded by Tertiary material. Some road cut exposures show the T3 terrace overlain by sediment of the T2 terrace. An area of T3 terrace material in the SE¼SW¼ sec. 4, T. 9 N., R. 5 W., occurs as a small hill. The Ruston soils of the T3 terrace are mapped on the crest of the hill. The Savannah soils of the T2 terrace are mapped on its side slopes, and Glenmora soils of the T1 terrace are on broad flats surrounding the hill.

Another representative area of the T3 terrace in Winn Parish is a road cut exposure in the NW¼SE¼ sec. 19, T. 10 N., R. 5 W., on U.S. Highway 84, at the Dogwood Trail in the Kisatchie National Forest. This exposure was identified by Huner as the Bently terrace *(20)*.

Another interesting exposure of the T3 terrace in Winn Parish can be observed in a railroad cut in the NE¼ of Spanish Land Grant sec. 37, T. 9 N., R. 6 W., at St. Maurice. This exposure is reddish and very graveliferous. In this exposure, a stone line separates the overlying T3 material from what is thought to be Tertiary age material of the Sparta Formation. A rectangular stone found in the stone line at this site measuring about 14x16x5 inches and weighing 76 pounds is evidence that the velocity of the water carrying these sediments was significant.

In the SE¼NE¼ sec. 23, T. 9 N., R. 4 W., in the vicinity of a logging road intersection, many pebbles are scattered over the surface of an outcropping of the Jackson Formation of Tertiary age. The gravels were thought to be erosional remnants of the T3 terrace which once capped the Jackson Formation. The same situation is evident in the NE¼ of Spanish Land Grant sec. 37, T. 9 N., R. 6 W., about 600 feet southeast of Saline Bayou, north of the railroad.

Tertiary Age Marine Sediment

Tertiary age sediment in Winn Parish was identified, described, and delineated by Huner as surface exposures of the Jackson Group, Cockfield Formation, Cook Mountain Formation, and Sparta Formation (youngest to oldest) *(20)*. The Cockfield, Cook Mountain, and Sparta Formations are members of the Claiborne Group. Both the Claiborne and Jackson Groups are in the Eocene Series of the Tertiary System.

Huner stated, "The sands of the Sparta closely resemble the Pleistocene sands" *(20)*. He also stated, "Except for color and the massive character, there is no evidence to confirm the belief that this material might be of Pleistocene age." These statements indicate that differentiating Pleistocene sediments from some Tertiary sediments may be difficult. However, some consistent differences between the two sediments were observed in this survey and in surveys of nearby parishes. First, all soils formed in Tertiary sediments are underlain by grayish parent material that is mostly stratified sands and clays, or it is thick strata of grayish to yellowish clays. Second, most of the soils formed in Pleistocene sediments are underlain by reddish or brownish relatively homogeneous parent material from which the soil formed. An exception is where the soils formed in thin layers of Pleistocene sediments over Tertiary sediments. Third, parent materials of Tertiary formations, when sandy, contain a dominance of very fine sands. Those sediments of early and late Pleistocene age contain a dominance of fine and coarser sand. However, this third criteria is not true for the soils on the T1 terrace, because the sediments were sorted during the depositional sequence.

In the vicinity of Coochie Brake, as indicated on the general soil map, the Cook Mountain Formation of the Bellwood-Savannah-Vaiden map unit, is only 5 1/2 miles from the Jackson Group, also of the Bellwood-Savannah-Vaiden map unit. The same soil series was mapped on both the Cook Mountain Formation and the Jackson Group.

A review of the paleontology of the Cook Mountain Formation and the Jackson Group as reported by Huner indicates that four genera (Conus, Natica, Volutilithes, and Dentalium) and one species (Pseudoliva vestusta) occur in both formations *(20)*.

The close proximity of the two geologic units, the mapping of the same soil series on both geologic units, and the paleontology study suggest that the stratigraphy of this area of Winn Parish was not correctly interpreted. Localized warping of this strata with the Cockfield overlying it can easily be visualized. Further study is needed to better define the stratigraphy of this area.

Jackson Group. Soils formed in the Jackson Group occur in south-central Winn Parish. They are characterized mainly by their high content of clay.

The landscape of the Jackson Group is one of broad, stable ridgetops with short, steep or gentle side slopes. Relatively few streams and drainageways cross the areas. The gentle relief is attributed to the high clay content of the soils. The soils are less susceptible to erosion than soils having a higher content of sand and silt.

Soils formed in sediment of the Jackson Group include the Bellwood, Hollywood, Keiffer, Metcalf, Oktibbeha, and Vaiden soils. Areas of these soils correspond to that part of the Bellwood-Savannah-Vaiden general soil map unit in the southeastern part of the parish. The Bellwood and Metcalf soils contain no calcium carbonate. The Keiffer soils are in open prairies and have a high content of calcium carbonate throughout the profile. The Hollywood, Oktibbeha, and Vaiden soils have accumulations of calcium carbonate in the lower part of the profile.

The calcium carbonate formed from the remains of mullosks, coral, and other marine life forms. Fossils of these marine animals are common in subsurface exposures of these soils. Gypsum crystals (calcium sulfate) are also common in a few areas. Some of the crystals are as long as 10 inches.

Cockfield Formation. The soils formed in sediment of the Cockfield Formation are in a wide area in Winn Parish. The landscape of this formation is characterized by narrow ridgetops and long, steep slopes along drainageways. It is crossed by many small drainageways that feed into larger creeks and streams.

The Sacul soils are the only soils in the parish that formed in the Cockfield sediments. These soils have a thin solum and consist of red clay in the upper part and gray clay in the lower part. The profile grades with depth to highly stratified sand and clay parent material of the Cockfield. A large part of the area of the Sacul-Savannah general soil map unit consists of the Cockfield Formation.

Cook Mountain Formation. The soils formed in sediment of the Cook Mountain Formation are in a band about 6 miles wide at its northern limit and about 2 miles wide at its southern tip. Areas of these soils correspond to areas of the Mahan general soil map unit and to that part of the Bellwood-Savannah-Vaiden general soil map unit that is in the western part of the parish. The landscape of the Cook Mountain Formation is similar to that of the Jackson Group.

In this survey, the same soils were mapped on both the Cook Mountain Formation and the Jackson Group. The only exception is the Mahan soil which is mapped only on the Cook Mountain Formation. The Mahan soils are characterized by dark reddish colors, blocky structure, and kaolinitic mineralogy. The kaolinitic mineralogy of the Mahan soil is derived from the glauconitic materials that are reported to occur in this formation *(20)*. A borrow pit in the SE1/4NW1/4 sec. 12, T. 13 N., R. 3 W., has soil material with glauconitic characteristics.

Most areas of the Mahan soils are in positions similar to those of the Ruston soils. They are on the high points of the landscape and seem to occur as erosional remnants. In places, the Ruston soils are mapped as occurring stratigraphically over the Mahan soils.

Large ironstone boulders, 3 to 10 feet in diameter, occur in a few places. These boulders are near areas of the Mahan soils and are probably associated with the high iron content of this soil. In the NE1/4SE1/4 sec. 2, T. 12 N., R. 4 W., several of the boulders lie exposed on the surface. Another large boulder, visible from the highway, is on the west side of U.S. Highway 84 in north Dodson.

Sparta Formation. Outcrops of the Sparta Formation are in the northwestern part of Winn Parish. The landscape of the Sparta Formation is similar to that of the Cockfield Formation.

The Sacul soils are the only soils mapped on the Sparta Formation. They formed in a clayey unit of the Sparta Formation. The Sacul soils are also mapped on the Cockfield Formation. Areas of these soils correspond to the area of the Sacul-Savannah general soil map unit in the western part of the parish.

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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.

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

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

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

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

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

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

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or “"chain,” of soils on a landscape that formed in similar kinds of parent material but that have different characteristics as a result of differences in relief and drainage.

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.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

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.

Cemented.—Hard; little affected by moistening.

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.

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.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of 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.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

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 human or animal activities or of a catastrophe in nature, such as fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

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.

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

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

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue 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, an Arabic numeral, commonly a 2, precedes the letter C.

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.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Large stones (in tables). Rock fragments that are 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

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

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

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

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

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

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

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

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

Mottling, soil. Irregular spots of different colors that vary in number and size. 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).

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 with hue of 10YR, 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.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

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, such as 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.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of 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 values, are:

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

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

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

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.

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.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of 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.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, thickness of the line can be one fragment or more. It generally overlies material that weathered in place, and it is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

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.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in organic matter content than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the ""plow layer," or the ""Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying ""coarse," ""fine," or ""very fine."

Thin layer (in tables). 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.

Toxicity (in tables). An excessive amount of toxic substances in the soil, such as sodium or sulfur, severely hinders the establishment of vegetation or severely restricts plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

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.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1972-86 at Bienville, 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-----	54.0	32.7	43.4	80	10	82	6.22	2.53	9.33	7	1.0
February----	60.4	36.9	48.7	83	14	97	4.81	2.65	6.72	6	0.0
March-------	69.7	45.5	57.6	87	25	254	6.04	4.03	7.86	7	0.0
April-------	76.5	52.0	64.3	88	33	429	4.54	2.41	6.40	6	0.0
May---------	83.5	60.0	71.8	94	43	676	6.63	2.44	10.11	7	0.0
June--------	90.3	67.0	78.7	98	51	861	4.29	1.50	6.59	6	0.0
July--------	94.0	70.7	82.4	101	61	1004	3.51	.99	5.54	6	0.0
August------	93.2	69.4	81.3	101	56	970	3.59	1.40	5.42	6	0.0
September---	86.6	64.0	75.3	96	40	759	4.11	1.76	6.11	5	0.0
October-----	77.4	52.5	65.0	93	32	465	5.68	2.65	8.27	6	0.0
November----	66.1	43.6	54.9	84	21	200	5.52	3.27	7.53	7	0.0
December----	58.0	35.8	46.9	79	14	90	5.62	2.16	8.51	6	0.0
Yearly:											
Average---	75.8	52.5	64.2	---	---	---	---	---	---	---	---
Extreme---	---	---	---	102	9	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,887	60.56	50.71	69.93	75	1.0

* 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

(Recorded in the period 1972-86 at Bienville, Louisiana)

Probability	Temperature: 24 °F or lower	Temperature: 28 °F or lower	Temperature: 32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Mar. 6	Mar. 15	Apr. 8
2 years in 10 later than--	Feb. 27	Mar. 10	Apr. 2
5 years in 10 later than--	Feb. 14	Feb. 27	Mar. 21
First freezing temperature in fall:			
1 year in 10 earlier than--	Nov. 27	Nov. 9	Oct. 15
2 years in 10 earlier than--	Dec. 1	Nov. 14	Oct. 23
5 years in 10 earlier than--	Dec. 9	Nov. 22	Nov. 6

TABLE 3.--GROWING SEASON

(Recorded in the period 1972-86 at Bienville, Louisiana)

Probability	Daily minimum temperature during growing season: Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	275	247	206
8 years in 10	283	254	214
5 years in 10	299	268	229
2 years in 10	320	283	245
1 year in 10	>365	295	258

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Bc	Bellwood loam, 1 to 5 percent slopes	22,300	3.6
BD	Bellwood loam, 5 to 15 percent slopes	21,000	3.4
Bo	Boykin loamy fine sand, 1 to 5 percent slopes	2,000	0.3
BP	Boykin loamy fine sand, 5 to 20 percent slopes	3,400	0.6
Br	Brimstone very fine sandy loam, occasionally flooded	1,400	0.2
Ca	Cahaba fine sandy loam, 1 to 3 percent slopes	1,800	0.3
Da	Darden loamy fine sand, 1 to 5 percent slopes	800	0.1
Dp	Dumps, quarry	100	*
Fz	Frizzell-Guyton silt loams, 0 to 2 percent slopes	87,600	14.4
Ga	Gallion silt loam, rarely flooded	500	0.1
Gc	Glenmora silt loam, 1 to 3 percent slopes	12,300	2.0
Ge	Gore silt loam, 1 to 5 percent slopes	1,400	0.2
GO	Gore silt loam, 5 to 15 percent slopes	3,800	0.6
GY	Guyton silt loam, frequently flooded	101,700	16.7
Ha	Harleston fine sandy loam, 1 to 3 percent slopes	8,100	1.3
Hw	Hollywood silty clay loam, 1 to 5 percent slopes	2,700	0.4
Ke	Keiffer loam, 1 to 5 percent slopes	300	*
Ko	Kolin silt loam, 1 to 5 percent slopes	2,400	0.4
Ma	Mahan fine sandy loam, 1 to 5 percent slopes	4,600	0.8
MB	Mahan fine sandy loam, 5 to 15 percent slopes	7,000	1.1
Me	Metcalf silt loam, 0 to 2 percent slopes	5,000	0.8
Mo	Moreland clay, occasionally flooded	1,200	0.2
Ok	Oktibbeha silt loam, 1 to 5 percent slopes	1,700	0.3
OL	Oktibbeha silt loam, 5 to 15 percent slopes	1,800	0.3
Os	Osier fine sandy loam, 0 to 2 percent slopes	4,100	0.7
Pe	Perry clay, occasionally flooded	1,100	0.2
Pg	Pits, gravel	100	*
Pr	Pits, quarry	100	*
Ra	Roxana silt loam, occasionally flooded	300	*
Ro	Roxana silt loam, frequently flooded	100	*
Rr	Roxana-Moreland complex, gently undulating, occasionally flooded	800	0.1
Rs	Ruston fine sandy loam, 1 to 5 percent slopes	11,600	1.9
Sa	Sacul fine sandy loam, 1 to 5 percent slopes	43,100	7.0
SC	Sacul fine sandy loam, 5 to 20 percent slopes	145,900	23.9
Sh	Savannah fine sandy loam, 1 to 5 percent slopes	85,600	14.0
Sk	Shatta very fine sandy loam, 1 to 5 percent slopes	4,600	0.8
SM	Smithdale fine sandy loam, 5 to 20 percent slopes	8,400	1.4
Va	Vaiden silty clay loam, 0 to 1 percent slopes	6,900	1.1
YO	Yorktown clay, frequently flooded	2,300	0.4
	Water, large	2,300	0.4
	Total	612,200	100.0

* Less than 0.1 percent.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Grain sorghum	Bahiagrass	Common bermuda-grass	Improved bermuda-grass
		Bu	Bu	AUM*	AUM*	AUM*
Bc------------------------ Bellwood	IVe	---	---	5.5	5.0	8.0
BD------------------------ Bellwood	VIe	---	---	5.5	5.0	7.0
Bo------------------------ Boykin	IIIs	---	---	8.0	6.0	10.0
BP------------------------ Boykin	VIe	---	---	5.0	5.0	7.0
Br------------------------ Brimstone	IIIs	---	---	---	---	---
Ca------------------------ Cahaba	IIe	---	---	8.0	6.5	9.5
Da------------------------ Darden	IVs	---	---	---	---	---
Dp**. Dumps, quarry						
Fz:						
Frizzell------------------	IIw	---	---	6.8	5.0	10.0
Guyton--------------------	IIIw	---	---	6.0	4.5	9.0
Ga------------------------ Gallion	I	90	80	9.5	7.0	15.0
Gc------------------------ Glenmora	IIe	---	---	7.0	5.0	11.0
Ge------------------------ Gore	IVe	---	---	6.5	4.5	8.0
GO------------------------ Gore	VIe	---	---	---	---	---
GY------------------------ Guyton	Vw	---	---	---	4.0	---
Ha------------------------ Harleston	IIe	---	---	8.5	6.5	10.5
Hw------------------------ Hollywood	IIIe	---	---	---	4.5	8.0
Ke------------------------ Keiffer	IIIe	---	---	5.0	---	8.0
Ko------------------------ Kolin	IIIe	---	---	8.5	5.5	12.0

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Grain sorghum	Bahiagrass	Common bermuda-grass	Improved bermuda-grass
		Bu	Bu	AUM*	AUM*	AUM*
Ma----------------------- Mahan	IIIe	---	---	7.0	5.0	8.0
MB----------------------- Mahan	VIe	---	---	6.0	4.5	7.0
Me----------------------- Metcalf	IIw	---	---	7.0	5.0	11.0
Mo----------------------- Moreland	IVw	---	65	---	5.5	---
Ok----------------------- Oktibbeha	IIIe	---	---	---	5.0	9.0
OL----------------------- Oktibbeha	VIe	---	---	---	4.5	8.0
Os----------------------- Osier	Vw	---	---	---	---	---
Pe----------------------- Perry	IVw	---	65	---	6.5	---
Pg**. Pits, gravel						
Pr**. Pits, quarry						
Ra----------------------- Roxana	IIw	85	75	---	8.5	15.5
Ro----------------------- Roxana	Vw	---	---	---	---	---
Rr**: Roxana------------------	IIw	---	75	---	8.5	15.5
Moreland----------------	IVw	---	65	---	5.5	---
Rs----------------------- Ruston	IIIe	---	---	9.5	5.5	12.0
Sa----------------------- Sacul	IVe	---	---	7.5	6.5	7.5
SC----------------------- Sacul	VIe	---	---	6.5	5.5	7.0
Sh----------------------- Savannah	IIe	---	---	9.0	5.5	8.5
Sk----------------------- Shatta	IIIe	---	---	6.0	5.5	8.5
SM----------------------- Smithdale	VIe	---	---	8.0	5.0	9.0

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Grain sorghum	Bahiagrass	Common bermuda-grass	Improved bermuda-grass
		Bu	Bu	AUM*	AUM*	AUM*
Va------------------------ Vaiden	IIIw	---	---	6.5	5.0	4.5
YO------------------------ Yorktown	VIIw	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 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)

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
Bc, BD------------- Bellwood	8C	Severe	Moderate	Moderate	Moderate	Loblolly pine-------	78	8	Loblolly pine.
						Shortleaf pine------	68	7	
						White oak-----------	70	4	
						Southern red oak----	75	4	
Bo, BP------------- Boykin	10S	Slight	Moderate	Slight	Moderate	Loblolly pine-------	92	10	Loblolly pine.
						Shortleaf pine------	76	8	
						Longleaf pine-------	---	---	
						Water oak-----------	---	---	
						Southern red oak----	---	---	
						Post oak------------	---	---	
Br----------------- Brimstone	11T	Severe	Moderate	Severe	Moderate	Loblolly pine-------	80	8	Loblolly pine, water oak.
						Sweetgum------------	---	---	
						Water oak-----------	---	---	
Ca----------------- Cahaba	9A	Slight	Slight	Slight	Moderate	Loblolly pine-------	87	9	Loblolly pine, sweetgum, water oak.
						Shortleaf pine------	70	8	
						Yellow-poplar-------	---	---	
						Sweetgum------------	90	7	
						Southern red oak----	---	---	
						Water oak-----------	---	---	
Da----------------- Darden	8S	Moderate	Severe	Slight	Slight	Loblolly pine-------	80	8	Loblolly pine.
						Shortleaf pine------	70	8	
						Blackjack oak-------	---	---	
						Sand oak------------	---	---	
						Sassafras-----------	---	---	
Fz**:									
Frizzell----------	9W	Moderate	Slight	Moderate	Severe	Loblolly pine-------	90	9	Loblolly pine, water oak, Shumard oak.
						Sweetgum------------	90	7	
						Water oak-----------	---	---	
Guyton------------	8W	Severe	Moderate	Severe	Severe	Loblolly pine-------	85	8	Loblolly pine, water oak, green ash.
						Sweetgum------------	---	---	
						Green ash-----------	---	---	
						Cherrybark oak------	---	---	
						Water oak-----------	---	---	
						Willow oak----------	78	5	
Ga----------------- Gallion	9A	Slight	Slight	Slight	Moderate	Cherrybark oak------	95	9	Water oak, Shumard oak, cherrybark oak, pecan.
						Green ash-----------	80	4	
						Sweetgum------------	83	6	
						Water oak-----------	---	---	
						Pecan---------------	---	---	
						American sycamore---	---	---	
						Eastern cottonwood--	100	9	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	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
Gc------------------ Glenmora	10A	Slight	Slight	Moderate	Severe	Loblolly pine-------	93	10	Loblolly pine, Shumard oak.
						Shortleaf pine------	---	---	
						Sweetgum------------	---	---	
						Southern red oak----	---	---	
						Hickory-------------	---	---	
						White oak-----------	---	---	
						Post oak------------	---	---	
Ge, GO------------- Gore	7C	Moderate	Moderate	Slight	Slight	Loblolly pine-------	76	7	Loblolly pine.
						Shortleaf pine------	---	---	
						Southern red oak----	---	---	
						White oak-----------	---	---	
GY----------------- Guyton	6W	Severe	Severe	Severe	Severe	Green ash-----------	100	6	Nuttall oak, green ash.
						Sweetgum------------	---	---	
						Black willow--------	---	---	
						Nuttall oak---------	---	---	
						Eastern cottonwood--	---	---	
						Sugarberry----------	---	---	
						Loblolly pine-------	95	10	
						American beech------	---	---	
Ha----------------- Harleston	9A	Slight	Slight	Slight	Moderate	Loblolly pine-------	90	9	Loblolly pine.
						Shortleaf pine------	80	9	
						Sweetgum------------	75	5	
Hw----------------- Hollywood	9C	Moderate	Severe	Slight	Severe	Loblolly pine-------	90	9	Loblolly pine.
						Sweetgum------------	90	7	
						Shortleaf pine------	---	---	
						Post oak------------	---	---	
Ke----------------- Keiffer	3C	Moderate	Moderate	Slight	Slight	Eastern redcedar----	37	3	Eastern redcedar.
Ko----------------- Kolin	8A	Slight	Slight	Moderate	Severe	Loblolly pine-------	80	8	Loblolly pine.
						Shortleaf pine------	---	---	
						Sweetgum------------	---	---	
						Southern red oak----	---	---	
						White oak-----------	---	---	
						Hickory-------------	---	---	
						Post oak------------	---	---	
Ma, MB------------- Mahan	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	90	9	Loblolly pine.
						Shortleaf pine------	---	---	
						Hickory-------------	---	---	
						Southern red oak----	---	---	
						Sweetgum------------	---	---	
						White oak-----------	---	---	
						Post oak------------	---	---	
Me----------------- Metcalf	10W	Moderate	Slight	Moderate	Severe	Loblolly pine-------	92	10	Loblolly pine, Shumard oak, cherrybark oak.
						Shortleaf pine------	74	8	
						Sweetgum------------	---	---	
						Southern red oak----	---	---	
						White oak-----------	---	---	
						Post oak------------	---	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
Mo----------------- Moreland	3W	Severe	Moderate	Moderate	Severe	Green ash----------- Sweetgum------------ Honeylocust--------- Nuttall oak--------- Sugarberry---------- Overcup oak--------- Water hickory-------	75 90 --- --- --- --- ---	3 7 --- --- --- --- ---	Green ash, Nuttall oak.
Ok, OL------------- Oktibbeha	7C	Moderate	Moderate	Slight	Moderate	Loblolly pine------- Shortleaf pine------ Eastern redcedar---- Southern red oak---- Post oak------------ Sweetgum------------	76 66 45 70 --- ---	7 7 4 4 --- ---	Loblolly pine.
Os----------------- Osier	9W	Severe	Severe	Severe	Severe	Loblolly pine------- Longleaf pine-------	87 69	9 5	Loblolly pine.
Pe----------------- Perry	3W	Severe	Moderate	Moderate	Severe	Green ash----------- Sweetgum------------ Water oak----------- Nuttall oak--------- Honeylocust--------- Sugarberry---------- Baldcypress---------	75 92 --- --- --- --- ---	3 8 --- --- --- --- ---	Nuttall oak, green ash, water oak.
Ra----------------- Roxana	12A	Slight	Slight	Slight	Moderate	Eastern cottonwood-- Sweetgum------------ Pecan--------------- American sycamore--- Water oak----------- Cherrybark oak------ Willow oak----------	115 100 --- --- --- --- ---	12 10 --- --- --- --- ---	Pecan, water oak, cherrybark oak, Shumard oak.
Ro----------------- Roxana	8W	Moderate	Moderate	Moderate	Moderate	Eastern cottonwood-- Black willow--------	95 ---	8 ---	Eastern cottonwood, green ash, American sycamore.
Rr**:									
Roxana------------	12A	Slight	Slight	Slight	Moderate	Eastern cottonwood-- Sweetgum------------ Pecan--------------- American sycamore--- Water oak----------- Cherrybark oak------ Willow oak---------- Nuttall oak---------	115 100 --- --- --- --- --- ---	12 10 --- --- --- --- --- ---	Water oak, cherrybark oak, Shumard oak.
Moreland----------	3W	Severe	Moderate	Moderate	Severe	Green ash----------- Sweetgum------------ Honeylocust--------- American sycamore--- Water oak----------- Nuttall oak--------- Sugarberry----------	75 90 --- --- 90 --- ---	3 7 --- --- 6 --- ---	Green ash, water oak, Nuttall oak.

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
Rs------------------ Ruston	8A	Slight	Slight	Slight	Slight	Loblolly pine-------	84	8	Loblolly pine.
						Shortleaf pine------	75	8	
						Southern red oak----	---	---	
						Post oak------------	---	---	
						Sweetgum------------	---	---	
						Hickory-------------	---	---	
Sa, SC-------------- Sacul	8C	Moderate	Slight	Moderate	Moderate	Loblolly pine-------	84	8	Loblolly pine.
						Shortleaf pine------	74	8	
						Southern red oak----	---	---	
						Post oak------------	---	---	
Sh------------------ Savannah	8A	Slight	Slight	Moderate	Moderate	Loblolly pine-------	81	8	Loblolly pine.
						Shortleaf pine------	76	8	
						Southern red oak----	75	4	
						Sweetgum------------	---	---	
						Post oak------------	---	---	
Sk------------------ Shatta	8A	Slight	Slight	Moderate	Moderate	Loblolly pine-------	83	8	Loblolly pine.
						Shortleaf pine------	77	9	
						Sweetgum------------	---	---	
						Southern red oak----	---	---	
						White oak-----------	---	---	
SM------------------ Smithdale	8R	Slight	Slight	Slight	Slight	Loblolly pine-------	80	8	Loblolly pine.
						Shortleaf pine------	69	8	
						Southern red oak----	---	---	
						Post oak------------	---	---	
Va------------------ Vaiden	8C	Moderate	Moderate	Slight	Severe	Loblolly pine-------	79	8	Loblolly pine.
						Shortleaf pine------	66	7	
						Eastern redcedar----	45	4	
						Southern red oak----	70	4	
						Sweetgum------------	---	---	
						White oak-----------	---	---	
YO------------------ Yorktown	3W	Severe	Severe	Severe	Severe	Baldcypress---------	70	3	Baldcypress, green ash, water tupelo.
						Water tupelo--------	---	---	
						Water hickory-------	---	---	
						Green ash-----------	---	---	

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 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)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Bc-------------------- Bellwood	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
BD-------------------- Bellwood	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, percs slowly.
Bo-------------------- Boykin	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Slight.
BP-------------------- Boykin	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: slope.
Br-------------------- Brimstone	Severe: flooding, wetness, excess sodium.	Severe: wetness, excess sodium.	Severe: wetness, excess sodium.	Severe: wetness.	Severe: wetness, excess sodium.
Ca-------------------- Cahaba	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
Da-------------------- Darden	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: droughty.
Dp*. Dumps, quarry					
Fz*:					
Frizzell-------------	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Guyton---------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ga-------------------- Gallion	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
Gc-------------------- Glenmora	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
Ge-------------------- Gore	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: droughty.
GO-------------------- Gore	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, droughty.
GY-------------------- Guyton	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ha-------------------- Harleston	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones, wetness.	Slight----------	Slight.
Hw-------------------- Hollywood	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight----------	Slight.
Ke-------------------- Keiffer	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope.	Slight----------	Slight.
Ko-------------------- Kolin	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
Ma-------------------- Mahan	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
MB-------------------- Mahan	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Me-------------------- Metcalf	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
Mo-------------------- Moreland	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
Ok-------------------- Oktibbeha	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
OL-------------------- Oktibbeha	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
Os-------------------- Osier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Pe-------------------- Perry	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
Pg*. Pits, gravel					
Pr*. Pits, quarry					
Ra-------------------- Roxana	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
Ro-------------------- Roxana	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Slight----------	Severe: flooding.
Rr*: Roxana---------------	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Rr*:					
Moreland	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
Rs Ruston	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Sa Sacul	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Slight	Slight.
SC Sacul	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Sh Savannah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, droughty.
Sk Shatta	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
SM Smithdale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Va Vaiden	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
YO Yorktown	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.	Severe: ponding, flooding, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Bc-----------------Bellwood	Fair	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BD-----------------Bellwood	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Bo, BP-------------Boykin	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Br-----------------Brim stone	Fair	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ca-----------------Cahaba	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Da-----------------Darden	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Dp*. Dumps, quarry											
Fz*:											
Frizzell-----------	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Guyton-------------	Fair	Fair	Fair	Fair	Fair	Good	Good	Good	Fair	Fair	Good.
Ga-----------------Gallion	Good	Good	Good	Good	Fair	Good	Poor	Very poor.	Good	Good	Very poor.
Gc-----------------Glenmora	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ge-----------------Gore	Fair	Fair	Good	Fair	Fair	Good	Poor	Poor	Fair	Fair	Poor.
GO-----------------Gore	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
GY-----------------Guyton	Poor	Fair	Fair	Fair	Fair	Poor	Good	Good	Poor	Fair	Good.
Ha-----------------Harleston	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Hw-----------------Hollywood	Fair	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Ke-----------------Keiffer	Fair	Fair	Fair	Poor	Fair	Poor	Poor	Very poor.	Fair	Poor	Very poor.
Ko-----------------Kolin	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ma-----------------Mahan	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MB----------------- Mahan	Poor	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Me----------------- Metcalf	Fair	Good	Good	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Mo----------------- Moreland	Fair	Fair	Fair	Good	Poor	Fair	Good	Good	Fair	Good	Good.
Ok----------------- Oktibbeha	Fair	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Poor.
OL----------------- Oktibbeha	Fair	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Os----------------- Osier	Very poor.	Poor	Fair	Fair	Fair	Fair	Fair	Good	Poor	Fair	Fair.
Pe----------------- Perry	Fair	Fair	Fair	Good	---	Good	Good	Good	Fair	Good	Good.
Pg*. Pits, gravel											
Pr*. Pits, quarry											
Ra----------------- Roxana	Good	Good	Good	Good	Fair	Good	Poor	Very poor.	Good	Good	Very poor.
Ro----------------- Roxana	Poor	Fair	Fair	Good	Poor	Fair	Poor	Very poor.	Fair	Good	Very poor.
Rr*:											
Roxana-------------	Good	Good	Good	Good	Fair	Good	Poor	Very poor.	Good	Good	Very poor.
Moreland-----------	Fair	Fair	Fair	Good	Poor	Fair	Good	Good	Fair	Good	Good.
Rs----------------- Ruston	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sa----------------- Sacul	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SC----------------- Sacul	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Sh----------------- Savannah	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sk----------------- Shatta	Good	Good	Good	---	Good	Good	Poor	Poor	Good	Good	Poor.
SM----------------- Smithdale	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Va----------------- Vaiden	Fair	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life
YO-----------------Yorktown	Very poor.	Very poor.	Very poor.	Poor	Poor	Poor	Poor	Good	Very poor.	Very poor.	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--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)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Bc: Bellwood	Severe: cutbanks cave, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
BD: Bellwood	Severe: cutbanks cave, wetness.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, percs slowly.
Bo: Boykin	Slight	Slight	Slight	Slight	Slight.
BP: Boykin	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Br: Brimstone	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, low strength, flooding.	Severe: wetness, excess sodium.
Ca: Cahaba	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Da: Darden	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: droughty.
Dp*. Dumps, quarry					
Fz*:					
Frizzell	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Guyton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
Ga: Gallion	Slight	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
Gc: Glenmora	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: low strength.	Slight.
Ge: Gore	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: droughty.
GO: Gore	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, droughty.
GY: Guyton	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ha---------------- Harleston	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
Hw---------------- Hollywood	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Ke---------------- Keiffer	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Ko---------------- Kolin	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
Ma---------------- Mahan	Moderate: too clayey.	Slight-----------	Slight-----------	Moderate: low strength.	Slight.
MB---------------- Mahan	Moderate: too clayey, slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Me---------------- Metcalf	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
Mo---------------- Moreland	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.
Ok---------------- Oktibbeha	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
OL---------------- Oktibbeha	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
Os---------------- Osier	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Pe---------------- Perry	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: wetness, flooding, low strength.	Severe: wetness, too clayey.
Pg*. Pits, gravel					
Pr*. Pits, quarry					
Ra---------------- Roxana	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Ro---------------- Roxana	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Rr*:					
Roxana	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Moreland	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, too clayey.
Rs Ruston	Severe: cutbanks cave.	Slight	Slight	Moderate: low strength.	Slight.
Sa Sacul	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
SC Sacul	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
Sh Savannah	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness, droughty.
Sk Shatta	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
SM Smithdale	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Va Vaiden	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
YO Yorktown	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, flooding, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--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)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Bc------------------ Bellwood	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
BD------------------ Bellwood	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Bo------------------ Boykin	Slight-----------	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
BP------------------ Boykin	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Br------------------ Brimstone	Severe: wetness, percs slowly, flooding.	Severe: flooding.	Severe: wetness, flooding, excess sodium.	Severe: wetness, flooding.	Poor: wetness, excess sodium.
Ca------------------ Cahaba	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Fair: thin layer.
Da------------------ Darden	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Dp*. Dumps, quarry					
Fz*:					
Frizzell-----------	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Guyton-------------	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ga------------------ Gallion	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
Gc------------------ Glenmora	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Ge------------------ Gore	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
GO------------------ Gore	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GY----------------- Guyton	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ha----------------- Harleston	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Hw----------------- Hollywood	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Ke----------------- Keiffer	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Ko----------------- Kolin	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Ma----------------- Mahan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, hard to pack.
MB----------------- Mahan	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
Me----------------- Metcalf	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness.	Moderate: wetness.	Poor: thin layer.
Mo----------------- Moreland	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Ok----------------- Oktibbeha	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
OL----------------- Oktibbeha	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Os----------------- Osier	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Pe----------------- Perry	Severe: wetness, percs slowly, flooding.	Severe: flooding.	Severe: wetness, too clayey, flooding.	Severe: wetness, flooding.	Poor: too clayey, hard to pack, wetness.
Pg*. Pits, gravel					
Pr*. Pits, quarry					

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ra, Ro Roxana	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: thin layer.
Rr*:					
Roxana	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: thin layer.
Moreland	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Rs Ruston	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too sandy.	Slight	Fair: too sandy.
Sa Sacul	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
SC Sacul	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
Sh Savannah	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Sk Shatta	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
SM Smithdale	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too clayey, slope.
Va Vaiden	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
YO Yorktown	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--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)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Bc, BD: Bellwood	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bo: Boykin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
BP: Boykin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, slope.
Br: Brimstone	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
Ca: Cahaba	Good	Probable	Improbable: too sandy.	Fair: too clayey.
Da: Darden	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Dp*. Dumps, quarry				
Fz*:				
Frizzell	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Guyton	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ga: Gallion	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Gc: Glenmora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Ge, GO: Gore	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
GY: Guyton	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ha: Harleston	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Hw: Hollywood	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Ke: Keiffer	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ko-------------------- Kolin	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer, too clayey.
Ma, MB---------------- Mahan	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Me-------------------- Metcalf	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer, too clayey.
Mo-------------------- Moreland	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Ok, OL---------------- Oktibbeha	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Os-------------------- Osier	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
Pe-------------------- Perry	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Pg*. Pits, gravel				
Pr*. Pits, quarry				
Ra, Ro---------------- Roxana	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Rr*:				
Roxana---------------	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Moreland-------------	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Rs-------------------- Ruston	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Sa, SC---------------- Sacul	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Sh-------------------- Savannah	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Sk-------------------- Shatta	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SM-------------------- Smithdale	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Va-------------------- Vaiden	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
YO-------------------- Yorktown	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--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)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Bc: Bellwood	Moderate: slope.	Severe: hard to pack.	Percs slowly, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily, percs slowly.
BD: Bellwood	Severe: slope.	Severe: hard to pack.	Percs slowly, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
Bo: Boykin	Moderate: seepage.	Moderate: piping.	Deep to water	Slope, fast intake, soil blowing.	Soil blowing	Favorable.
BP: Boykin	Moderate: seepage.	Moderate: piping.	Deep to water	Slope, fast intake, soil blowing.	Slope, soil blowing.	Slope.
Br: Brimstone	Slight	Severe: wetness, excess sodium.	Percs slowly, flooding, excess sodium.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, excess sodium.
Ca: Cahaba	Severe: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable	Favorable	Favorable.
Da: Darden	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, slope.	Soil blowing	Droughty.
Dp*. Dumps, quarry						
Fz*: Frizzell	Moderate: seepage.	Severe: piping, wetness.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Erodes easily, percs slowly.
Guyton	Moderate: seepage.	Severe: piping, wetness.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Ga: Gallion	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Gc: Glenmora	Moderate: seepage.	Moderate: piping, wetness.	Percs slowly	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Ge: Gore	Moderate: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, droughty, slope.	Erodes easily, percs slowly.	Erodes easily, droughty.
GO: Gore	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, droughty, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
GY: Guyton	Moderate: seepage.	Severe: piping, wetness.	Percs slowly, flooding.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Ha: Harleston	Moderate: seepage.	Severe: piping.	Favorable	Wetness	Wetness	Favorable.
Hw: Hollywood	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Ke: Keiffer	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Ko: Kolin	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
Ma: Mahan	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
MB: Mahan	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, soil blowing.	Slope, soil blowing.	Slope.
Me: Metcalf	Slight	Moderate: piping, wetness.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Erodes easily, percs slowly.
Mo: Moreland	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Ok: Oktibbeha	Moderate: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
OL: Oktibbeha	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Os: Osier	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy.	Wetness, droughty.
Pe: Perry	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Pg*. Pits, gravel						
Pr*. Pits, quarry						
Ra, Ro: Roxana	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Rr*:						
Roxana	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Moreland	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Rs: Ruston	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Too sandy, soil blowing.	Favorable.
Sa: Sacul	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, slope.	Slope, wetness.	Wetness, soil blowing.	Percs slowly.
SC: Sacul	Severe: slope.	Moderate: hard to pack, wetness.	Percs slowly, slope.	Slope, wetness.	Slope, wetness, soil blowing.	Slope, percs slowly.
Sh: Savannah	Moderate: seepage, slope.	Severe: piping.	Slope	Slope, wetness, droughty.	Wetness	Rooting depth.
Sk: Shatta	Moderate: slope.	Moderate: piping, wetness.	Percs slowly, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
SM: Smithdale	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.
Va: Vaiden	Moderate: slope.	Severe: hard to pack, wetness.	Percs slowly, slope.	Slope, wetness.	Wetness, percs slowly.	Wetness, percs slowly.
YO: Yorktown	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Bc--------------- Bellwood	0-3	Loam-------------	ML, CL-ML, SC-SM, SM	A-4	0	100	100	95-100	40-65	<25	NP-7
	3-75	Silty clay, clay	CH, MH	A-7	0	100	100	100	90-95	60-90	35-50
BD--------------- Bellwood	0-3	Loam-------------	ML, CL-ML, SC-SM, SM	A-4	0	100	100	95-100	40-65	<25	NP-7
	3-60	Silty clay, clay	CH, MH	A-7	0	100	100	100	90-95	60-90	35-50
Bo--------------- Boykin	0-6	Loamy fine sand	SM	A-2-4, A-4	0	97-100	95-100	75-98	17-45	<25	NP-4
	6-36	Loamy fine sand	SM	A-2-4, A-4	0	97-100	95-100	70-98	17-45	<25	NP-4
	36-60	Fine sandy loam, sandy clay loam.	SC, CL	A-4, A-6, A-7-6	0	95-100	95-100	80-98	36-55	22-45	8-30
BP--------------- Boykin	0-7	Loamy fine sand	SM	A-2-4, A-4	0	97-100	95-100	75-98	17-45	<25	NP-4
	7-22	Loamy fine sand	SM	A-2-4, A-4	0	97-100	95-100	70-98	17-45	<25	NP-4
	22-88	Fine sandy loam, sandy clay loam.	SC, CL	A-4, A-6, A-7-6	0	95-100	95-100	80-98	36-55	22-45	8-30
Br--------------- Brimstone	0-23	Very fine sandy loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	16-38	6-17
	23-37	Silt loam, silty clay loam.	CL	A-6, A-7-6	0	100	100	95-100	80-95	26-48	11-33
	37-60	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	100	95-100	80-95	26-48	11-33
Ca--------------- Cahaba	0-10	Fine sandy loam	SM	A-4, A-2-4	0	95-100	95-100	65-90	30-45	---	NP
	10-33	Sandy clay loam, loam, clay loam.	SC, CL	A-4, A-6	0	90-100	80-100	75-90	40-75	22-35	8-15
	33-60	Sand, loamy sand, sandy loam.	SM, SP-SM	A-2-4	0	95-100	90-100	60-85	10-35	---	NP
Da--------------- Darden	0-23	Loamy fine sand	SM, SP-SM	A-2, A-3	0	100	100	90-100	5-35	<20	NP-3
	23-72	Loamy fine sand	SM, SP-SM	A-2	0	100	100	90-100	10-35	<20	NP-3
Dp*. Dumps, quarry											
Fz*:											
Frizzell--------	0-3	Silt loam--------	CL-ML, ML, CL	A-4	0	100	100	90-100	65-90	11-30	NP-10
	3-39	Silt loam, loam	CL-ML, ML, CL	A-4	0	100	100	90-100	65-90	11-30	NP-10
	39-54	Silty clay loam, silt loam, clay loam.	CL	A-6	0	100	100	90-100	70-95	31-40	11-19
	54-85	Silt loam, silty clay loam, clay loam.	CL	A-6, A-4	0	100	100	90-100	65-95	28-40	8-19

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Fz*:											
Guyton----------	0-28	Silt loam--------	ML, CL-ML	A-4	0	100	100	95-100	65-90	<27	NP-7
	28-58	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-6, A-4	0	100	100	94-100	75-95	22-40	6-18
	58-66	Silt loam, silty clay loam, sandy clay loam.	CL, CL-ML, ML	A-6, A-4	0	100	100	95-100	50-95	<40	NP-18
Ga--------------- Gallion	0-6	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	100	100	100	90-100	<28	NP-11
	6-37	Silt loam, silty clay loam, clay loam.	CL	A-6	0	100	100	100	90-100	28-40	11-17
	37-73	Silt loam, very fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	23-34	4-12
Gc--------------- Glenmora	0-7	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	75-85	<27	NP-7
	7-42	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	95-100	80-95	25-38	8-16
	42-60	Silty clay loam	CL	A-6	0	100	100	95-100	80-95	30-40	12-18
Ge--------------- Gore	0-4	Silt loam--------	ML, CL-ML	A-4	0	100	100	95-100	60-90	<27	NP-7
	4-72	Clay, silty clay	CH	A-7-6	0	100	100	95-100	85-100	53-65	28-40
GO--------------- Gore	0-5	Silt loam--------	ML, CL-ML	A-4	0	100	100	95-100	60-90	<27	NP-7
	5-66	Clay, silty clay	CH	A-7-6	0	100	100	95-100	85-100	53-65	28-40
GY--------------- Guyton	0-16	Silt loam--------	ML, CL-ML	A-4	0	100	100	95-100	65-90	<27	NP-7
	16-62	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-6, A-4	0	100	100	94-100	75-95	22-40	6-18
	62-86	Silt loam, silty clay loam, sandy clay loam.	CL, CL-ML, ML	A-6, A-4	0	100	100	95-100	50-95	<40	NP-18
Ha--------------- Harleston	0-8	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-2, A-4	0	90-100	85-100	60-85	30-55	<25	NP-7
	8-40	Sandy loam, loam	SC, CL, CL-ML, SC-SM	A-2, A-4	0	90-100	85-100	60-95	30-70	20-30	5-10
	40-60	Sandy loam, loam, sandy clay loam.	SC, CL, CL-ML, SC-SM	A-2, A-4, A-6	0	90-100	85-100	60-95	30-70	20-35	5-13
Hw--------------- Hollywood	0-6	Silty clay loam	CL	A-6, A-7	0	98-100	98-100	95-100	75-95	25-45	11-25
	6-72	Silty clay, clay	CH	A-7	0	98-100	98-100	95-100	75-95	51-75	25-45
Ke--------------- Keiffer	0-5	Loam-------------	CL-ML, CL	A-4, A-6	0	100	98-100	95-100	70-95	20-40	5-20
	5-35	Loam, silty clay, clay.	CL, CH	A-7-6, A-6	0	100	98-100	95-100	85-95	35-55	16-32
	35-72	Silty clay, clay, clay loam.	CH, CL	A-7-6	0	100	98-100	95-100	85-95	45-65	22-42
Ko--------------- Kolin	0-9	Silt loam--------	ML, CL-ML	A-4	0	100	100	85-100	60-85	<27	NP-7
	9-37	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	100	95-100	85-97	30-46	11-22
	37-88	Clay, silty clay	CH	A-7-6	0	100	100	90-100	75-95	50-63	25-35

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Ma--------------- Mahan	0-13	Fine sandy loam	SM, SC-SM, ML, SC	A-2-4, A-4	0-1	90-100	85-100	65-80	30-55	<25	NP-8
	13-33	Sandy clay loam, sandy clay, clay.	CL, MH, ML, CH	A-7-6, A-6, A-7-5	0-2	90-100	85-95	80-90	50-85	36-55	12-22
	33-43	Sandy loam, fine sandy loam, sandy clay loam.	SC, SC-SM, CL, CL-ML	A-4, A-6	0-2	90-100	85-95	65-85	35-55	16-35	4-18
	43-60	Sandy clay loam, sandy loam, clay loam.	SC, SC-SM, CL, CL-ML	A-4, A-6	0-1	90-100	85-95	65-85	35-55	16-30	4-15
MB--------------- Mahan	0-14	Fine sandy loam	SM, SC-SM, ML, SC	A-2-4, A-4	0-1	90-100	85-100	65-80	30-55	<25	NP-8
	14-48	Sandy clay loam, sandy clay, clay.	CL, MH, ML, CH	A-7-6, A-6, A-7-5	0-2	90-100	85-95	80-90	50-85	36-55	12-22
	48-57	Sandy loam, fine sandy loam, sandy clay loam.	SC, SC-SM, CL, CL-ML	A-4, A-6	0-2	90-100	85-95	65-85	35-55	16-35	4-18
	57-64	Stratified sandy clay loam to sandy loam.	SC, SC-SM, CL, CL-ML	A-4, A-6	0-1	90-100	85-95	65-85	35-55	16-30	4-15
Me--------------- Metcalf	0-7	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	65-90	<25	NP-6
	7-34	Silt loam, loam, clay loam.	CL	A-6	0	100	100	90-100	65-95	31-40	11-18
	34-60	Silty clay, clay, clay loam.	CH, CL	A-7-6	0	100	100	95-100	85-100	46-66	20-38
Mo--------------- Moreland	0-7	Clay-------------	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	7-32	Silty clay, clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	32-84	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	20-45
Ok--------------- Oktibbeha	0-4	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	95-100	85-95	60-90	20-40	4-20
	4-34	Clay-------------	CH	A-7	0	100	95-100	95-100	95-100	55-65	30-40
	34-88	Clay, silty clay	CL	A-7	0-5	95-100	90-100	90-100	90-100	41-49	25-30
OL--------------- Oktibbeha	0-3	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	95-100	85-95	60-90	20-40	4-20
	3-33	Clay-------------	CH	A-7	0	100	95-100	95-100	95-100	55-65	30-40
	33-67	Clay, silty clay	CL	A-7	0-5	95-100	90-100	90-100	90-100	41-49	25-30
Os--------------- Osier	0-9	Fine saydy loam	SM	A-2	0	100	98-100	70-90	13-25	---	NP
	9-60	Sand, loamy sand, loamy fine sand.	SP-SM, SM	A-2, A-3	0	100	95-100	65-96	5-20	---	NP
Pe--------------- Perry	0-9	Clay-------------	CH, CL	A-7-6	0	100	100	100	95-100	45-75	22-45
	9-35	Clay-------------	CH	A-7-6	0	100	100	100	95-100	60-80	33-50
	35-72	Clay-------------	CH, CL	A-7-6	0	90-100	85-100	75-100	70-100	45-80	22-50
Pg*. Pits, gravel											
Pr*. Pits, quarry											

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ra--------------- Roxana	0-7	Silt loam--------	ML, CL-ML	A-4	0	100	100	85-100	50-75	<27	NP-7
	7-72	Silt loam, very fine sandy loam, loamy very fine sand.	ML, CL-ML	A-4	0	100	100	85-100	50-85	<27	NP-7
Ro--------------- Roxana	0-4	Silt loam--------	ML, CL-ML	A-4	0	100	100	85-100	50-75	<27	NP-7
	4-60	Silt loam, very fine sandy loam, loamy very fine sand.	ML, CL-ML	A-4	0	100	100	85-100	50-85	<27	NP-7
Rr*: Roxana----------	0-5	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	85-100	50-75	<27	NP-7
	5-62	Silt loam, very fine sandy loam, loamy very fine sand.	ML, CL-ML	A-4	0	100	100	85-100	50-85	<27	NP-7
Moreland--------	0-6	Clay-------------	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	6-52	Silty clay-------	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	52-65	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	20-45
Rs--------------- Ruston	0-14	Fine sandy loam	SM, ML, CL-ML	A-4, A-2-4	0	100	85-100	65-85	30-55	<20	NP-7
	14-59	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-7-6	0	100	85-100	80-95	36-75	25-45	11-20
	59-68	Fine sandy loam, sandy loam, loamy sand.	SM, ML, CL-ML, SC-SM	A-4, A-2-4	0	100	85-100	65-85	30-75	<27	NP-7
	68-80	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-7-6	0	100	85-100	80-95	36-75	25-45	11-20
Sa--------------- Sacul	0-3	Fine sandy loam	SM, SC-SM	A-4, A-2	0	75-100	75-100	45-85	25-50	<25	NP-7
	3-13	Very fine sandy loam, fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4, A-1	0	75-100	75-100	40-95	12-75	<30	NP-10
	13-61	Clay, silty clay, clay loam.	CH, CL, SC	A-7	0	85-100	85-100	70-100	40-95	45-70	20-40
	61-75	Silty clay loam, clay loam, loam.	CL, SC	A-6, A-7, A-4, A-2	0	85-100	85-100	65-100	30-95	25-48	8-25
SC--------------- Sacul	0-1	Fine sandy loam	SM, SC-SM	A-4, A-2	0	75-100	75-100	45-85	25-50	<25	NP-7
	1-5	Very fine sandy loam, fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4, A-1	0	75-100	75-100	40-95	12-75	<30	NP-10
	5-51	Clay, silty clay, clay loam.	CH, CL, SC	A-7	0	85-100	85-100	70-100	40-95	45-70	20-40
	51-60	Silty clay loam, clay loam, loam.	CL, SC	A-6, A-7, A-4, A-2	0	85-100	85-100	65-100	30-95	25-48	8-25

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Sh---------------Savannah	0-10	Fine sandy loam	SM, ML	A-2-4, A-4	0	98-100	90-100	60-100	30-65	<25	NP-4
	10-31	Sandy clay loam, clay loam, loam.	CL, SC, CL-ML	A-4, A-6	0	98-100	90-100	80-100	40-80	23-40	7-19
	31-64	Loam, clay loam, sandy clay loam.	CL, SC, CL-ML	A-4, A-6, A-7, A-2	0	94-100	90-100	60-100	30-80	23-43	7-19
Sk---------------Shatta	0-6	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	90-100	55-90	23-28	3-7
	6-34	Silty clay loam, loam, silt loam.	CL	A-6	0	100	100	90-100	70-90	30-40	11-18
	34-75	Loam, silt loam, silty clay loam.	CL	A-6, A-4	0	100	100	90-100	60-90	27-35	8-14
SM---------------Smithdale	0-7	Fine sandy loam	SM, SC-SM	A-4, A-2	0	100	85-100	60-95	28-49	<20	NP-5
	7-45	Clay loam, sandy clay loam, loam.	SC-SM, SC, CL, CL-ML	A-6, A-4	0	100	85-100	80-96	45-75	23-38	7-16
	45-73	Loam, sandy loam	SM, ML, CL, SC	A-4	0	100	85-100	65-95	36-70	<30	NP-10
Va---------------Vaiden	0-3	Silty clay loam	MH, CH	A-7	0	100	100	95-100	70-90	50-60	20-30
	3-33	Clay, silty clay	CH, MH	A-7	0	100	100	95-100	85-95	50-90	30-50
	33-72	Clay, silty clay	CH	A-7	0	100	100	95-100	85-95	50-90	30-52
YO---------------Yorktown	0-8	Clay-------------	CH	A-7	0	100	100	90-100	75-95	55-75	35-50
	8-57	Clay-------------	CH	A-7	0	100	100	90-100	75-95	75-95	50-70
	57-64	Clay-------------	CH	A-7	0	100	100	90-100	75-95	75-95	50-70

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--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)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
Bc---------------- Bellwood	0-3	10-27	1.40-1.55	0.6-2.0	0.15-0.20	3.6-6.0	Low-----------	0.43	5	.2-5
	3-75	45-75	1.05-1.35	<0.06	0.14-0.18	3.6-5.5	High----------	0.28		
BD---------------- Bellwood	0-3	10-27	1.40-1.55	0.6-2.0	0.15-0.20	3.6-6.0	Low-----------	0.43	5	.2-5
	3-60	45-75	1.05-1.35	<0.06	0.14-0.18	3.6-5.5	High----------	0.28		
Bo---------------- Boykin	0-6	3-10	1.40-1.60	6.0-20	0.07-0.11	4.5-6.5	Low-----------	0.20	5	.5-4
	6-36	3-10	1.40-1.60	6.0-20	0.07-0.11	4.5-6.5	Low-----------	0.20		
	36-60	18-30	1.45-1.70	0.6-2.0	0.13-0.17	3.6-6.0	Low-----------	0.28		
BP---------------- Boykin	0-7	3-10	1.40-1.60	6.0-20	0.07-0.11	4.5-6.5	Low-----------	0.20	5	.5-4
	7-22	3-10	1.40-1.60	6.0-20	0.07-0.11	4.5-6.5	Low-----------	0.20		
	22-88	18-30	1.45-1.70	0.6-2.0	0.13-0.17	3.6-6.0	Low-----------	0.28		
Br---------------- Brimstone	0-23	5-14	1.35-1.65	0.6-2.0	0.13-0.20	5.1-8.4	Low-----------	0.49	3	.5-2
	23-37	18-32	1.35-1.70	0.06-0.2	0.10-0.16	6.6-9.0	Moderate------	0.43		
	37-60	20-35	1.35-1.70	0.06-0.2	0.10-0.16	6.6-9.0	Moderate------	0.43		
Ca---------------- Cahaba	0-10	7-17	1.35-1.60	2.0-6.0	0.10-0.14	4.5-6.0	Low-----------	0.24	5	.5-4
	10-40	18-35	1.35-1.60	0.6-2.0	0.12-0.20	4.5-6.0	Low-----------	0.28		
	40-60	4-20	1.40-1.70	2.0-20	0.05-0.10	4.5-6.0	Low-----------	0.24		
Da---------------- Darden	0-23	2-10	1.20-1.60	6.0-20	0.05-0.09	4.5-6.5	Low-----------	0.15	5	.1-2
	23-72	2-10	1.20-1.60	6.0-20	0.05-0.09	4.5-7.3	Low-----------	0.15		
Dp*. Dumps, quarry										
Fz*:										
Frizzell---------	0-3	8-18	1.35-1.65	0.6-2.0	0.15-0.22	4.5-5.5	Low-----------	0.49	5	.5-2
	3-39	8-18	1.35-1.65	0.6-2.0	0.15-0.20	4.5-5.5	Low-----------	0.43		
	39-54	14-30	1.35-1.65	0.06-0.2	0.15-0.20	3.6-5.5	Low-----------	0.43		
	54-85	14-30	1.35-1.65	0.06-0.6	0.15-0.20	4.5-5.5	Low-----------	0.43		
Guyton-----------	0-28	7-25	1.35-1.65	0.6-2.0	0.20-0.23	3.6-6.0	Low-----------	0.43	5	.5-4
	28-58	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-6.0	Low-----------	0.37		
	58-66	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-8.4	Low-----------	0.37		
Ga---------------- Gallion	0-6	14-27	1.35-1.65	0.6-2.0	0.21-0.23	5.1-7.3	Low-----------	0.43	5	.5-2
	6-37	18-35	1.35-1.70	0.6-2.0	0.20-0.22	5.6-7.8	Moderate------	0.32		
	37-73	14-27	1.35-1.70	0.6-2.0	0.20-0.23	5.6-8.4	Low-----------	0.37		
Gc---------------- Glenmora	0-7	8-22	1.35-1.65	0.6-2.0	0.20-0.23	4.5-6.0	Low-----------	0.49	5	.5-2
	7-42	18-35	1.35-1.65	0.6-2.0	0.18-0.20	4.5-6.0	Low-----------	0.43		
	42-60	27-35	1.35-1.70	0.06-0.2	0.18-0.20	4.5-6.0	Moderate------	0.43		
Ge---------------- Gore	0-4	5-15	1.35-1.60	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.49	5	.5-4
	4-72	40-60	1.20-1.65	<0.06	0.08-0.14	4.5-9.0	High----------	0.32		
GO---------------- Gore	0-5	5-15	1.35-1.60	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.49	5	.5-4
	5-66	40-60	1.20-1.65	<0.06	0.08-0.14	4.5-9.0	High----------	0.32		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
GY---------------- Guyton	0-16	7-25	1.35-1.65	0.6-2.0	0.20-0.23	3.6-6.0	Low-----------	0.43	5	.5-4
	16-62	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-6.0	Low-----------	0.37		
	62-86	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-8.4	Low-----------	0.37		
Ha---------------- Harleston	0-8	2-8	1.25-1.35	0.6-6.0	0.08-0.16	3.6-5.5	Low-----------	0.20	5	1-5
	8-40	8-18	1.55-1.65	0.6-2.0	0.13-0.16	4.5-5.5	Low-----------	0.32		
	40-60	8-27	1.55-1.65	0.6-2.0	0.13-0.16	4.5-5.5	Low-----------	0.32		
Hw---------------- Hollywood	0-6	27-39	1.15-1.35	0.2-0.6	0.15-0.22	6.1-7.3	Moderate-----	0.32	3	2-5
	6-72	40-60	1.15-1.30	<0.06	0.12-0.18	6.6-8.4	High----------	0.37		
Ke---------------- Keiffer	0-5	16-27	1.35-1.65	0.6-2.0	0.12-0.22	6.6-8.4	Moderate-----	0.32	2	2-5
	5-35	35-50	1.20-1.50	0.06-2.0	0.12-0.17	7.4-8.4	High----------	0.37		
	35-72	35-59	1.20-1.50	0.06-2.0	0.12-0.17	7.4-8.4	High----------	0.37		
Ko---------------- Kolin	0-9	10-27	1.35-1.65	0.6-2.0	0.18-0.22	4.5-6.5	Low-----------	0.49	5	.5-4
	9-37	20-35	1.35-1.65	0.2-0.6	0.18-0.22	4.5-6.0	Moderate-----	0.37		
	37-88	40-55	1.20-1.50	<0.06	0.15-0.18	4.5-6.5	High----------	0.32		
Ma---------------- Mahan	0-13	2-15	1.35-1.70	2.0-6.0	0.10-0.15	5.1-7.3	Low-----------	0.28	5	.5-4
	13-33	35-60	1.30-1.70	0.6-2.0	0.12-0.18	4.5-6.0	Low-----------	0.32		
	33-43	10-35	1.35-1.70	0.6-2.0	0.10-0.17	4.5-6.0	Low-----------	0.28		
MB---------------- Mahan	0-14	2-15	1.35-1.70	2.0-6.0	0.10-0.15	5.1-6.0	Low-----------	0.28	5	.5-4
	14-48	35-60	1.30-1.70	0.6-2.0	0.12-0.18	4.5-6.0	Low-----------	0.32		
	48-57	10-35	1.35-1.70	0.6-2.0	0.10-0.17	4.5-6.0	Low-----------	0.28		
	57-64	10-35	1.35-1.70	0.2-0.6	0.10-0.17	4.5-6.0	Low-----------	0.28		
Me---------------- Metcalf	0-7	7-22	1.35-1.65	0.6-2.0	0.12-0.18	3.6-6.0	Low-----------	0.49	5	.5-2
	7-34	18-27	1.35-1.65	0.2-0.6	0.15-0.20	3.6-6.0	Low-----------	0.37		
	34-60	38-60	1.20-1.60	<0.06	0.15-0.18	3.6-6.0	High----------	0.32		
Mo---------------- Moreland	0-7	40-50	1.20-1.50	<0.06	0.12-0.18	6.1-7.8	Very high----	0.32	5	1-4
	7-32	39-60	1.20-1.45	<0.06	0.12-0.18	6.6-8.4	Very high----	0.32		
	32-84	35-60	1.20-1.70	<0.2	0.12-0.21	6.6-8.4	High----------	0.32		
Ok---------------- Oktibbeha	0-4	15-27	1.20-1.50	0.6-2.0	0.15-0.22	4.5-6.5	Low-----------	0.37	4	2-6
	4-34	60-80	1.00-1.30	<0.06	0.12-0.16	4.5-6.5	High----------	0.32		
	34-88	50-70	1.10-1.40	<0.06	0.05-0.10	6.6-8.4	High----------	0.32		
OL---------------- Oktibbeha	0-3	15-27	1.20-1.50	0.6-2.0	0.15-0.22	4.5-6.5	Low-----------	0.37	4	2-6
	3-33	60-80	1.00-1.30	<0.06	0.12-0.16	4.5-6.5	High----------	0.32		
	33-67	50-70	1.10-1.40	<0.06	0.05-0.10	6.6-8.4	High----------	0.32		
Os---------------- Osier	0-9	10-15	1.35-1.60	6.0-20	0.10-0.15	3.6-6.0	Low-----------	0.15	5	2-6
	9-60	1-10	1.40-1.60	6.0-20	0.03-0.10	3.6-6.0	Low-----------	0.10		
Pe---------------- Perry	0-9	40-80	1.20-1.55	<0.06	0.12-0.18	4.5-7.8	High----------	0.32	5	.5-4
	9-35	55-85	1.17-1.40	<0.06	0.12-0.18	5.1-7.8	Very high----	0.28		
	35-72	55-85	1.17-1.35	<0.06	0.12-0.18	6.1-8.4	Very high----	0.28		
Pg*. Pits, gravel										
Pr*. Pits, quarry										
Ra---------------- Roxana	0-7	5-27	1.35-1.70	0.6-2.0	0.10-0.21	6.1-8.4	Low-----------	0.43	5	.4-2
	7-72	10-18	1.35-1.70	0.6-2.0	0.10-0.19	6.6-9.0	Low-----------	0.37		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
Ro----------------	0-4	5-27	1.35-1.70	0.6-2.0	0.10-0.21	6.1-8.4	Low----------	0.43	5	.4-2
Roxana	4-60	10-18	1.35-1.70	0.6-2.0	0.10-0.19	6.6-9.0	Low----------	0.37		
Rr*:										
Roxana----------	0-5	5-27	1.35-1.70	0.6-2.0	0.10-0.21	6.1-8.4	Low----------	0.43	5	.4-2
	5-62	10-18	1.35-1.70	0.6-2.0	0.10-0.19	6.6-9.0	Low----------	0.37		
Moreland--------	0-6	40-50	1.20-1.50	<0.06	0.12-0.18	6.1-7.8	Very high----	0.32	5	1-4
	6-52	39-60	1.20-1.45	<0.06	0.12-0.18	6.6-8.4	Very high----	0.32		
	52-65	35-60	1.20-1.70	<0.2	0.12-0.21	6.6-8.4	High---------	0.32		
Rs----------------	0-14	10-20	1.30-1.70	0.6-2.0	0.09-0.16	4.5-6.5	Low----------	0.28	5	.1-2
Ruston	14-59	18-35	1.40-1.70	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.28		
	59-68	10-20	1.30-1.70	0.6-2.0	0.12-0.15	4.5-6.0	Low----------	0.28		
	68-80	15-38	1.40-1.70	0.6-2.0	0.12-0.17	3.6-6.0	Low----------	0.28		
Sa----------------	0-3	5-20	1.30-1.50	0.6-2.0	0.09-0.12	4.5-6.0	Low----------	0.28	5	1-3
Sacul	3-13	2-25	1.40-1.60	0.6-2.0	0.07-0.17	4.5-6.0	Low----------	0.28		
	13-61	35-60	1.25-1.40	0.06-0.2	0.15-0.18	3.6-5.5	High---------	0.32		
	61-75	15-40	1.30-1.45	0.2-0.6	0.14-0.18	3.6-5.5	Low----------	0.28		
SC----------------	0-1	5-20	1.30-1.50	0.6-2.0	0.09-0.12	4.5-6.0	Low----------	0.28	5	1-3
Sacul	1-5	2-25	1.40-1.60	0.6-2.0	0.07-0.17	4.5-6.0	Low----------	0.28		
	5-51	35-60	1.25-1.40	0.06-0.2	0.15-0.18	3.6-5.5	High---------	0.32		
	51-60	15-40	1.30-1.45	0.2-0.6	0.14-0.18	3.6-5.5	Low----------	0.28		
Sh----------------	0-10	1-16	1.50-1.60	0.6-2.0	0.13-0.16	4.5-6.0	Low----------	0.24	3	.0-3
Savannah	10-31	5-32	1.45-1.65	0.6-2.0	0.11-0.17	4.5-6.0	Low----------	0.28		
	31-64	10-35	1.60-1.80	0.2-0.6	0.05-0.10	3.6-6.0	Low----------	0.24		
Sk----------------	0-6	10-20	1.35-1.60	0.6-2.0	0.18-0.22	4.5-6.0	Low----------	0.37	3	.5-3
Shatta	6-34	18-30	1.35-1.65	0.2-0.6	0.18-0.22	4.5-6.0	Low----------	0.37		
	34-75	15-30	1.50-1.85	0.06-0.2	0.08-0.12	4.5-6.0	Low----------	0.37		
SM----------------	0-7	2-15	1.40-1.50	2.0-6.0	0.14-0.16	4.5-6.0	Low----------	0.28	5	.5-2
Smithdale	7-45	18-33	1.40-1.55	0.6-2.0	0.15-0.17	4.5-5.5	Low----------	0.24		
	45-73	12-27	1.40-1.55	2.0-6.0	0.14-0.16	4.5-5.5	Low----------	0.28		
Va----------------	0-3	27-39	1.10-1.40	0.06-0.2	0.10-0.15	4.5-6.0	High---------	0.32	5	.5-2
Vaiden	3-33	60-75	1.00-1.30	<0.06	0.10-0.15	4.5-6.0	Very high----	0.32		
	33-72	40-75	1.10-1.40	<0.06	0.10-0.15	4.5-7.8	Very high----	0.32		
YO----------------	0-8	40-65	1.25-1.45	<0.06	0.16-0.22	5.1-7.3	High---------	0.32	5	1-8
Yorktown	8-57	60-85	1.25-1.45	<0.06	0.09-0.14	5.6-7.3	Very high----	0.32		
	57-64	60-85	1.30-1.50	<0.06	0.08-0.14	7.4-8.4	Very high----	0.32		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft				
Bc, BD------------ Bellwood	D	None--------	---	---	2.0-4.0	Apparent	Dec-Apr	High-----	Moderate.
Bo, BP------------ Boykin	B	None--------	---	---	>6.0	---	---	Moderate	High.
Br---------------- Brimstone	D	Occasional	Brief to long.	Dec-Jun	0-1.5	Perched	Dec-Apr	High-----	Low.
Ca---------------- Cahaba	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
Da---------------- Darden	A	None--------	---	---	>6.0	---	---	Low------	High.
Dp*. Dumps, quarry									
Fz*:									
Frizzell---------	C	None--------	---	---	1.5-4.0	Apparent	Dec-Apr	High-----	High.
Guyton-----------	D	None--------	---	---	0-1.5	Perched	Dec-May	High-----	High.
Ga---------------- Gallion	B	Rare--------	---	---	>6.0	---	---	Moderate	Low.
Gc---------------- Glenmora	C	None--------	---	---	2.0-3.0	Apparent	Dec-Apr	High-----	Moderate.
Ge, GO------------ Gore	D	None--------	---	---	>6.0	---	---	High-----	Low.
GY---------------- Guyton	D	Frequent----	Very brief to long.	Jan-Dec	0-1.5	Perched	Dec-May	High-----	High.
Ha---------------- Harleston	C	None--------	---	---	2.0-3.0	Apparent	Nov-Apr	Moderate	High.
Hw---------------- Hollywood	D	None--------	---	---	>6.0	---	---	High-----	Low.
Ke---------------- Keiffer	C	None--------	---	---	>6.0	---	---	Moderate	Low.
Ko---------------- Kolin	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	High-----	Moderate.
Ma, MB------------ Mahan	C	None--------	---	---	>6.0	---	---	High-----	High.
Me---------------- Metcalf	D	None--------	---	---	1.5-2.5	Perched	Dec-Apr	High-----	Moderate.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
Mo----------------- Moreland	D	Occasional	Brief to very long.	Dec-Jun	0-1.5	Perched	Dec-Apr	High-----	Low.
Ok, OL------------ Oktibbeha	D	None--------	---	---	>6.0	---	---	High-----	High.
Os----------------- Osier	D	None--------	---	---	0-0.5	Apparent	Dec-Jun	High-----	High.
Pe----------------- Perry	D	Occasional	Brief to very long.	Dec-Jun	0-2.0	Apparent	Dec-Jun	High-----	Moderate.
Pg*. Pits, gravel									
Pr*. Pits, quarry									
Ra----------------- Roxana	B	Occasional	Brief to very long.	Dec-Jun	4.0-6.0	Apparent	Dec-Apr	Low------	Low.
Ro----------------- Roxana	B	Frequent----	Brief to very long.	Dec-Jun	4.0-6.0	Apparent	Dec-Apr	Low------	Low.
Rr*: Roxana-----------	B	Occasional	Brief to very long.	Dec-Jun	4.0-6.0	Apparent	Dec-Apr	Low------	Low.
Moreland---------	D	Occasional	Brief to very long.	Dec-Jun	0-1.5	Perched	Dec-Apr	High-----	Low.
Rs----------------- Ruston	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
Sa, SC------------ Sacul	C	None--------	---	---	2.0-4.0	Perched	Dec-Apr	High-----	High.
Sh----------------- Savannah	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	Moderate	High.
Sk----------------- Shatta	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	Moderate	Moderate.
SM----------------- Smithdale	B	None--------	---	---	>6.0	---	---	Low------	Moderate.
Va----------------- Vaiden	D	None--------	---	---	1.0-2.0	Apparent	Nov-Mar	High-----	High.
YO----------------- Yorktown	D	Frequent----	Very long	Oct-Aug	+5-0.5	Apparent	Oct-Aug	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--FERTILITY TEST DATA FOR SELECTED SOILS

(Analyses by the Soil Fertility Laboratory, Louisiana Agricultural Experiment Station. Dashes indicate data is not available.)

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity, Na	Saturation: Effective cation-exchange capacity, Al	Ca/Mg
		In	Pct		Ppm	----------Milliequivalents/100 grams of soil----------									Pct	Pct	Pct	
Bellwood loam:[1]																		
(S87LA-127-11)	A	0-3	0.28	3.9	9	6.3	6.0	0.4	0.2	0.5	0.3	12.6	25.5	13.7	50.6	0.8	3.6	1.1
	Bss1	3-12	0.63	4.1	10	8.0	6.1	1.0	0.1	11.5	2.5	24.6	39.8	29.2	38.2	0.3	39.4	1.3
	Bss2	12-23	2.75	5.3	13	8.0	3.3	0.3	0.1	17.8	0.0	27.0	38.7	29.5	30.2	0.3	60.3	2.4
	Bss3	23-43	0.10	3.7	11	6.2	4.0	0.3	6.0	17.1	1.1	28.2	44.7	34.7	36.9	13.4	49.3	1.6
	Bss4	43-53	0.10	3.7	5	3.4	2.0	0.2	3.0	17.1	1.0	28.8	37.4	26.7	23.0	8.0	64.0	1.7
	BC	53-75	0.01	4.0	7	2.4	1.3	0.1	1.4	17.5	1.2	28.8	34.0	23.9	15.3	4.1	73.2	1.8
Boykin loamy																		
fine sand:[2]	A	0-5	1.79	5.6	16	2.2	0.6	0.2	0.0	0.0	1.2	7.1	10.1	4.2	29.7	0.0	0.0	3.7
(S88LA-127-24)	E	5-13	0.13	5.7	8	0.8	0.3	0.1	0.0	0.0	1.0	7.8	9.0	2.2	13.3	0.0	0.0	2.7
	Bt1	13-22	0.06	4.9	9	0.5	1.7	0.2	0.0	3.6	2.0	7.9	10.3	8.0	23.3	0.0	45.0	0.3
	Bt2	22-32	0.01	4.9	11	0.2	1.1	0.2	0.0	3.4	1.6	7.7	9.2	6.5	16.3	0.0	52.3	0.2
	BC	32-39	0.01	5.0	11	0.1	0.6	0.1	0.0	3.1	1.5	6.6	7.4	5.4	10.8	0.0	57.4	0.2
	C	39-60	0.01	4.9	10	0.1	0.3	0.1	0.0	2.7	1.7	6.0	6.5	4.9	7.7	0.0	55.1	0.3
Boykin loamy																		
fine sand:[1]	A	0-7	2.31	4.6	27	1.0	0.4	0.1	0.0	1.1	0.1	4.8	6.3	2.7	23.8	0.0	40.7	2.5
(S89LA-127-38)	E	7-22	0.62	4.5	28	1.1	1.0	0.1	0.0	0.2	0.4	3.4	5.6	2.8	39.3	0.0	7.1	1.1
	Bt1	22-36	0.34	4.4	27	1.1	1.3	0.1	0.1	1.0	0.2	4.2	6.8	3.8	38.2	1.5	26.3	0.8
	Bt2	36-48	0.19	5.0	11	2.1	1.3	0.1	0.2	1.5	0.5	4.4	8.1	5.7	45.7	2.5	26.3	1.6
	Bt3	48-88	0.14	4.8	9	2.8	1.7	0.2	0.4	1.6	0.5	4.6	9.7	7.2	52.6	4.1	22.2	1.6
Brimstone very																		
fine sandy	A	0-6	1.78	5.6	29	3.7	0.5	0.1	0.9	0.0	1.4	5.4	10.6	6.6	49.1	8.5	0.0	7.4
loam:[1]	Eng	6-23	0.33	7.8	19	2.2	0.5	0.0	2.6	0.0	0.6	1.2	6.5	5.9	81.5	40.0	0.0	4.4
(S89LA-127-31)	Btng/E	23-37	0.01	8.7	26	2.9	1.2	0.1	2.9	0.0	0.6	1.8	8.9	7.7	79.8	32.6	0.0	2.4
	Btng1	37-51	0.03	8.4	33	2.1	1.1	0.1	3.3	0.0	1.0	4.2	10.8	7.6	61.1	30.6	0.0	1.9
	Btng2	51-60	0.01	8.5	47	3.4	1.9	0.1	4.4	0.0	1.4	6.0	15.8	11.2	62.0	27.8	0.0	1.8
Cahaba fine																		
sandy loam:[3]	A	0-4	1.21	5.5	11	3.3	1.0	0.3	0.0	0.0	0.4	3.6	8.2	5.0	56.1	0.0	0.0	3.3
(S89LA-127-8)	Bt1	4-9	0.01	5.1	9	2.0	1.0	0.1	0.0	1.1	0.0	4.2	7.3	4.2	42.5	0.0	26.2	2.0
	Bt2	9-15	0.01	4.9	8	1.0	1.0	0.1	0.0	2.7	0.0	5.4	7.5	4.8	28.0	0.0	56.3	1.0
	BC	15-22	0.01	5.0	9	0.5	1.0	0.1	0.0	1.3	0.3	3.0	4.6	3.2	34.8	0.0	40.6	0.5
	C	22-30	0.01	5.2	10	0.4	0.3	0.1	0.0	0.7	0.0	1.2	2.0	1.5	40.0	0.0	46.7	1.3

See footnotes at end of table.

TABLE 16.--FERTILITY TEST DATA FOR SELECTED SOILS--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity, Na	Saturation: Effective cation-exchange capacity, Al	Ca/Mg
		In	Pct		Ppm	Milliequivalents/100 grams of soil									Pct	Pct	Pct	
Darden loamy fine sand:[1]																		
(S89LA-127-35)	A1	0-9	1.02	5.1	23	0.7	0.1	0.0	0.0	0.8	1.4	9.6	10.4	3.0	7.7	0.0	26.7	7.0
	A2	9-23	0.28	5.3	25	0.3	0.1	0.0	0.0	0.8	0.0	6.6	7.0	2.2	5.7	0.0	36.4	3.0
	Bw	23-72	0.01	5.4	42	0.3	0.1	0.0	0.0	0.0	0.0	5.4	5.8	1.4	6.9	0.0	0.0	3.0
Darden loamy fine sand:[4]																		
(S90LA-127-44)	A	0-9	0.66	6.0	20	1.3	0.1	0.0	0.0	0.0	1.2	4.3	5.7	2.6	24.6	0.0	0.0	13.0
	Bw1	9-18	0.10	6.0	15	0.3	0.0	0.0	0.0	0.0	1.2	3.0	3.3	1.5	9.1	0.0	0.0	0.0
	Bw2	18-39	0.00	5.5	10	0.1	0.0	0.0	0.0	0.0	0.8	3.0	3.1	0.9	3.2	0.0	0.0	0.0
	Bw3	39-54	0.00	5.3	8	0.1	0.0	0.0	0.0	0.0	1.0	3.7	3.8	1.1	2.6	0.0	0.0	0.0
Frizzell silt loam:[5]																		
(S87LA-127-9)	A	0-4	1.91	4.1	8	1.0	0.2	0.1	0.0	3.8	0.0	9.6	10.9	5.1	11.9	0.0	74.5	5.0
	B/E	4-28	0.24	4.4	4	0.3	0.2	0.1	0.0	1.4	1.4	4.8	5.4	3.4	11.1	0.0	41.2	1.5
	Bt1	28-39	0.15	4.6	5	0.3	1.0	0.1	1.0	6.3	0.1	10.8	13.2	8.8	18.2	7.6	71.6	0.3
	Bt2	39-46	0.01	4.2	6	1.0	1.3	0.1	3.1	3.4	0.2	7.2	12.7	9.1	43.3	24.4	37.4	0.8
	Bt3	46-58	0.01	4.2	5	1.0	1.3	0.1	4.2	1.6	0.2	4.8	11.4	8.4	57.9	36.8	19.0	0.8
	C	58-88	0.01	4.5	5	1.3	2.4	0.1	7.0	0.5	0.5	4.2	15.0	11.8	72.0	46.7	4.2	0.5
Gallion silt loam:[1]																		
(S90LA-127-40)	Ap	0-6	1.63	5.2	90	6.1	3.4	0.3	0.1	4.6	0.8	5.2	15.1	15.3	65.6	0.7	30.1	1.8
	Bt1	6-22	0.23	5.6	79	5.8	5.7	0.3	0.1	0.0	1.4	7.4	19.3	13.3	61.7	0.5	0.0	1.0
	Bt2	22-37	0.11	6.4	132	5.8	5.0	0.2	0.3	0.0	0.8	3.7	15.0	12.1	75.3	2.0	0.0	1.2
	BC	37-46	0.11	7.3	201	7.2	4.8	0.2	0.3	0.0	1.0	3.6	16.1	13.5	77.6	1.9	0.0	1.5
	C	46-73	0.13	8.2	166	19.4	4.8	0.2	0.3	0.0	1.6	3.0	27.7	26.3	89.2	1.1	0.0	4.0
Glenmora silt loam:[1]																		
(S90LA-127-43)	A	0-7	1.13	4.5	16	0.8	0.3	0.1	0.0	0.4	1.2	8.1	9.3	2.8	12.9	0.0	14.3	2.7
	BE	7-11	0.67	4.5	10	0.6	0.5	0.0	0.0	1.8	0.6	7.4	8.5	3.5	12.9	0.0	51.4	1.2
	Bt1	11-22	0.21	4.6	13	0.9	1.0	0.1	0.1	4.2	0.2	8.9	11.0	6.5	19.1	0.9	64.6	0.9
	Bt2	22-34	0.07	4.6	12	0.3	0.7	0.1	0.1	4.2	1.2	11.8	13.0	6.6	9.2	0.8	63.6	0.4
	B/E	34-42	0.03	5.0	10	0.3	0.9	0.1	0.2	4.0	0.4	11.9	13.4	5.9	11.2	1.5	67.8	0.3
	B't	42-60	0.01	5.2	11	0.3	1.8	0.1	0.8	4.4	0.4	12.0	15.0	7.8	20.0	5.3	56.4	0.2
Gore silt loam:[1]																		
(S88LA-127-21)	A	0-4	1.29	5.8	22	5.8	1.8	0.2	0.0	0.2	0.0	4.8	12.6	8.0	61.9	0.0	2.5	3.2
	Bt	4-15	0.12	4.7	23	5.6	5.8	0.4	0.2	9.4	1.0	19.2	31.2	22.4	38.5	0.6	42.0	1.0
	Btss1	15-25	0.06	4.8	26	6.9	7.8	0.5	0.5	9.0	3.0	19.3	35.0	27.7	44.9	1.4	32.5	0.9
	Btss2	25-40	0.04	5.0	31	10.5	10.7	0.5	1.1	2.2	1.6	11.4	34.2	26.6	66.7	3.2	8.3	1.0
	BC	40-56	0.08	5.9	34	14.3	13.9	0.5	2.8	0.2	0.0	6.0	37.5	31.7	84.0	7.5	0.6	1.0
	C	56-72	0.01	6.8	65	12.5	12.6	0.5	3.3	0.0	0.0	2.5	31.4	28.9	92.0	10.5	0.0	1.0

See footnotes at end of table.

TABLE 16.--FERTILITY TEST DATA FOR SELECTED SOILS--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Exchangeable cations: Mg	Exchangeable cations: K	Exchangeable cations: Na	Exchangeable cations: Al	Exchangeable cations: H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity, Na	Saturation: Effective cation-exchange capacity, Al	Ca/Mg
		In	Pct		Ppm	----------Milliequivalents/100 grams of soil----------									Pct	Pct	Pct	
Guyton silt loam:[1]																		
(S87LA-127-10)	A	0-4	2.49	4.5	48	6.0	1.4	0.3	0.3	1.4	0.8	9.6	17.6	10.2	45.5	1.7	13.7	4.3
	Eg1	4-10	0.99	4.5	16	3.0	1.0	0.1	0.2	3.8	0.2	11.4	15.7	8.3	27.4	1.3	45.8	3.0
	Eg2	10-16	0.90	4.4	16	2.2	1.0	0.1	0.4	5.6	0.2	11.4	15.1	9.5	24.5	2.6	58.9	2.2
	B/E	16-28	0.54	4.5	8	2.0	1.1	0.1	1.0	6.7	0.1	12.6	16.8	11.0	25.0	6.0	60.8	1.8
	Btg1	28-46	0.01	4.4	11	12.0	6.1	0.4	1.0	7.2	0.0	12.6	32.1	26.7	60.7	3.1	27.0	2.0
	Btg2	46-62	0.01	4.1	7	7.0	6.0	1.0	1.0	2.0	1.2	13.8	28.8	18.2	52.1	3.5	11.0	1.2
	C	62-86	0.01	4.1	8	6.3	6.0	0.4	0.4	5.4	0.0	14.4	27.5	18.5	47.6	1.5	29.2	1.1
Harleston fine sandy loam:[1]																		
(S88LA-127-25)	A, E	0-8	1.07	4.9	9	0.4	0.1	0.0	0.0	0.9	0.9	5.9	6.4	2.3	7.8	0.0	39.1	4.0
	Bt1	8-20	0.05	4.8	9	0.7	0.4	0.0	0.0	2.0	1.0	3.5	4.6	4.1	23.9	0.0	48.8	1.8
	Bt2	20-29	0.01	5.0	8	1.2	0.3	0.0	0.0	0.9	2.1	2.4	3.9	4.5	38.5	0.0	20.0	4.0
	Bt3	29-40	0.01	5.0	7	0.9	0.2	0.0	0.0	1.1	0.7	2.3	3.4	2.9	32.4	0.0	37.9	4.5
	Bt4	40-48	0.01	5.0	9	0.9	0.2	0.1	0.1	1.8	0.8	2.5	3.8	3.9	34.2	2.6	46.2	4.5
	Bt5	48-60	0.01	5.2	10	0.8	0.7	0.1	0.6	4.5	1.1	8.5	10.7	7.8	20.6	5.6	57.7	1.1
Mahan fine sandy loam:[6]																		
(S88LA-127-28)	A	0-3	0.92	7.0	25	7.1	0.4	0.1	0.0	0.0	0.1	9.5	17.1	7.7	44.4	0.0	0.0	17.8
	E	3-8	0.27	6.8	10	1.6	0.4	0.0	0.0	0.0	0.1	5.2	7.2	2.1	27.8	0.0	0.0	4.0
	Bt1	8-18	0.44	5.7	27	8.1	5.5	0.2	0.1	0.0	1.2	10.2	24.1	15.1	57.7	0.4	0.0	1.5
	Bt2	18-28	0.21	5.4	26	6.4	5.9	0.3	0.1	2.0	0.6	12.5	25.2	15.3	50.4	0.4	13.1	1.1
	Bt3	28-47	0.06	5.2	17	2.4	3.5	0.2	0.1	3.1	1.7	13.1	19.3	11.0	32.1	0.5	28.2	0.7
	Bt4	47-73	0.01	4.6	20	2.0	3.2	0.3	0.1	11.2	0.2	15.6	21.2	17.0	26.4	0.5	65.9	0.6
Mahan fine sandy loam:[1]																		
(S88LA-127-29)	A	0-5	0.62	5.1	12	1.1	0.5	0.1	0.0	0.0	1.0	3.0	4.7	2.7	36.2	0.0	0.0	2.2
	E	5-13	0.01	5.8	10	0.7	0.2	0.0	0.0	0.0	1.0	2.0	2.9	1.9	31.0	0.0	0.0	3.5
	Bt1	13-22	0.04	5.7	11	0.7	0.3	0.1	0.0	0.0	0.8	3.6	4.7	1.9	23.4	0.0	0.0	2.3
	Bt2	22-33	0.01	5.4	9	1.0	0.4	0.1	0.0	0.0	1.6	4.1	5.6	3.1	26.8	0.0	0.0	2.5
	BC	33-43	0.01	5.4	13	1.8	0.7	0.2	0.0	0.0	1.0	4.5	7.2	3.7	37.5	0.0	0.0	2.6
	C	43-63	0.03	5.4	13	1.3	0.5	0.1	0.0	0.0	1.0	4.0	5.9	2.9	32.2	0.0	0.0	2.6
	C	63-67	0.03	5.4	11	0.8	0.3	0.0	0.0	0.0	1.4	3.6	4.7	2.5	23.4	0.0	0.0	2.7
Metcalf silt loam:[1]																		
(S89LA-127-37	A	0-7	1.25	5.7	19	1.6	0.3	0.1	0.0	0.0	1.0	7.2	9.2	3.0	21.7	0.0	0.0	5.3
	Bt1	7-17	0.09	5.8	10	0.5	0.2	0.0	0.0	0.0	0.8	4.2	4.9	1.5	14.3	0.0	0.0	2.5
	Bt2	17-28	0.10	5.2	19	2.3	1.5	0.3	0.1	0.8	0.4	7.2	11.4	5.4	36.8	0.9	14.8	1.5
	B/E	28-34	0.09	5.1	14	1.9	1.9	0.1	0.0	0.8	0.2	7.8	11.7	4.9	33.3	0.0	16.3	1.0
	2B′t3	34-60	0.05	5.1	33	1.7	1.6	0.2	0.1	1.0	0.4	6.6	10.2	5.0	35.3	1.0	20.0	1.1

See footnotes at end of table.

TABLE 16.--FERTILITY TEST DATA FOR SELECTED SOILS--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity, Na	Effective cation-exchange capacity, Al	Ca/Mg
		In	Pct		Ppm	---------Milliequivalents/100 grams of soil---------									Pct	Pct	Pct	
Moreland clay:[1]																		
(S90LA-127-47)	Ap	0-7	1.68	6.5	58	15.3	8.8	0.6	0.1	0.0	0.6	7.4	32.2	25.4	77.0	0.3	0.0	1.7
	Bw	7-22	0.50	6.9	178	16.3	14.4	0.7	0.3	0.0	0.6	7.0	38.7	32.3	81.9	0.8	0.0	1.1
	Bss	22-32	0.25	7.5	312	15.8	15.4	0.6	0.5	0.0	0.6	5.2	37.5	32.9	86.1	1.3	0.0	1.0
	BCkss	32-42	0.28	8.0	296	26.6	13.9	0.5	0.6	0.0	1.8	3.7	45.3	43.4	91.8	1.3	0.0	1.9
	Css	42-67	0.20	8.0	326	20.5	13.3	0.5	0.7	0.0	2.0	3.6	38.6	37.0	90.7	1.8	0.0	1.5
	Css	67-84	0.25	8.0	309	21.0	11.9	0.5	0.7	0.0	1.4	2.7	36.8	35.5	92.7	1.9	0.0	1.8
Oktibbeha silt																		
loam:[1]	A	0-4	2.66	5.7	16	7.6	0.8	0.1	0.1	0.0	1.0	15.6	24.2	9.6	35.5	0.4	0.0	9.5
(S89LA-127-34)	Btss1	4-14	1.30	4.7	34	35.8	4.1	0.5	0.1	3.6	0.8	22.8	63.3	44.9	64.0	0.2	8.0	8.7
	Btss2	14-26	0.64	5.1	37	40.7	3.2	0.7	0.2	2.6	0.8	24.0	68.8	48.2	65.1	0.3	5.4	12.7
	Btss3	26-34	0.43	6.5	36	48.9	2.5	0.9	0.2	0.0	1.2	17.4	69.9	53.7	75.1	0.3	0.0	19.6
	Ckss1	34-61	0.29	7.7	37	55.2	1.7	0.9	0.2	0.0	1.2	7.2	65.2	59.2	89.0	0.3	0.0	32.5
	Ckss2	61-88	0.42	7.7	35	49.8	1.8	0.8	0.2	0.0	1.2	6.6	59.2	54.0	88.9	0.3	0.4	27.7
Osier fine																		
sandy loam:[1]	A1	0-4	5.27	5.7	60	6.4	1.3	0.4	0.3	0.0	1.0	9.6	18.0	9.4	46.7	1.7	0.0	4.9
(S89LA-127-32)	A2	4-9	4.29	5.1	41	1.5	0.4	0.1	0.2	0.2	1.0	8.4	10.6	3.4	20.8	1.9	5.9	3.8
	Cg1	9-20	2.03	4.7	18	0.6	0.2	0.1	0.1	0.4	1.0	5.4	6.4	2.4	15.6	1.6	16.7	3.0
	Cg2	20-32	0.65	4.7	11	0.3	0.1	0.0	0.0	0.6	1.0	6.0	6.4	2.0	6.3	0.0	30.0	3.0
	Cg3	32-47	0.12	4.8	7	0.2	0.1	0.0	0.0	0.6	0.4	6.4	6.7	1.3	4.5	0.0	46.2	2.0
	Cg4	47-60	0.18	4.9	9	0.6	0.3	0.0	0.0	0.8	0.8	10.8	11.7	2.5	7.7	0.0	32.0	2.0
Perry clay:[1]																		
(S88LA-127-22)	Ap	0-4	2.09	7.4	235	21.6	8.1	0.8	0.2	0.0	0.0	3.5	34.2	30.7	89.8	0.6	0.0	2.7
	A2	4-9	1.00	7.3	111	23.4	10.7	0.9	0.2	0.0	0.0	4.9	40.1	35.2	87.8	0.5	0.0	2.2
	Bssg1	9-21	0.37	7.2	79	16.7	16.1	0.7	0.5	0.0	0.0	4.9	38.9	34.0	87.4	1.3	0.0	1.0
	Bssg2	21-35	0.22	7.4	112	14.7	20.7	0.8	1.2	0.0	0.0	6.4	43.8	37.4	85.4	2.7	0.0	0.7
	2BCss	35-50	0.16	7.6	175	13.5	20.7	0.7	1.9	0.0	0.0	3.6	40.4	36.8	91.1	4.7	0.0	0.7
	2Ck	50-72	0.13	7.9	285	15.2	20.8	0.7	2.4	0.0	0.0	2.5	41.6	39.1	94.0	5.8	0.0	0.7
Roxana silt																		
loam:[1]	Ap	0-7	0.47	8.0	131	5.4	2.0	0.2	0.0	0.0	0.2	3.0	10.6	7.8	71.7	0.0	0.0	2.7
(S90LA-127-42)	C1	7-21	0.05	8.3	114	8.5	1.7	0.1	0.0	0.0	0.6	2.2	12.5	10.9	82.4	0.0	0.0	5.0
	C2	21-37	0.01	8.4	89	5.3	0.8	0.1	0.0	0.0	0.6	2.1	8.3	6.8	74.7	0.0	0.0	6.6
	C3	37-58	0.01	8.2	127	5.7	1.0	0.1	0.0	0.0	1.2	1.5	8.3	8.0	81.9	0.0	0.0	5.7
	C4	58-72	0.01	7.9	121	5.3	0.9	0.1	0.0	0.0	0.8	1.4	7.7	7.1	81.8	0.0	0.0	5.9

See footnotes at end of table.

TABLE 16.--FERTILITY TEST DATA FOR SELECTED SOILS--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity, Na	Saturation: Effective cation-exchange capacity, Al	Ca/Mg
		In	Pct		Ppm	----------Milliequivalents/100 grams of soil----------									Pct	Pct	Pct	
Ruston fine sandy loam:[7] (S87LA-127-2)	A	0-5	0.10	5.0	4	0.4	0.1	0.0	0.0	1.4	0.0	5.4	5.9	1.9	8.5	0.0	73.7	4.0
	E	5-14	0.06	4.9	6	0.5	0.2	0.1	0.0	2.0	0.2	2.4	3.2	3.0	25.0	0.0	66.7	2.5
	Bt1	14-28	0.28	4.9	5	0.2	1.0	0.1	0.0	2.1	1.8	7.2	8.5	5.2	15.3	0.0	40.4	0.2
	Bt2	28-39	0.01	5.1	5	0.2	1.3	0.1	0.0	2.3	0.3	3.6	5.2	4.2	30.8	0.0	54.8	0.2
	B/E	39-44	0.01	5.1	5	0.2	2.0	0.1	0.0	3.8	0.0	4.8	7.1	6.1	32.4	0.0	62.3	0.1
	B't1	44-54	0.01	5.0	6	0.1	2.0	0.1	0.1	5.2	0.0	6.6	8.9	7.5	25.8	1.1	69.3	0.1
	B't2	54-60	0.01	4.1	8	1.0	0.3	0.1	0.0	5.4	0.4	8.4	9.8	7.2	14.3	0.0	75.0	3.3
Sacul fine sandy loam:[1] (S87LA-127-4)	A	0-1	1.96	5.0	15	4.3	1.0	0.1	0.0	0.5	0.1	7.2	12.6	6.0	42.9	0.0	8.3	4.3
	E	1-5	0.19	4.9	5	1.0	1.0	0.1	0.1	0.5	0.1	3.0	5.2	2.8	42.3	1.9	17.9	1.0
	Bt1	5-15	0.15	4.9	6	2.3	2.2	0.2	0.1	11.3	1.0	22.2	27.0	17.1	17.8	0.4	66.1	1.0
	Bt2	15-24	0.19	5.5	4	1.1	0.3	0.1	0.0	11.3	3.5	22.8	24.3	16.3	6.2	0.0	69.3	3.7
	Btg1	24-35	1.43	4.8	8	2.0	0.4	0.1	0.0	11.3	3.7	22.2	24.7	17.5	10.1	0.0	64.6	5.0
	Btg2	35-51	0.01	4.9	4	0.4	2.0	0.1	0.1	19.3	0.0	25.8	28.4	21.9	9.2	0.4	88.1	0.2
	Cg	51-60	0.01	4.9	4	0.4	1.1	0.1	0.0	13.1	3.7	28.2	29.8	18.4	5.4	0.0	71.2	0.4
Savannah fine sandy loam:[1] (S87LA-127-7)	A	0-5	0.06	4.5	8	1.0	6.0	0.3	0.2	0.4	0.4	7.2	14.7	8.3	51.0	1.4	4.8	0.2
	E	5-10	0.24	5.4	9	1.4	6.0	0.4	0.1	0.0	0.4	8.4	16.3	8.3	48.5	0.6	0.0	0.2
	Bt1	10-17	0.46	5.5	8	3.0	5.3	0.4	0.1	1.3	0.3	7.2	16.0	10.4	55.0	0.6	12.5	0.6
	Bt2	17-31	0.63	5.6	7	2.0	1.0	0.1	0.0	3.8	0.4	7.8	10.9	7.3	28.4	0.0	52.1	2.0
	Btx1	31-39	0.01	5.0	4	0.4	1.0	0.2	0.1	4.3	0.1	7.2	8.9	6.1	19.1	1.1	70.5	0.4
	Btx1, Btx2	39-64	0.01	5.1	4	0.3	2.0	0.1	0.3	5.8	0.4	9.6	12.3	8.9	22.0	2.4	65.2	0.2
Shatta very fine sandy loam:[1] (S89LA-127-33)	A	0-6	2.14	4.6	29	1.6	0.4	0.1	0.0	0.6	0.4	9.6	11.7	3.1	17.9	0.0	19.4	4.0
	E	6-16	0.20	5.0	11	1.6	0.6	0.0	0.0	0.8	0.2	4.2	6.4	3.2	34.4	0.0	25.0	2.7
	Bt1	16-25	0.18	5.0	16	2.4	2.8	0.2	0.1	1.2	0.8	8.4	13.9	7.5	39.6	0.7	16.0	0.9
	Bt2	25-34	0.05	4.8	14	1.0	1.7	0.2	0.1	4.0	0.6	10.2	13.2	7.6	22.7	0.8	52.6	0.6
	Btx1	34-42	0.10	4.8	11	0.5	1.1	0.1	0.1	4.0	1.0	10.0	11.8	6.8	15.3	0.8	58.8	0.5
	Btx2	42-60	0.02	4.5	13	0.5	1.1	0.2	0.1	5.6	0.8	7.2	9.1	8.3	20.9	1.1	67.5	0.5
	BC	60-75	0.01	4.5	13	0.5	1.0	0.1	0.1	5.4	1.0	16.2	17.9	8.1	9.5	0.6	66.7	0.5

See footnotes at end of table.

TABLE 16.--FERTILITY TEST DATA FOR SELECTED SOILS--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity, Na	Saturation: Effective cation-exchange capacity, Al	Ca/Mg
		In	Pct		Ppm	Milliequivalents/100 grams of soil									Pct	Pct	Pct	
Smithdale fine sandy loam:[8]																		
(S88LA-127-26)	A	0-4	0.82	4.6	57	0.4	0.2	0.2	0.0	0.7	1.1	0.6	1.4	2.6	57.1	0.0	26.9	2.0
	E	4-8	0.40	4.3	26	0.2	0.1	0.1	0.0	1.4	0.2	1.6	2.0	2.0	20.0	0.0	70.0	2.0
	Bt1	8-27	0.03	5.2	9	1.8	0.7	0.1	0.0	0.9	0.9	2.4	5.0	4.4	52.0	0.0	20.5	2.6
	Bt2	27-40	0.01	5.1	9	1.1	0.7	0.1	0.0	1.1	1.1	1.9	3.8	3.5	50.0	0.0	14.3	1.6
	Bt3	40-56	0.02	5.2	13	1.2	0.8	0.1	0.0	0.7	0.7	2.5	4.6	3.3	45.7	0.0	15.2	1.5
	Bt4	56-73	0.01	4.8	9	0.4	0.4	0.1	0.0	1.4	1.4	3.6	4.5	4.5	20.0	0.0	48.9	1.0
Smithdale fine sandy loam:[1]																		
(S90LA-127-45)	A	0-7	0.76	5.9	11	0.6	0.1	0.0	0.0	1.2	0.4	5.9	6.6	2.3	10.6	0.0	52.2	6.0
	Bt1	7-17	0.28	5.1	13	1.0	1.0	0.1	0.0	3.0	0.6	8.9	11.0	5.7	19.1	0.0	52.6	1.0
	Bt2	17-24	0.00	5.0	10	0.5	0.7	0.1	0.0	3.2	0.6	8.7	10.0	5.1	13.0	0.0	62.7	0.7
	Bt3	24-45	0.00	5.1	10	0.3	0.7	0.1	0.0	3.4	1.8	8.4	9.5	6.3	11.6	0.0	54.0	0.4
	Bt4	45-73	0.00	4.9	9	0.4	0.7	0.1	0.0	3.6	1.8	8.6	9.8	6.6	12.2	0.0	54.5	0.6
Vaiden silty clay loam:[1]																		
(S87LA-127-3)	A	0-3	1.87	5.2	12	10.1	1.4	0.3	0.1	1.4	0.0	8.4	20.3	13.3	58.6	0.5	10.5	7.2
	Btss1	3-13	0.37	4.7	10	19.2	3.0	0.2	0.1	2.8	1.0	14.4	36.9	26.3	61.0	0.3	10.6	6.4
	Btss2	13-33	0.01	4.9	11	26.0	3.0	0.3	0.2	2.7	0.5	15.6	45.1	32.7	65.4	0.4	8.3	8.7
	Css1	33-52	0.01	5.5	12	32.0	2.3	0.4	0.2	0.4	0.2	11.4	46.3	35.5	75.4	0.4	1.1	13.9
	Ckss2	52-72	0.06	7.8	14	35.1	1.4	0.3	0.2	0.0	0.0	2.4	39.4	37.0	93.9	0.5	0.0	25.1
SND:[9]																		
(S87LA-127-1)	A	0-8	0.99	6.1	12	3.0	1.0	0.2	0.0	---	---	1.2	5.4	---	77.8	0.0	---	3.0
	E	8-18	0.01	6.4	11	1.0	1.0	0.1	0.0	---	---	0.6	2.7	---	77.8	0.0	---	1.0
	B/E	18-34	0.01	5.5	15	1.1	0.4	0.1	0.0	0.9	0.0	1.0	2.6	2.5	61.5	0.0	36.0	2.8
	Bt	34-49	0.01	5.1	17	1.0	1.0	0.1	0.0	1.4	2.6	3.6	5.7	6.1	36.8	0.0	23.0	1.0
	C	49-60	0.01	5.5	10	0.2	0.2	0.1	0.0	0.9	0.0	1.2	1.7	1.4	29.4	0.0	64.3	1.0
SND:[10]																		
(S88LA-127-23)	A	0-7	0.33	5.2	9	0.5	0.0	0.0	0.0	0.7	0.7	1.9	2.4	1.9	20.8	0.0	36.8	0.0
	Bw	7-25	0.01	4.9	7	0.2	0.0	0.0	0.0	0.5	0.7	1.3	1.5	1.4	13.3	0.0	35.7	0.0
	Bt1	25-49	0.01	5.0	7	0.8	0.1	0.0	0.0	0.9	0.5	1.3	2.2	2.3	40.9	0.0	39.1	8.0
	Bt2	49-60	0.01	4.7	11	0.2	0.1	0.1	0.0	3.2	1.2	5.3	5.7	4.8	7.0	0.0	66.7	2.0
	C	60-73	0.01	4.9	13	0.3	0.1	0.0	0.1	1.4	0.6	4.6	5.1	2.5	9.8	2.0	56.0	3.0

See footnotes at end of table.

TABLE 16.--FERTILITY TEST DATA FOR SELECTED SOILS--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity Na	Effective cation-exchange capacity Al	Ca/Mg
		In	Pct		Ppm	Milliequivalents/100 grams of soil									Pct	Pct	Pct	
SND:[11] (S87LA-127-6)	A	0-6	0.06	4.8	4	1.0	1.0	0.1	0.0	0.4	0.2	4.2	6.3	2.7	33.3	0.0	14.8	1.0
	E	6-10	0.06	4.8	5	1.1	3.0	0.1	0.0	0.0	0.4	1.2	5.4	4.6	77.8	0.0	0.0	0.4
	Bt1	10-20	0.19	5.6	3	2.0	0.2	0.0	0.0	2.7	0.5	7.2	9.4	5.4	23.4	0.0	50.0	10.0
	Bt2	20-27	0.12	5.6	5	4.0	0.3	0.1	0.0	3.6	0.2	7.2	11.6	8.2	37.9	0.0	43.9	13.3
	Btx1	27-38	0.06	3.7	80	1.2	10.1	0.4	1.0	5.2	0.0	9.6	22.3	17.9	57.0	4.5	29.1	0.1
	Btx2	38-52	0.01	3.7	13	1.0	10.0	0.4	1.0	4.9	0.0	9.6	22.0	17.3	56.4	4.5	28.3	0.1
	Btx3	52-60	0.01	3.7	10	1.0	9.0	0.3	0.4	5.9	0.3	10.2	20.9	16.9	51.2	1.9	34.9	0.1

[1] Representative pedon for the survey area. For the description and location, see the section "Soil Series and Their Morphology."

[2] This pedon is located about 105 feet northeast of National Forest boundary, 42 feet north of center of gravelled road, SE1/4SW1/4 sec. 27, T. 13 N., R. 4 W.

[3] This pedon is located about 130 feet south of edge of woods, SE1/4SE1/4 sec. 24, T. 11 N., R. 3 W.

[4] This pedon is located about 0.1 mile north of Morrow Lake Lodge Road from Louisiana Highway 126, 18 steps west on woods road, SE1/4SE1/4 sec. 11, T. 13 N., R. 5 W.

[5] This pedon is located about 0.15 mile west of Turkey Creek, 82 feet north of the center of gravelled road, SE1/4NW1/4 sec. 7, T. 11 N., R. 1 E.

[6] This pedon is located about 65 steps on logging road west of driveway, SE1/4SE1/4 sec. 13, T. 13 N., R. 4 W.

[7] This pedon is located about 16 miles southwest of Winnfield, 0.8 mile east on gravelled road from Wheeling, NW1/4SE1/4 sec. 24, T. 9 N., R. 5 W.

[8] This pedon is located about 0.6 mile south of Wheeling, 0.6 mile south of the intersection of Louisiana Highway 34 and a paved parish road, 1,100 feet west of parish road, NE1/4SE1/4 sec. 23, T. 9 N., R. 5 W.

[9] SND- Series not designated. This pedon is included as a similar soil in map unit Ca, Cahaba fine sandy loam, 1 to 3 percent slopes. It is located about 125 feet west of road on edge of woods, SW1/4NE1/4 sec. 27, T. 10 N., R. 1 E.

[10] SND- Series not designated. This pedon is included as a similar soil in map unit Fz, Frizzell-Guyton silt loams, 0 to 2 percent slopes. It is located in NW1/4NW1/4 sec. 25, T. 10 N., R. 5 W.

[11] SND- Series not designated. This pedon is included as a similar soil in map unit Sh, Savannah fine sandy loam, 1 to 5 percent slopes. It is located in a road cut on north side of road at the intersection of U.S. Highway 84 and Louisiana Highway 124, NW1/4SE1/4 sec. 23, T. 11 N., R. 2 W.

TABLE 17.--PHYSICAL TEST DATA FOR SELECTED SOILS

(The symbol < means less than. Dashes indicate analyses 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 (0.25-0.10 mm)	Very fine (0.10-0.05 mm)	Total (2.0-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Water content: 1/3 bar	15 bar	Bulk density: Air-dry	Oven-dry	Field moisture
		In	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct (wt)	Pct (wt)	g/cm^3	g/cm^3	g/cm^3
Bellwood loam:[1] (S87LA-127-15)	A	0-4	6.9	2.5	1.9	3.2	22.6	37.1	37.4	25.5	33.2	17.3	1.46	1.90	1.40
	Bss1	4-14	0.1	0.2	0.1	0.7	14.9	16.0	23.7	60.3	39.4	25.8	1.84	2.12	1.44
	Bss2	14-23	0.2	0.1	0.1	0.4	11.0	11.8	28.0	60.2	40.3	25.2	1.91	2.53	1.47
	Bss3	23-36	0.2	0.1	0.0	0.2	9.1	9.6	29.4	61.0	41.7	25.5	1.94	2.39	1.52
	Bss4	36-46	0.3	0.1	0.1	0.5	15.5	16.5	25.9	57.6	40.8	23.7	1.97	2.70	1.57
	Bss5	46-55	0.0	0.0	0.0	0.3	23.5	23.5	24.0	52.6	40.3	22.3	1.94	2.60	1.63
	BC	55-70	0.0	1.1	0.5	1.0	17.1	19.7	35.3	45.0	41.7	23.3	1.84	2.61	1.51
	C	70-84	0.1	0.2	0.1	0.2	6.5	7.1	41.8	51.1	48.4	25.5	1.89	2.59	1.54
Keiffer loam:[2] (LA Heritage Program)	A	0-4	2.5	2.5	5.2	17.5	9.7	37.4	38.5	24.1	---	---	---	---	---
	Bk1	4-16	0.1	0.2	2.9	12.5	8.3	24.0	49.3	26.7	---	---	---	---	---
	Bk2	16-30	0.8	0.8	2.1	7.0	4.9	15.6	66.7	17.7	---	---	---	---	---
	Bk3	30-50	2.2	1.7	4.0	23.6	9.1	40.6	23.5	35.9	---	---	---	---	---
	Bkss	50-70	4.3	2.9	2.8	13.0	3.5	26.5	35.7	37.8	---	---	---	---	---
Savannah very fine sandy loam:[3] (S87LA-127-12)	A	0-4	0.5	0.8	3.4	22.9	31.4	59.0	39.4	1.6	13.2	3.7	1.38	1.63	1.31
	E	4-7	0.5	1.0	3.5	22.8	33.0	60.8	35.1	4.1	12.4	3.4	1.78	2.30	1.71
	Bt1	7-12	0.5	0.5	3.1	22.9	30.9	57.9	21.0	21.1	25.2	11.4	1.74	2.35	1.60
	Bt2	12-18	0.2	0.2	2.3	17.6	25.7	46.0	43.8	10.2	19.3	6.8	1.81	2.32	1.72
	Bt3	18-26	1.6	0.6	1.7	10.5	17.5	31.9	43.8	24.3	27.1	10.9	1.72	2.14	1.68
	Btx/E	26-42	0.3	0.3	2.2	16.0	24.2	43.0	43.8	13.2	21.8	6.6	1.74	2.46	1.70
	2Btx4	42-62	0.1	0.1	1.5	14.1	24.0	39.9	33.9	26.2	27.3	7.6	1.89	2.11	1.81
	2Btx5	62-65	0.1	0.1	1.6	14.3	25.1	41.2	30.3	28.5	26.9	8.4	1.84	2.42	1.79
	2Btx6	65-87	0.0	0.1	0.9	15.3	25.7	42.0	23.6	34.4	30.1	9.6	2.01	2.89	1.88
Savannah very fine sandy loam:[4] (S87LA-127-13)	A	0-7	0.1	1.0	6.1	20.7	24.3	52.2	41.5	6.3	17.1	4.9	1.67	2.11	1.62
	E	7-12	0.3	0.7	4.5	20.3	22.5	48.3	45.0	6.7	15.5	3.2	1.76	2.44	1.76
	Bt1	12-28	0.2	0.4	4.0	14.0	16.7	35.3	37.9	26.8	25.2	12.1	1.81	2.36	1.66
	Btx1	28-41	0.1	0.4	4.1	16.7	20.0	41.3	37.1	21.6	20.6	9.0	1.81	2.36	1.68
	Btx2	41-49	0.0	0.3	3.6	14.4	20.1	38.4	33.8	27.8	23.8	12.1	1.81	2.26	1.72
	Bt2	49-60	0.0	0.1	3.0	19.9	24.1	47.1	22.0	30.9	25.1	13.2	1.90	2.55	1.73
	2Bt3	60-72	0.1	0.1	2.3	22.0	29.1	53.6	26.4	20.0	20.5	9.2	1.87	2.42	1.77
	2BC	72-88	0.2	0.2	2.3	26.6	38.1	67.4	15.3	17.3	17.3	7.4	1.83	2.46	1.75

See footnotes at end of table.

TABLE 17.--PHYSICAL TEST DATA FOR SELECTED SOILS--Continued

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 (0.25-0.10 mm)	Very fine (0.10-0.05 mm)	Total (2.0-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Water content: 1/3 bar	15 bar	Bulk density: Air-dry	Oven-dry	Field moisture
		In	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct (wt)	Pct (wt)	g/cm^3	g/cm^3	g/cm^3
Savannah very fine sandy loam:[5] (S87LA-127-14)	A	0-6	0.6	0.8	1.3	15.7	34.9	53.3	41.5	5.2	15.0	3.5	1.47	1.89	1.43
	E	6-13	0.3	0.1	0.7	15.1	34.5	50.7	42.6	6.7	13.7	2.9	1.63	2.17	1.58
	Bt1	13-24	0.3	0.1	0.3	8.7	21.5	30.9	49.1	20.0	26.1	8.6	1.66	1.98	1.59
	Bt2	24-32	0.1	0.1	5.5	4.8	17.7	28.2	51.5	20.3	28.3	10.3	1.70	2.34	1.65
	Btx1	32-43	0.1	0.2	0.3	6.5	16.7	23.8	57.5	18.7	25.1	10.0	1.68	2.22	1.63
	Btx2	43-53	0.1	0.1	0.3	6.8	19.5	26.8	49.1	24.1	25.6	11.7	1.76	2.52	1.72
	2B't1	53-61	0.0	0.0	0.2	6.8	19.5	26.5	47.5	26.0	27.8	13.4	1.80	2.52	1.75
	2B't2	61-72	0.1	0.1	0.3	5.9	18.1	24.5	45.9	29.6	27.9	13.8	1.86	2.52	1.75
	2B't3	72-84	0.0	0.0	0.1	6.7	15.0	21.8	51.8	26.4	27.5	13.2	1.79	2.49	1.69
Savannah silt loam:[6] (S87LA-127-17)	A	0-4	1.1	1.1	1.9	12.8	24.8	41.7	55.5	2.8	14.5	3.8	1.55	1.95	1.55
	E	4-9	0.1	0.1	1.2	9.5	27.4	38.3	56.2	5.5	14.7	3.0	1.54	2.06	1.51
	Bt1	9-15	0.2	0.1	0.9	8.9	24.9	35.0	53.5	11.5	19.4	5.7	1.59	2.05	1.57
	Bt2	15-25	0.3	0.1	0.7	6.8	20.3	28.2	50.1	21.7	25.8	10.6	1.88	2.85	1.87
	Btx1	25-38	0.2	0.1	0.7	8.1	23.5	32.6	54.8	12.6	21.5	6.8	1.80	2.37	1.79
	2Btx2	38-51	0.1	0.0	0.7	7.5	22.6	30.9	46.8	22.3	28.5	12.5	1.77	2.53	1.81
	2Btx3	51-63	0.0	0.0	0.2	6.4	25.9	32.5	40.5	27.0	31.8	14.2	1.90	2.85	1.88
	3B't1	63-72	0.0	0.0	0.1	4.2	24.5	28.8	43.1	28.1	33.0	15.9	1.87	2.60	1.85
	3B't2	72-80	0.1	0.0	0.2	3.6	34.5	38.4	39.6	22.0	31.9	13.7	1.77	2.27	1.76
	3BC	80-90	0.0	0.0	0.1	5.1	65.7	70.9	18.4	11.7	17.9	7.2	1.62	2.13	1.62
Savannah fine sandy loam:[7] (S87LA-127-18)	A	0-6	0.4	0.6	2.8	37.9	20.7	62.4	36.0	1.6	10.6	2.9	1.64	1.89	1.60
	E	6-13	0.3	0.1	2.0	37.1	20.7	60.2	37.4	2.4	10.4	2.6	1.76	2.07	1.72
	Bt1	13-20	0.2	0.1	1.7	35.4	19.9	57.3	37.0	5.7	11.9	3.9	1.71	2.21	1.63
	Bt2	20-35	0.2	0.2	1.5	31.3	17.6	50.8	37.4	11.8	18.0	6.7	1.72	2.12	1.63
	Bt3	35-43	0.1	0.1	1.5	31.6	17.9	51.2	38.5	10.3	18.0	6.1	1.75	2.05	1.73
	Btx1	43-53	0.0	0.1	1.4	31.2	18.5	51.2	37.7	11.1	17.0	6.7	1.80	2.16	1.78
	Btx2	53-62	0.0	0.1	1.5	32.2	17.7	51.5	34.5	14.0	18.9	8.0	1.84	2.35	1.88
	Btx3	62-77	0.0	0.1	2.5	32.2	17.9	52.7	29.8	17.5	18.5	7.7	1.83	2.41	1.81
	Btx4	77-86	0.1	0.1	1.4	31.9	18.1	51.6	27.0	21.4	19.2	8.9	1.87	2.41	1.85
	2Btx5	86-94	---	---	---	---	---	---	---	---	24.2	11.5	1.91	2.73	1.89

See footnotes at end of table.

TABLE 17.--PHYSICAL TEST DATA FOR SELECTED SOILS--Continued

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 (0.25-0.10 mm)	Very fine (0.10-0.05 mm)	Total (2.0-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Water content: 1/3 bar	15 bar	Bulk density: Air-dry	Oven-dry	Field moisture
		In	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct (wt)	Pct (wt)	g/cm^3	g/cm^3	g/cm^3
Vaiden silt loam:[8]															
(S87LA-127-19)	A	0-5	6.2	3.7	3.0	9.1	10.1	32.1	51.0	16.9	23.8	11.3	1.95	1.92	1.60
	Btss1	5-14	1.0	1.1	0.9	3.8	4.6	11.4	30.3	58.3	41.7	26.6	2.04	2.33	2.04
	Btss2	14-22	0.9	1.2	0.9	3.5	4.5	11.0	30.7	58.3	41.0	25.6	2.01	2.46	2.00
	Btss3	22-35	0.8	0.9	0.8	3.1	3.9	9.5	29.1	61.4	43.0	27.8	2.04	2.35	2.04
	Btss4	35-48	0.3	0.7	0.7	3.1	4.1	8.9	33.4	57.7	44.6	28.8	2.09	2.58	2.07
	Bk1	48-55	0.2	0.4	0.6	1.4	2.5	5.1	63.2	31.7	33.1	16.4	1.91	2.30	1.88
	Bk2	55-70	2.4	1.0	0.6	2.7	3.2	9.9	38.6	51.5	44.3	26.3	2.06	2.44	2.00
	Bk3	70-84	1.6	0.6	0.5	3.6	4.1	10.4	39.2	50.4	46.4	28.0	2.03	2.64	2.01
	Ck	84-90	0.6	0.4	0.5	4.1	5.2	10.8	47.0	42.2	44.6	26.1	1.92	2.55	1.92
SND:[9]															
(S87LA-127-16)	A	0-3	0.9	1.3	1.3	3.4	18.0	24.9	67.3	7.8	20.3	6.3	---	---	---
	E	3-6	0.3	0.3	0.5	2.6	17.9	21.6	68.0	10.4	20.9	4.9	1.68	2.00	1.55
	Bt1	6-12	0.3	0.1	0.3	2.1	15.4	18.2	67.0	14.8	23.3	6.6	1.88	2.42	1.57
	Bt2	12-23	0.3	0.1	0.1	1.7	14.4	16.6	65.3	18.1	26.2	8.3	1.57	1.88	1.52
	Bt3	23-31	0.2	0.1	0.1	1.6	14.9	16.9	69.1	14.0	24.4	7.1	1.67	2.06	1.63
	Bt4	31-38	0.1	0.1	0.1	1.5	13.6	15.4	67.9	16.7	26.8	8.1	1.67	2.24	1.64
	B/E	38-53	0.2	0.1	0.1	1.6	14.5	16.5	69.1	14.4	24.6	7.3	1.70	2.16	1.59
	2Bt5	53-64	0.1	0.0	0.0	0.9	9.8	10.8	57.5	31.7	31.2	15.9	1.75	2.26	1.70
	2Bt6	64-74	0.1	0.0	0.1	0.8	9.2	10.2	55.3	34.5	33.5	18.3	1.97	2.69	1.73
	2BC	74-90	0.1	0.0	0.0	0.3	5.6	6.0	47.4	46.6	39.9	22.9	2.04	2.72	1.68

[1] This pedon is located about 7.5 miles northwest of Winnfield, 3 miles west on Louisiana Highway 505 from its intersection with U.S. Highway 167, 255 feet north of highway on logging road, 30 feet west of road in pine plantation; SE1/4SW1/4 sec. 17, T. 12 N., R. 3 W.

[2] This pedon is located about 11 miles west of Winnfield, 0.3 mile east from Sanders Chapel on Louisiana Highway 156, 1.5 miles south on gravelled road, 125 feet east of road; NE1/4SE1/4 sec. 13, T. 11 N., R. 5 W. The clay content shown for this soil is carbonate-free clay.

[3] This pedon is located in the NE1/4SE1/4 sec. 25, T. 12 N., R. 1 E.*

[4] This pedon is located 9.6 miles northeast of Winnfield, 0.65 mile west on Louisiana Highway 127 from the LaSalle-Winn parish line, southwest 0.6 mile on woods road, 25 feet north of road; SW1/4NW1/4 sec. 25, T. 12 N., R. 1 E.*

[5] This pedon is located in the NW1/4NW1/4 sec. 30, T. 11 N., R. 1 W.*

[6] This pedon is located in the NW1/4SW1/4 sec. 29, T. 9 N., R. 4 W.*

[7] This pedon is located in the NW1/4SE1/4 sec. 16, T. 10 N., R. 4 W.

[8] This pedon is located in the SE1/4SE1/4 sec. 7, T. 9 N., R. 3 W. It is mapped as an included soil in map unit Va-Vaiden silty clay loam, 0 to 1 percent slopes.

[9] SND- Series not designated. This pedon classifies as a coarse-silty, siliceous, thermic Aquic Paleudult. It is mapped as an included soil in map unit Gc-Glenmora silt loam, 1 to 3 percent slopes. The pedon is located in the SW1/4SE1/4 sec. 17, T. 9 N., R. 5 W.

* It is mapped as an included soil in map unit Sh-Savannah fine sandy loam, 1 to 5 percent slopes.

TABLE 18.--CHEMICAL TEST DATA FOR SELECTED SOILS

(The symbol < means less than. Dashes indicate analyses not made.)

Soil name and sample number	Horizon	Depth	Extractable cations: Ca	Extractable cations: Mg	Extractable cations: K	Extractable cations: Na	Extractable acidity	Cation-exchange capacity (NH4OAc)	Base saturation (NH4OAc)	Organic carbon	pH 1:1 H_2O	pH 1:1 KCl	pH 1:2 $CaCl_2$	Extractable iron	Extractable aluminum	Extractable hydrogen	Extractable phosphorus (Bray 2)
		In	Meq/100g	Meq/100g	Meq/100g	Meq/100g	Pct	Pct	Pct	Pct				Pct	Meq/100g	Meq/100g	Ppm
Bellwood loam:[1] (S87LA-127-15)	A	0-4	15.5	5.6	0.7	0.1	13.8	22.3	61.3	2.78	5.6	4.4	4.8	1.67	0.0	1.0	9
	Bss1	4-14	14.1	9.3	0.6	0.1	19.8	36.7	54.9	0.29	4.6	3.3	4.0	1.69	13.6	0.4	<5
	Bss2	14-23	4.6	5.6	0.6	0.2	27.0	37.8	28.9	0.19	4.3	3.0	3.5	2.50	22.0	0.0	<5
	Bss3	23-36	5.1	6.7	0.5	0.3	28.2	38.5	30.9	0.09	4.1	2.9	3.5	2.00	18.6	1.4	<5
	Bss4	36-46	5.3	7.9	0.5	0.3	24.0	35.0	36.8	0.08	4.2	2.8	3.6	1.67	13.2	1.8	5
	Bss5	46-55	5.8	6.1	0.6	1.4	23.4	31.0	37.3	0.05	3.9	2.8	3.2	1.69	13.8	0.0	5
	BC	55-70	7.6	7.5	0.5	1.1	14.4	27.9	53.7	0.01	4.2	2.9	3.6	2.17	6.0	2.0	17
	C	70-84	20.1	10.5	0.5	0.3	13.2	32.2	31.4	<0.01	4.1	3.0	3.6	1.50	4.6	1.8	20
Keiffer loam:[2] (LA Heritage Program)	A	0-4	32.0	0.5	0.2	0.1	1.2	21.1	96.5	1.70	7.0	6.8	7.4	---	---	---	18
	Bk1	4-16	35.0	0.5	0.1	0.2	0.8	16.8	97.8	0.93	7.7	7.0	7.5	---	---	---	5
	Bk2	16-30	34.5	2.3	0.1	0.4	0.4	17.5	98.9	0.15	7.9	7.1	7.5	---	---	---	5
	Bk3	30-50	35.4	0.3	0.2	2.0	1.0	19.2	97.4	0.09	8.0	7.0	7.5	---	---	---	<5
	Bkss	50-70	35.0	0.8	0.2	1.0	1.0	18.1	97.4	0.09	8.0	6.9	7.5	---	---	---	5
Savannah very fine sandy loam:[3] (S87LA-127-12)	A	0-4	1.8	0.5	0.3	0.5	3.0	4.7	50.8	1.01	5.7	4.7	4.9	0.17	0.0	1.0	28
	E	4-7	1.1	0.3	0.2	0.6	3.6	5.6	37.9	0.61	4.9	4.0	4.4	0.33	0.8	1.4	9
	Bt1	7-12	1.0	1.1	0.3	0.6	9.0	14.4	25.0	0.47	4.8	3.7	4.1	0.30	5.0	1.4	8
	Bt2	12-18	1.0	0.9	0.2	0.6	7.4	9.7	26.7	0.44	4.7	3.7	4.1	0.17	5.0	0.6	6
	Bt3	18-26	0.8	1.1	0.3	0.7	9.6	12.1	23.2	0.38	5.0	3.6	4.1	1.33	5.4	1.6	5
	Btx/E	26-42	0.5	0.6	0.3	0.7	6.6	8.6	24.1	0.39	5.0	3.6	4.0	1.50	4.0	0.0	5
	2Btx4	42-62	1.7	2.3	0.3	1.0	9.6	14.9	35.6	0.35	4.9	3.4	4.0	1.67	5.6	1.4	5
	2Btx5	62-65	3.3	3.5	0.3	1.2	7.2	15.5	53.5	0.34	4.7	3.3	3.9	1.83	4.6	0.2	5
	2Btx6	65-87	4.5	1.5	0.3	1.3	6.6	9.4	53.5	0.13	4.4	3.3	3.9	2.50	4.6	1.6	5
Savannah very fine sandy loam:[4] (S87LA-127-13)	A	0-7	2.8	5.1	0.2	0.6	7.8	9.4	52.7	1.45	5.1	4.1	4.6	0.17	4.0	1.0	5
	E	7-12	2.1	2.3	0.2	0.6	3.6	4.6	59.1	0.26	5.3	4.1	4.6	0.19	0.4	0.6	5
	Bt1	12-28	2.0	2.5	0.3	0.7	6.6	10.3	45.5	0.21	5.2	3.8	4.5	0.67	6.0	0.4	5
	Btx1	28-41	0.5	1.0	0.3	0.7	7.2	10.4	25.8	0.08	5.2	3.6	4.1	0.50	4.4	0.6	5
	Btx2	41-49	0.5	1.5	0.3	0.8	9.0	12.6	25.6	0.05	5.3	3.7	4.1	0.83	7.0	0.6	5
	Bt2	49-60	0.4	2.3	0.2	0.9	10.2	14.5	27.1	<0.01	5.1	3.5	4.1	1.00	9.4	0.0	5
	2Bt3	60-72	0.4	2.1	0.2	1.0	6.6	10.8	35.9	<0.01	5.2	3.5	4.0	1.15	5.0	0.4	5
	2BC	72-88	0.4	2.1	0.2	2.6	4.8	12.9	52.5	<0.01	5.3	3.5	4.0	1.00	4.6	0.2	5

See footnotes at end of table.

TABLE 18.--CHEMICAL TEST DATA FOR SELECTED SOILS--Continued

Soil name and sample number	Horizon	Depth	Extractable cations Ca	Extractable cations Mg	Extractable cations K	Extractable cations Na	Extractable acidity	Cation-exchange capacity NH$_4$OAc	Base saturation NH$_4$OAc	Organic carbon	pH 1:1 H_2O	pH 1:1 KCl	pH 1:2 $CaCl_2$	Extractable iron	Extractable aluminum	Extractable hydrogen	Extractable phosphorus (Bray 2)
		In	Meq/100g	Meq/100g	Meq/100g	Meq/100g	Pct	Pct	Pct	Pct				Pct	Meq/100g	Meq/100g	Ppm
Savannah very fine sandy loam:[5] (S87LA-127-14)	A	0-6	1.9	0.4	0.2	0.7	5.4	7.5	37.2	0.83	5.3	4.0	4.5	0.17	1.2	0.0	5
	E	6-13	1.3	0.3	0.2	0.7	3.6	5.0	41.0	0.35	5.2	4.0	4.4	0.20	0.4	1.2	5
	Bt1	13-24	1.3	0.5	0.2	0.6	7.2	9.2	26.5	0.12	4.9	3.7	4.0	0.33	4.2	1.6	5
	Bt2	24-32	0.8	1.0	0.3	0.7	9.6	12.8	22.6	0.10	4.8	3.7	4.0	0.35	6.0	0.6	5
	Btx1	32-43	0.6	0.9	0.2	0.7	8.4	10.7	22.2	0.05	4.8	3.5	3.9	0.50	5.6	0.0	5
	Btx2	43-53	0.7	1.2	0.3	1.0	9.0	12.2	26.2	<0.01	5.2	3.5	4.0	0.67	5.0	1.4	5
	2B't1	53-61	1.4	2.3	0.3	1.0	9.6	15.7	34.2	<0.01	5.1	3.5	4.1	0.65	7.0	0.2	5
	2B't2	61-72	1.7	3.0	0.3	1.2	9.0	19.1	40.8	<0.01	4.9	3.3	4.0	0.50	5.6	0.0	5
	2B't3	72-84	2.4	3.5	0.3	1.3	7.2	15.1	51.0	<0.01	4.7	3.3	3.9	0.33	4.0	1.0	5
Savannah silt loam:[6] (S87LA-127-17)	A	0-4	1.2	0.2	0.1	0.2	6.6	7.5	20.5	1.05	4.8	3.5	4.2	0.17	3.4	0.2	<5
	E	4-9	1.4	0.3	0.2	0.3	5.4	4.2	28.9	0.33	5.1	4.1	4.0	0.67	0.2	0.8	<5
	Bt1	9-15	1.8	0.8	0.1	0.2	6.0	5.7	36.0	0.23	5.1	3.7	4.0	1.16	3.4	1.2	<5
	Bt2	15-25	1.9	1.2	0.1	0.3	10.2	9.0	25.5	0.15	5.1	3.6	3.9	1.18	3.0	1.6	<5
	Btx1	25-38	1.1	1.1	0.1	1.3	7.2	7.0	33.3	0.15	5.4	3.6	4.2	1.33	3.6	2.0	<5
	2Btx2	38-51	1.4	1.7	0.2	1.2	9.6	11.3	31.9	0.05	5.3	3.5	4.1	1.50	9.4	0.0	<5
	2Btx3	51-63	1.4	2.2	0.2	1.1	9.6	15.5	33.8	0.05	4.9	3.3	4.0	1.67	5.0	0.6	<5
	3B't1	63-72	1.4	2.3	0.2	1.1	10.8	15.9	31.6	0.01	4.8	3.2	4.0	2.50	6.0	0.2	<5
	3B't2	72-80	1.8	3.4	0.2	2.2	9.0	14.4	67.5	<0.01	4.8	3.2	3.9	3.00	5.0	0.0	<5
	3BC	80-90	1.4	2.1	0.2	0.9	5.4	8.1	46.0	<0.01	5.1	3.3	4.1	3.00	1.8	1.0	<5
Savannah fine sandy loam:[7] (S87LA-127-18)	A	0-6	1.3	0.3	0.3	0.2	6.6	5.4	24.1	1.00	5.2	4.0	4.3	<0.10	0.4	1.0	<5
	E	6-13	1.0	0.3	0.2	0.2	3.6	4.5	32.1	0.12	5.3	4.1	4.4	0.17	0.8	0.4	<5
	Bt1	13-20	1.5	0.7	0.3	0.2	6.6	6.8	29.0	0.12	5.4	4.1	4.5	0.33	0.0	0.6	<5
	Bt2	20-35	1.3	0.7	0.3	0.2	6.0	7.5	27.7	0.15	5.1	3.8	4.2	0.50	1.0	2.4	<5
	Bt3	35-43	0.8	0.6	0.3	0.2	6.0	7.6	24.1	0.05	5.0	3.8	4.0	0.67	2.0	1.0	<5
	Btx1	43-53	1.0	0.6	0.2	0.2	6.0	6.5	25.0	0.06	5.1	3.7	4.1	1.67	4.0	0.4	<5
	Btx2	53-62	1.0	0.7	0.3	0.8	6.0	7.2	31.8	0.06	5.0	3.6	4.1	1.67	2.8	2.4	8
	Btx3	62-77	0.7	0.7	0.2	0.7	5.2	6.3	30.7	0.06	5.0	3.7	4.0	2.17	4.0	0.6	16
	Btx4	77-87	0.8	1.1	0.2	0.5	5.8	5.4	31.0	0.06	4.9	3.6	4.0	2.33	5.0	0.0	12
	2Btx5	87-94	0.7	2.5	0.3	0.6	10.2	13.5	28.7	0.05	4.6	3.3	3.7	2.50	6.6	1.0	14
Vaiden silt loam:[8] (S87LA-127-19)	A	0-5	13.4	1.3	0.3	0.2	7.5	9.9	67.0	1.41	5.6	4.6	5.1	1.50	0.0	0.8	12
	Btss1	5-14	23.5	2.5	0.4	0.2	13.8	35.3	65.8	0.37	4.7	3.6	4.5	1.67	3.0	1.8	8
	Btss2	14-22	24.8	3.6	0.4	0.2	12.6	30.6	69.7	0.17	4.8	3.6	4.3	1.83	5.0	3.0	8
	Btss3	22-35	29.5	3.3	0.5	0.2	13.2	36.0	71.7	0.15	4.8	3.6	4.4	2.50	2.2	1.0	7
	Btss4	35-48	40.3	3.5	0.5	0.3	12.7	36.0	77.8	0.10	4.8	3.9	4.8	1.50	1.6	2.0	8
	Bk1	48-55	40.3	2.5	0.3	0.3	2.6	20.7	94.3	0.19	7.2	6.3	6.9	1.33	<1.0	<1.0	8
	Bk2	55-70	52.7	4.1	0.5	0.3	3.6	32.9	94.1	0.19	7.4	6.3	7.1	0.67	<1.0	<1.0	6
	Bk3	70-84	53.7	4.6	0.5	0.4	1.2	32.0	98.0	0.19	7.4	6.4	7.1	1.83	<1.0	<1.0	5
	Ck	84-90	50.3	4.1	0.6	0.2	1.8	27.4	96.8	0.19	7.4	6.4	7.1	1.83	<1.0	<1.0	6

See footnotes at end of table.

TABLE 18.--CHEMICAL TEST DATA FOR SELECTED SOILS--Continued

Soil name and sample number	Horizon	Depth	Extractable cations: Ca	Extractable cations: Mg	Extractable cations: K	Extractable cations: Na	Extractable acidity	Cation-exchange capacity (NH_4OAc)	Base saturation (NH_4OAc)	Organic carbon	pH 1:1 H_2O	pH 1:1 KCl	pH 1:2 $CaCl_2$	Extractable iron	Extractable aluminum	Extractable hydrogen	Extractable phosphorus (Bray 2)
		In	Meq/100g	Meq/100g	Meq/100g	Meq/100g	Pct	Pct	Pct	Pct				Pct	Meq/100g	Meq/100g	Ppm
SND:[9]																	
(S87LA-127-16)	A	0-3	3.3	0.9	0.4	0.1	8.4	10.1	35.9	1.39	5.4	4.0	4.7	<0.01	0.0	0.8	14
	E	3-6	1.4	0.7	0.1	0.2	2.4	5.5	50.0	0.50	5.1	3.9	4.1	0.17	0.0	1.8	8
	Bt1	6-12	1.4	0.7	0.2	0.1	4.2	6.3	36.4	0.26	4.8	3.6	3.9	1.33	4.0	0.0	5
	Bt2	12-23	0.7	0.9	0.2	0.2	2.4	7.7	45.5	0.16	4.9	3.6	3.8	1.35	4.2	0.8	5
	Bt3	23-31	0.7	0.7	0.1	0.1	4.8	6.0	25.0	0.12	5.0	3.6	4.1	1.50	3.6	0.8	5
	Bt4	31-38	0.7	0.8	0.1	1.2	7.4	7.8	27.5	0.09	5.1	3.6	4.1	2.17	4.0	1.2	5
	B/E	38-53	0.6	0.8	0.1	1.3	7.2	7.0	28.0	0.05	5.2	3.5	4.2	2.00	3.6	1.2	5
	2Bt5	53-64	0.8	0.8	0.1	1.1	11.4	16.9	19.7	0.01	5.1	3.4	4.0	2.17	5.6	1.6	5
	2Bt6	64-74	4.1	4.6	0.3	1.9	10.8	22.5	50.2	0.01	5.1	3.3	4.1	2.50	4.0	1.6	5
	2BC	74-90	4.2	9.0	0.3	1.2	10.8	23.0	57.6	<0.01	4.6	3.2	4.3	3.00	2.6	1.8	5

[1] This pedon is located about 7.5 miles northwest of Winnfield, 3 miles west on Louisiana Highway 505 from its intersection with U.S. Highway 167, 255 feet north of highway on logging road, 30 feet west of road in pine plantation; SE1/4SW1/4 sec. 17, T. 12 N., R. 3 W.

[2] This pedon is located about 11 miles west of Winnfield, 0.3 mile east from Sanders Chapel on Louisiana Highway 156, 1.5 miles south on gravelled road, 125 feet east of road; NE1/4SE1/4 sec. 13, T. 11 N., R. 5 W. The clay content shown for this soil is carbonate-free clay.

[3] This pedon is located in the NE1/4SE1/4 sec. 25, T. 12 N., R. 1 E.*

[4] This pedon is located 9.6 miles northeast of Winnfield, 0.65 mile west on Louisiana Highway 127 from the LaSalle-Winn parish line, southwest 0.6 mile on woods road, 25 feet north of road; SW1/4NW1/4 sec. 25, T. 12 N., R. 1 E.*

[5] This pedon is located in the NW1/4NW1/4 sec. 30, T. 11 N., R. 1 W.*

[6] This pedon is located in the NW1/4SW1/4 sec. 29, T. 9 N., R. 4 W.*

[7] This pedon is located in the NW1/4SE1/4 sec. 16, T. 10 N., R. 4 W.

[8] This pedon is located in the SE1/4SE1/4 sec. 7, T. 9 N., R. 3 W. It is mapped as an included soil in map unit Va-Vaiden silty clay loam, 0 to 1 percent slopes.

[9] SND- Series not designated. This pedon classifies as a coarse-silty, siliceous, thermic Aquic Paleudults. It is mapped as an included soil in map unit GC-Glenmora silt loam, 1 to 3 percent slopes. The pedon is located in the SW1/4SE1/4 sec. 17, T. 9 N., R. 5 W.

* It is mapped as an included soil in map unit Sh-Savannah fine sandy loam, 1 to 5 percent slopes.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Bellwood	Very-fine, montmorillonitic, thermic Aquentic Chromuderts
Boykin	Loamy, siliceous, thermic Arenic Paleudults
Brimestone	Fine-silty, siliceous, thermic Glossic Natraqualfs
Cahaba	Fine-loamy, siliceous, thermic Typic Hapludults
Darden	Thermic, coated Typic Quartzipsamments
Frizzell	Coarse-silty, siliceous, thermic Glossaquic Hapludalfs
Gallion	Fine-silty, mixed, thermic Typic Hapludalfs
*Glenmora	Fine-silty, siliceous, thermic Glossaquic Paleudalfs
Gore	Fine, mixed, thermic Vertic Paleudalfs
Guyton	Fine-silty, siliceous, thermic Typic Glossaqualfs
Harleston	Coarse-loamy, siliceous, thermic Aquic Paleudults
Hollywood	Fine, montmorillonitic, thermic Typic Pelluderts
Keiffer	Fine-silty, carbonatic, thermic Rendollic Eutrochrepts
Kolin	Fine-silty, siliceous, thermic Glossaquic Paleudalfs
Mahan	Clayey, kaolinitic, thermic Typic Hapludults
Metcalf	Fine-silty, siliceous, thermic Aquic Glossudalfs
Moreland	Fine, mixed, thermic Vertic Hapludolls
Oktibbeha	Very-fine, montmorillonitic, thermic Vertic Hapludalfs
Osier	Siliceous, thermic Typic Psammaquents
Perry	Very-fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts
*Roxana	Coarse-silty, mixed, nonacid, thermic Typic Udifluvents
Ruston	Fine-loamy, siliceous, thermic Typic Paleudults
Sacul	Clayey, mixed, thermic Aquic Hapludults
Savannah	Fine-loamy, siliceous, thermic Typic Fragiudults
Shatta	Fine-silty, siliceous, thermic Typic Fragiudults
Smithdale	Fine-loamy, siliceous, thermic Typic Hapludults
Vaiden	Very-fine, montmorillonitic, thermic Vertic Hapludalfs
Yorktown	Very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents

* The soil is a taxadjunct to the series. See text for description of those characteristics of the soil that are outside the range of the series.

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