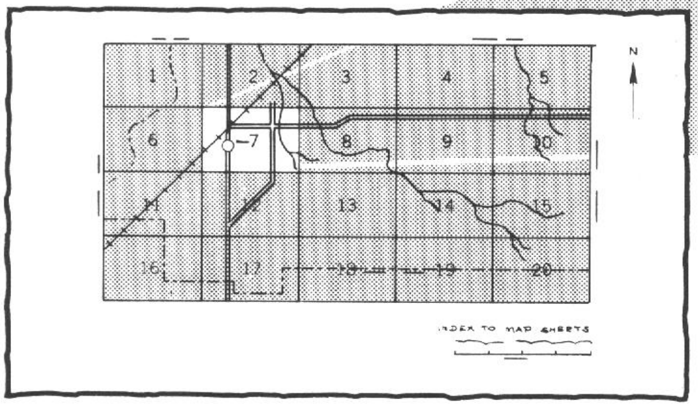
Soil Survey Of

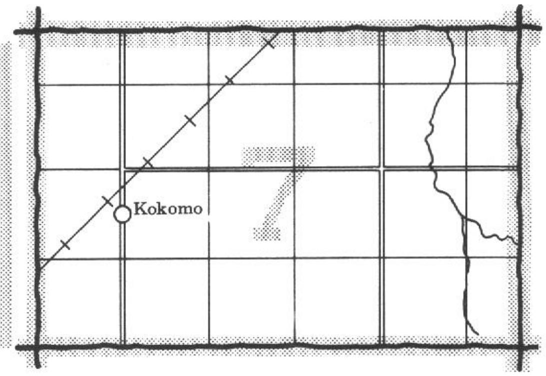
CADDO PARISH, LOUISIANA

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

HOW TO USE

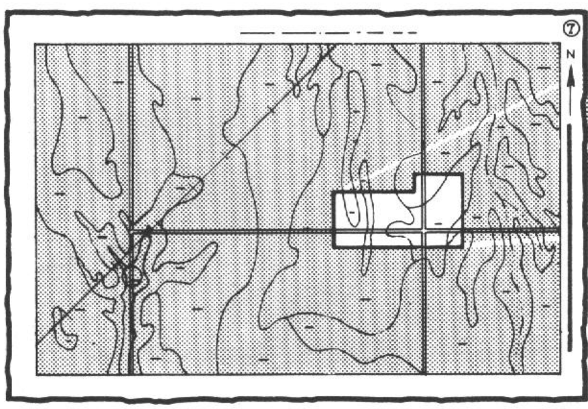
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

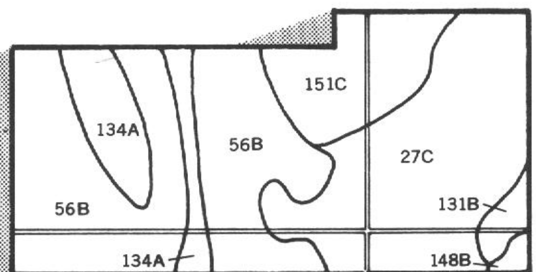




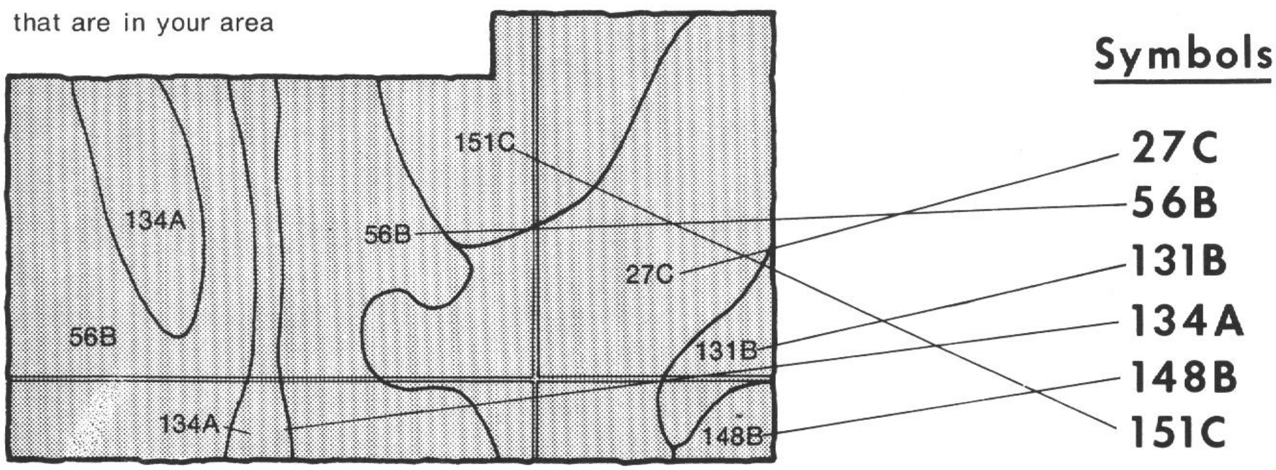
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



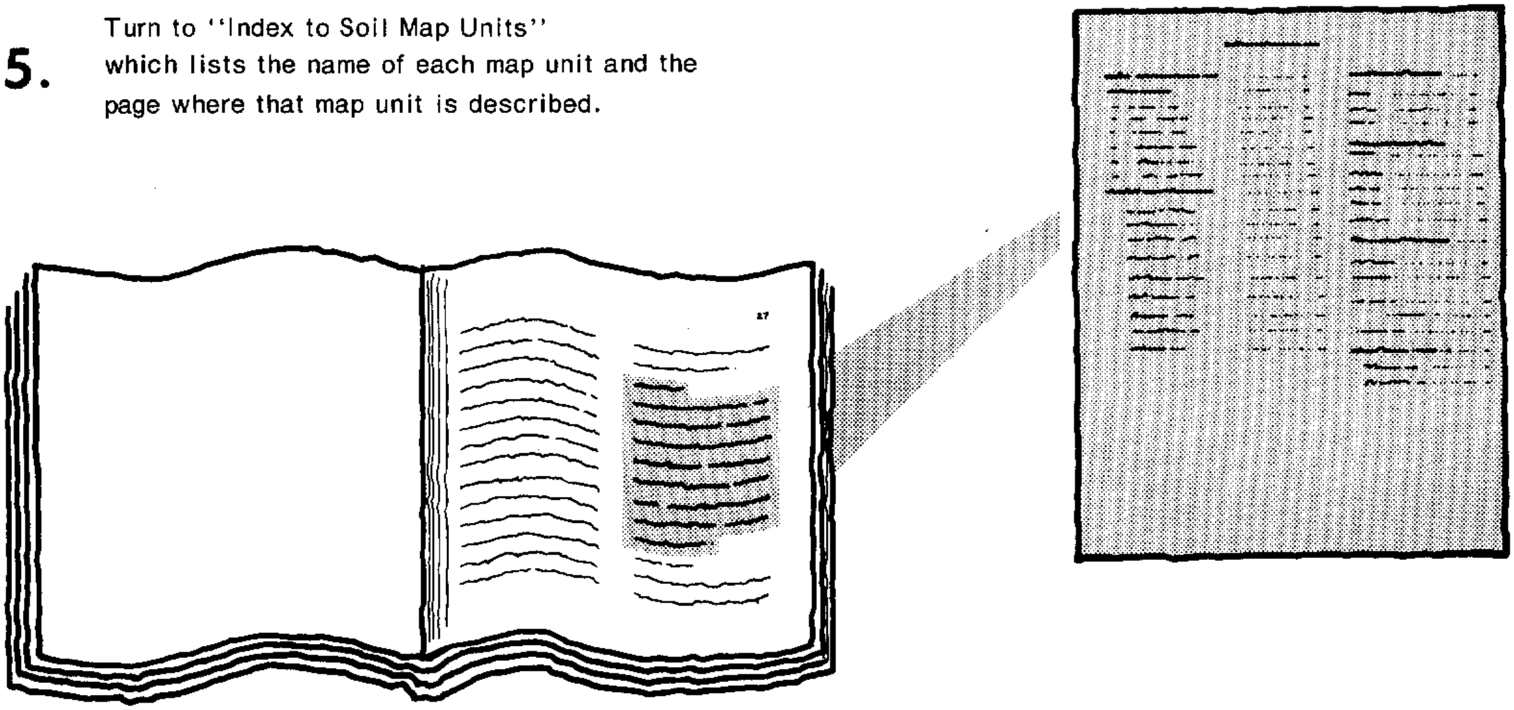


4. List the map unit symbols that are in your area

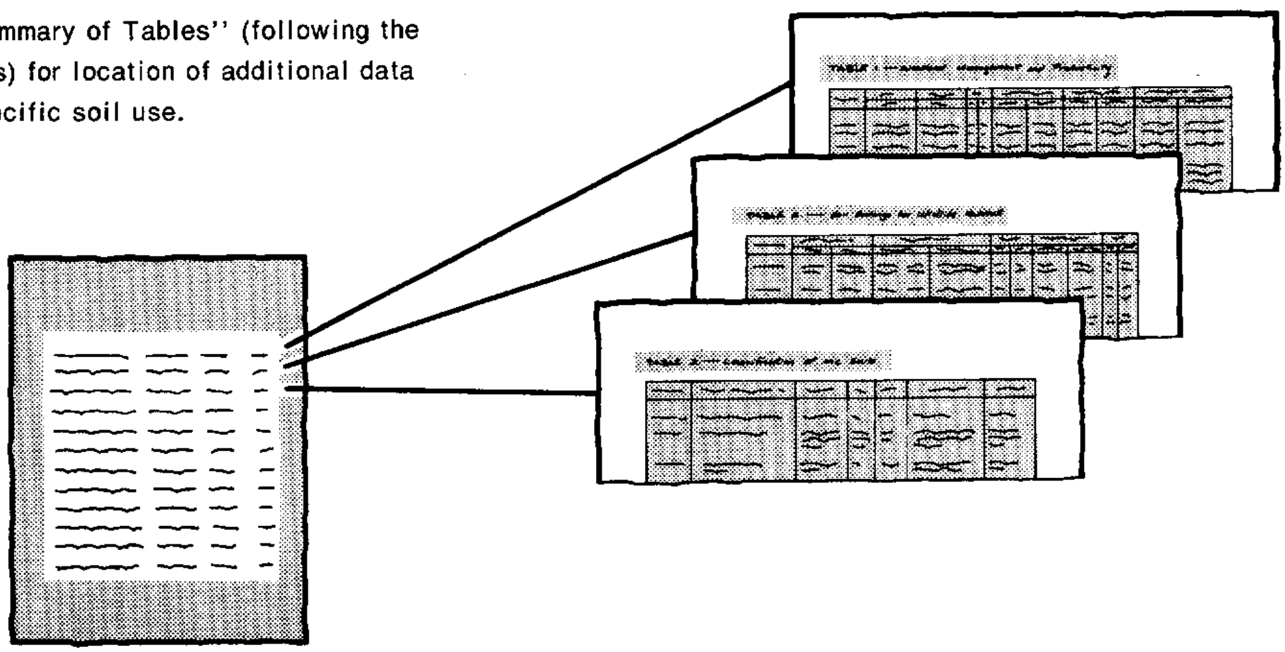


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1972-1977. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service, the Louisiana Agricultural Experiment Station, and Caddo Parish. It is part of the technical assistance furnished to the Upper West Red River Soil and Water Conservation District.

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

Cover: Skip-row cotton on Norwood silt loam.

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Issued June 1980

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Foreword

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

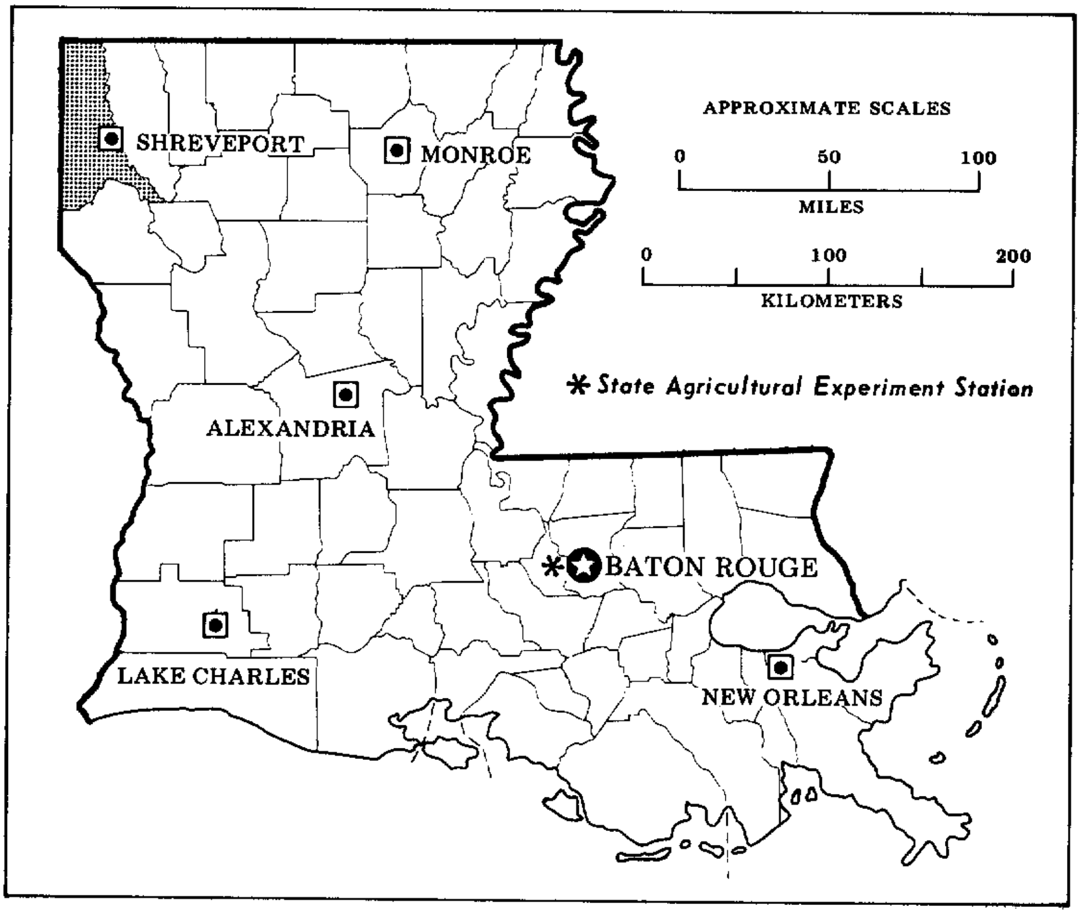
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use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

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

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

Alton Mangum

Alton Mangum
State Conservationist
Soil Conservation Service



Location of Caddo Parish in Louisiana.

SOIL SURVEY OF CADDO PARISH, LOUISIANA

By Jimmy P. Edwards, P. George Martin, J. Wayne Magoun, W. Wayne Kilpatrick, and Charley Henry, Jr., Soil Conservation Service

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

CADDO PARISH, in northwestern Louisiana, has a total area of 603,520 acres of which 575,296 acres is land and 28,224 acres is large water areas in the form of streams and waterways, lakes, and reservoirs (*9*). The Red River flows from north to south and forms the eastern boundary of the parish. According to the 1970 U.S. census, the population of the parish was 230,184. Shreveport, with a population of 164,372, is the largest city and is the parish seat. This parish is chiefly rural, except for the large urban area around Shreveport. Presently, the trend indicates that urban areas are expanding and acres of cropland are decreasing.

The parish generally consists of uplands, stream terraces, and the Red River alluvial plain. Elevation ranges from about 140 feet above sea level on the Red River alluvial plain in the southern part of the parish to about 465 feet above sea level in the uplands in the northern part of the parish.

The nearly level alluvial plain of the Red River and its major distributaries makes up nearly one-third of the area in the parish. Major distributaries, now inactive, are the Bayou Pierre, Prairie River, and Kelly Bayou. A system of manmade and natural levees protects most of the alluvial plain from flooding.

The fertile, loamy soils that formed on the natural levees of the Red River and its distributaries comprise much of the prime farmland in the parish. Most of the acreage is in crops, mainly cotton and soybeans. A small acreage is used for homesites and pasture. At the higher elevation, these loamy soils on the natural levees are ideal homesites because they have a minimal chance of being flooded.

Level, clayey soils are dominant on the lower part of the natural levees and in areas adjacent to the levees. Because of their lower elevation, some areas of these soils are flooded by runoff from the higher parts of the natural levees. The natural fertility of these clayey soils is high. Drainage is needed for most crops. Most of these soils are in pasture, but some are now being converted to cropland. Soybeans is the main crop.

The nearly level to strongly sloping soils on uplands and stream terraces make up the remaining part of the parish. These uplands and terraces are dissected by well defined drainageways in most places. In some parts of the parish, the escarpment adjacent to the Red River alluvial plain has steep slopes. The soils on these uplands and terraces range from clayey to sandy. They are generally low in natural fertility but respond well to fertilizers. Most of these soils are in woodland, but a small acreage is used for pasture and croplands.

General nature of the parish

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

History and development

Caddo Parish was created from Natchitoches Parish by resolution and enactment of the Legislature of Louisiana on January 18, 1838. It was named for the Caddo Indians, the original inhabitants of the area. Shreveport, the parish seat, was first started as a town in 1835, when it served as the headquarters for men working under Captain Henry Miller Shreve. He was an intrepid steamboat captain who was commissioned by the United States Government to remove "The Great Raft," a centuries old log jam in the Red River that made the river unnavigable and isolated the Caddo territory.

Until recent years, Caddo Parish has been primarily an agricultural parish. Large farms and plantations are on the alluvial plain, and small, upland farms are planted to cotton. Cotton, still the most important row crop, is grown mostly on the Red River alluvial plain. The small, upland farms have been converted from row crop farming to woodland and pasture.

Industrial development of Caddo Parish began with the discovery of the Caddo oil pool in 1906. With the development of oil and gas resources, Shreveport began to refine oil and manufacture or distribute many types of drilling and refining equipment. In addition to oil and gas, Shreveport has a diversified industrial economy. The city and neighboring suburbs have more than 300 industrial plants producing more than 700 different products.

Agriculture

Caddo Parish has experienced a decrease in the number of farms in the parish and an increase in the average size of the farm, according to the U.S. Census of Agriculture and the Louisiana Cooperative Extension Service's 1974 annual report. In 1964 there were 1,328 farms, and in 1974 only 656 farms remained. The average size of a farm increased from 196 acres in 1964 to 383 acres in 1974.

Most of the farms in Caddo Parish are from 10 to 250 acres in size; however, 81 farms have more than 1,000 acres. In 1974 cotton was grown on 27,698 acres, and soybeans was grown on 14,947 acres. Practically all of the cotton and soybeans in the parish are grown on the soils on the natural levees of the Red River alluvial plain. In 1974, 531 farms in the parish maintained about 60,704 cattle. There was 70,000 acres in pasture. Most of the acreage used for pasture is made up of the clayey soils and the occasionally flooded, loamy soils of the Red River alluvial plain and the upland soils in the western part of the parish. The parish has more than 300,000 acres of woodland and more than 800 owners of timberland.

The present trend of farming in Caddo Parish appears to be an increase of acreage planted to soybeans. If present trends continue, cropland acreage will decrease in the next 20 years as urbanization increases.

Climate

By Dr. Robert A. Muller, Department of Geography and Anthropology, Louisiana State University.

Caddo Parish is near the western margin of a broad region of the southeastern United States that has a humid, subtropical climate. The parish is dominated by warm, moist, maritime tropical air from the Gulf of Mexico. This air is displaced frequently during winter and spring by incursions of continental polar air from Canada that usually last no longer than 3 to 4 days. These incursions of cold air occur less frequently in autumn and only rarely in summer.

The weather usually sharply contrasts on either side of the frontal boundary separating polar and tropical air. After passage of a cold front during winter, the sky is typically covered by low clouds that are driven by strong, gusty northerly winds, temperatures fall into the forties, and drizzle is intermittent. Within 24 hours the sky generally clears, the winds abate, and, overnight, temperatures fall low enough to produce freezes. In the tropical air to the south of the cold front, however, January air temperatures may reach 70 degrees F, and cumulus clouds carry moisture northwards from the Gulf of Mexico.

Table 1 shows the annual regime of mean daily maximum and minimum temperatures by months, and the extreme temperatures that can be expected 2 years in 10. These temperature data are based on observations taken by personnel of the National Weather Service at Greater Shreveport Municipal Airport. There are minor variations in temperatures from those at the airport. Temperatures near the top of a dense stand of crops or vegetation are somewhat higher during sunny days and are colder during clear, calm nights. Other small temperature variations over the parish are associated with slopes, drainage, and proximity to bodies of water. Many rural areas are 2 to 5 degrees colder than the airport on clear, calm nights.

Table 1 also shows monthly precipitation data for Shreveport; maximum precipitation during the winter-spring season and minimum precipitation in the late summer-autumn season are representative of climate in Caddo Parish (*7*). Precipitation is usually associated with passage of warm and cold fronts over the parish. Heavy showers generally last no more than an hour or two and occur within vigorous squall lines that precede cold fronts during winter and spring. Rains of 24-hour duration are relatively uncommon. During summer, precipitation is usually in the form of widely scattered, local thunderstorms between noon and early evening; each shower normally covers a small area. The result is often a wide range of soil moisture conditions during summer and autumn. Heavy showers and rains associated with tropical storms from the Gulf of Mexico occasionally occur late in summer and in autumn. During recent decades, snowfalls of an inch or more have occurred on the average of every other year; the maximum snowfall has been 11 inches.

The climate of Caddo Parish is generally good for crops that are adapted to the subtropical climate and local drainage conditions. On the average, there is ample sunshine, warm but not excessively high temperatures, a relatively long frost-free season, abundant precipitation, little significant snowfall, high atmospheric humidity, and infrequent, damaging winds. Climatic hazards that can be especially damaging are mostly infrequent.

Table 2 shows probabilities of dates for the last low temperatures in spring and the first low temperatures in autumn at Shreveport. The table shows, for example, that the last 32 degree temperature is no later than March 2 in about every other year, but in about 1 year in 10 a freezing temperature can be expected as late as March 19 (*3*). In nearby rural areas, however, freezes may occur more than two weeks later in spring and two weeks earlier in autumn than those at the airport site. During the 30-year period of record, extremely low temperatures have damaged subtropical crops and vegetation. At Shreveport the absolute minimum temperature on record is 2 degrees above zero. Bitter polar outbreaks are relatively rare. Since 1941 extremely low temperatures have occurred mostly during the very cold winters of 1962 through 1966 and the most recent winters of 1976-1977 and 1977-1978.

Occasionally, rainstorms produce local flooding and excessive soil moisture. A daily rainfall of 4 to 5 inches can be expected in about 1 year in 5 in nothwestern Louisiana. An absolute maximum of 12.4 inches within 24 hours was recorded during July 1933. These rainfalls occur most often along stationary fronts in winter and spring but not very often during summer and fall.

Despite the average high rainfall, monthly and seasonal variations of precipitation are great enough to result in short-term droughts and wet spells, which affect farming and crop yields. The water-budget concept is a useful tool to indicate relationships between climate, land use, and agriculture. This concept is a physical and mathematical model that allocates the precipitation received at a given place into evapotranspiration, soil moisture storage, ground water recharge, and runoff on a monthly, weekly, or daily basis. Figure 1 is a graphical representation of some of the water-budget components that were calculated on a monthly basis from data recorded at Ryan Airport at Baton Rouge. Although Baton Rouge is located in southeastern Louisiana, these water-budget components are fairly representative of much of Louisiana (*10*). The graph for Baton Rouge serves here for illustrative purposes, but specific figures and tables for Shreveport are included.

In figure 1, potential evapotranspiration (PE), represented by the upper continuous curve, is defined as the maximum amount of evapotranspiration that would take

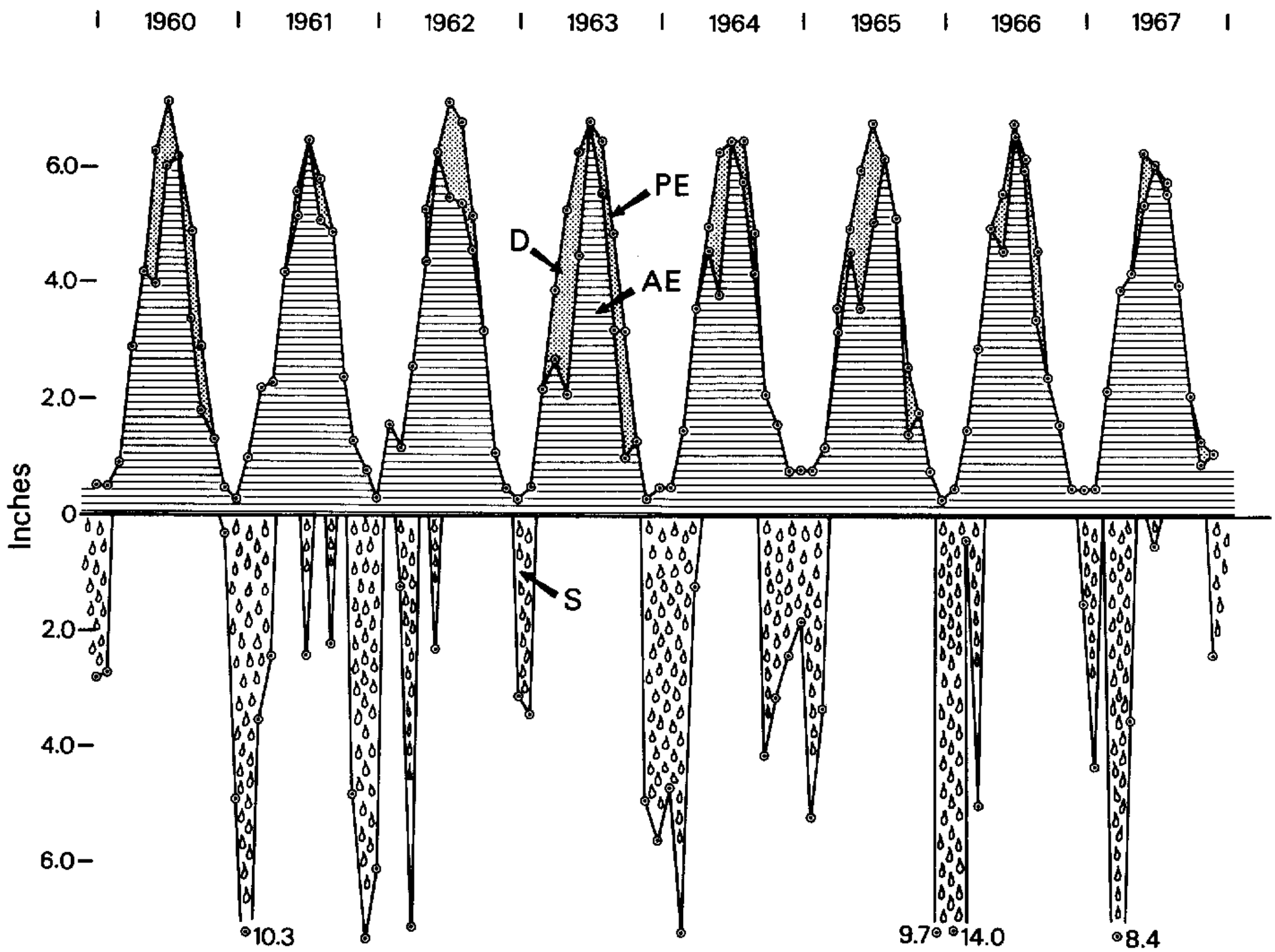


Figure 1.—Water-budget components calculated from data recorded at Baton Rouge, La. Legend: AE—Actual Evapotranspiration; PE—Potential Evapotranspiration; S—Moisture Surplus; D—Moisture Deficit.

place with a continuous vegetative cover and no shortage of soil moisture. Monthly PE depends on the amount of energy that is supplied to the evapotranspiration process, particularly from sunshine. The Thornthwaite system used in this analysis bases the estimates on air temperature and day length. The seasonal regime of PE is low in winter and high in summer, with relatively little variation from one year to the next.

Actual evapotranspiration (AE), based on rainfall and soil moisture storage during a particular month, is an index of water use and crop production. Monthly AE cannot be greater than monthly PE, but when AE is less than PE, the difference is the moisture deficit (D). Moisture deficit is an index of water shortage or the amount of irrigation needed for maximum crop production. The calculations assume that a 6-inch moisture storage capacity is available to vegetation within the rooting zone; therefore, the deficits would be greater for shallow-rooted young plants and smaller for deeper rooted plants.

Moisture surplus (S) represents precipitation not used in evapotranspiration or restoring moisture to the soil. This surplus either becomes surface runoff or ground water recharge. The surplus is strongly seasonal. It is highest in winter and spring and occurs only occasionally in summer and fall. In addition, very large monthly variations are evident. Figure 1 also illustrates the tendency of wet or dry months, seasons, or years to cluster. The variability and clustering have considerable impact on agricultural activities; for example, large moisture surpluses during 1961 were followed by large deficits during 1962 and the first half of 1963 at Baton Rouge.

Figure 2 shows monthly deficits and surpluses, summed on a seasonal basis, for the period 1941 through 1970 at Shreveport. Surpluses can be expected each winter and spring, are rare during summer, and occasionally occur during fall. Deficits, on the other hand, should be expected each summer and fall, but they very rarely occur during spring. During dry summers, deficits are large enough to reduce crop yields.

Figure 2 emphasizes the variability by seasons through the years and the tendency for clustering. For example, there were large winter surpluses of moisture during the late 1940's, large spring surpluses during the middle 1940's, large summer deficits at almost the same times during the late 1940's and early 1950's, and small summer deficits during the late 1950's.

The data from figure 2 are reorganized in table 3 to show the probability of monthly deficits or surpluses that are equal to or greater than selected amounts. Random variation of deficits and surpluses over the decades was assumed.

Extremely severe weather conditions are associated with thunderstorms and squall lines, but the frequency of serious damage at any one location within the parish is low. Hail and tornadoes are infrequent but occur during severe winter and spring thunderstorms and are usually embedded within squall lines. Heavy, wet snow and glaze occasionally do considerable damage to forest vegetation and powerlines.

Transportation

Caddo Parish is served by six major railroads that connect to every major railroad system in the United States. There are three United States highways, one Interstate highway, and numerous other paved state highways and parish roads.

The parish is served by two major air tranport centers. Five airline companies operate through these two airports. In addition to the larger airline companies, there are eight aircraft charter companies.

Caddo Parish is served with more than twenty motor freight carriers. Each has its own terminals. Continental Trailways is the only major bus line that serves the parish.

Water transportation, which is nonexistent at this time, will add a new dimension to local transportation with the completion of the Red River Navigation Project in the mid-1980's.

Industry

Industry is expanding in Caddo Parish. There are ten major industry groups: lumber and wood products; printing and publishing; machinery, except electrical; food and kindred products; fabricated metal products; stone, clay, and glass products; chemical and related products; miscellaneous manufacturers, including ordinance and accessories; electrical machinery products; and transportation equipment.

In addition to these industries, several oil and gas related industries are in the parish. Construction is now underway on an assembly plant for automobiles. With navigation on the Red River in the near future, the feasibility of port development may play an important role for new industry for the parish.

Water resources

Surface water. The principal sources of surface water in Caddo Parish are the Red River, Caddo Lake, Cross Lake, and Wallace Lake. Streams draining the uplands are not dependable sources of supply because they do not have well sustained flows during dry seasons. The largest source of surface water in the parish is the Red River, which drains approximately 56,000 square miles. The Red River has an average flow of 25,000 cubic feet per second, or about 16,160 million gallons per day. Red River water is quite hard, and contents of chlorides, sulfates, and dissolved solids are high. Caddo Lake was developed mainly for industrial water supply and has a surface area of 40,000 acres. Cross Lake on Cross Bayou is used primarily to supply water for the city of Shreveport and has a surface area of 11,000 acres.

Ground water. The potential ground-water supply avail-

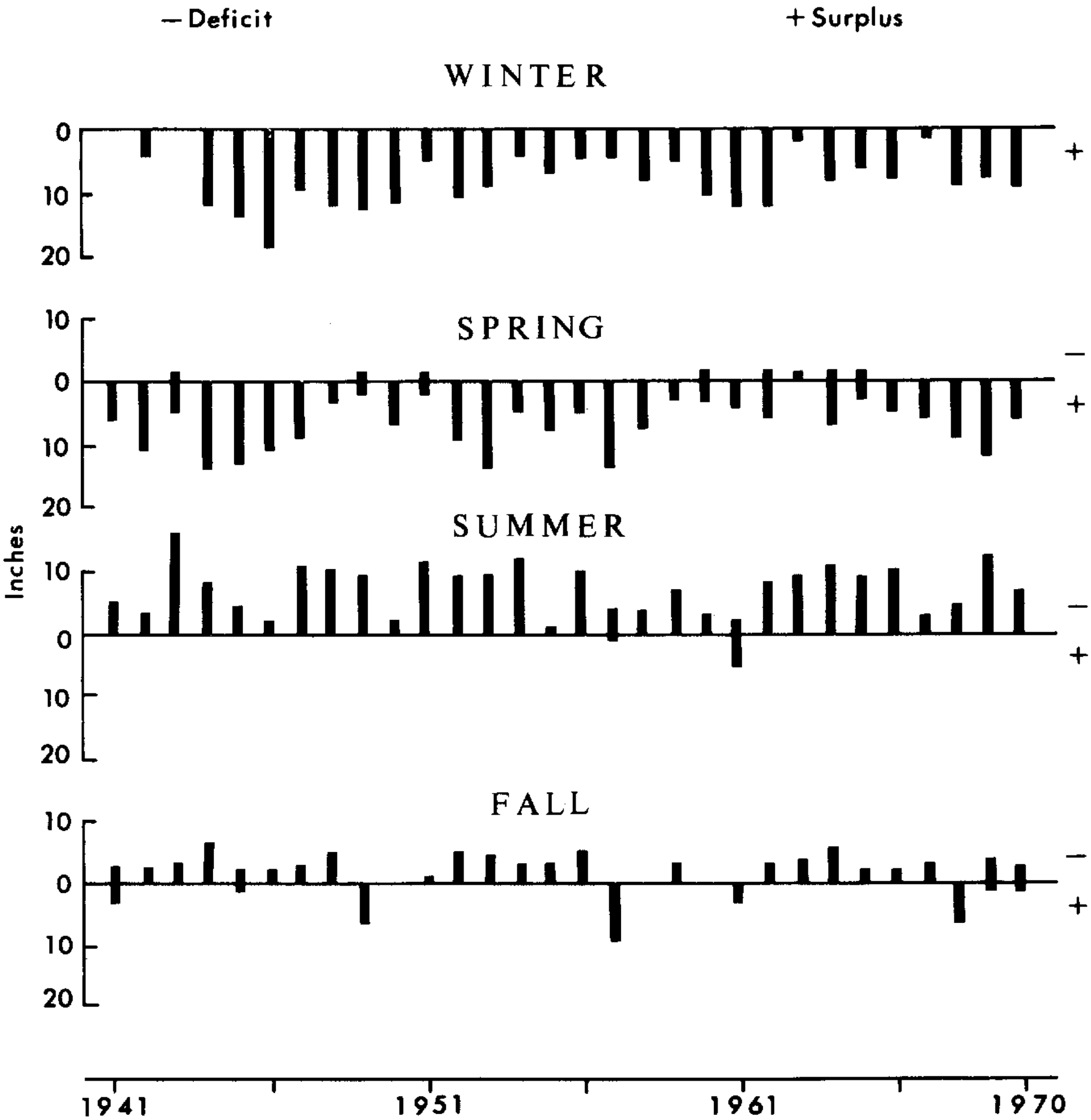


Figure 2.—Moisture variability by seasons for the period 1941 through 1970 at Shreveport.

able in sands of Tertiary and Quaternary ages is at least several times as great as the 1960 average ground-water withdrawal of 3.5 million gallons per day (*12*). The prospect of obtaining additional water from relatively undeveloped sands is excellent.

The Wilcox Group is the major source of fresh ground water in Caddo Parish. It ranges in thickness from less than 1 foot to almost 400 feet. Generally, water from the Wilcox Sand is clear, odorless, and soft to moderately hard and has a high percentage of sodium. Some water contains excessive amounts of iron, dissolved solids, flouride, or chloride, but it is used because water of better quality is unavailable. Practically all the water consumers in Caddo Parish use water from the Wilcox Sand, except those that have surface water available, such as the municipalities of Shreveport and Mooringsport.

Another freshwater bearing sand is called the Carrizo Sand, which overlies the Wilcox Group. It is found mostly in the northern part of the parish. The average thickness of this formation is about 70 feet. The Carrizo Sand contains water of the soft, sodium bicarbonate type. It is an important potential source of large quantities of water. Very little water is being pumped from this sand because it lies mostly in rural areas where freshwater is obtained from shallower sands.

Still another freshwater bearing sand is called the Cane River Formation. This formation is mostly in the extreme northern end of the parish and underlies about 13 percent of the area. It is a very shallow sand aquifer, from a few feet in depth to 500 feet. Its thickness varies from 10 to 110 feet. The water from the Cane River Formation is generally clear and soft but has been criticized for having a taste and odor of iron. Some municipalities use water from this formation.

Terrace deposits make up about 10 percent of the surface area. These deposits are made up of clay, silt, sand, and gravel. The coarser materials are at the base of the deposit, sand and silt is in the middle, and the silty clay is on top. The thickness of these deposits ranges from about 23 to 60 feet. The top of the water-bearing sand and gravel phase is generally about 50 feet below the surface. Water wells in the terrace deposits range from about 20 to 110 feet. In tested wells the water had a high iron content. Yields range from a few gallons per minute to about 1,200 gallons per minute.

The alluvial deposits of the Red River and its tributaries consist of clay, silt, sand, and gravel. Throughout the valley the alluvium lies unconformably on the eroded surface of Tertiary rocks. Two outstanding characteristics of the alluvial deposits are the uniformity of the sedimentary sequence from top to bottom and the increase of grain size as depth increases. The thickness of the alluvial deposits is irregular and ranges from 25 to 100 feet. The quality of the water from these alluvial deposits is generally unsatisfactory for most domestic and industrial uses because of its hardness and high iron content.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby parishes and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map for broad land use planning

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

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

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or 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 boundaries of the general soil map units in Caddo Parish were matched, wherever possible, with those of the previously published surveys of Bossier Parish, Louisiana, and Panola County, Texas, as well as with those of the completed unpublished survey of Red River Parish, Louisiana. In a few places, however, the lines do not join and the names of the map units differ. These differences resulted mainly because of changes in soil series concepts, differences in map unit design, and changes in soil patterns near survey area boundaries.

The general soil map units in this survey area are described on the pages that follow.

Descriptions of map units

Areas on uplands dominated by nearly level to moderately sloping soils that have a loamy surface layer and clayey subsoil

The three map units in this group consist mainly of moderately well drained and somewhat poorly drained, loamy soils that have a clayey subsoil.

These maps units make up about 36 percent of the parish. Most of the area is in woodland or pasture. Areas used as cropland are commonly small and scattered. Wetness and shrinking and swelling of the clayey subsoil are the main limitations if the soils are used for urban development.

1. Keithville-Woodtell-Metcalf

Nearly level to moderately steep, moderately well drained and somewhat poorly drained soils that have a loamy surface layer and a loamy or clayey subsoil

This map unit is in the central and southern part of the parish on broad ridges, in swales, and on side slopes. Elevations range from about 160 to 220 feet above sea level.

This unit makes up about 20 percent of the parish. It is about 32 percent Keithville soils, 25 percent Woodtell soils, 15 percent Metcalf soils, and 28 percent minor soils.

Keithville soils are gently sloping, moderately well drained, and on ridgetops. Woodtell soils are very gently sloping to moderately steep, moderately well drained, and on short side slopes. Metcalf soils are nearly level, somewhat poorly drained, and in swales between ridges. Keithville and Metcalf soils have a thick loamy layer over clayey material that is at a depth of about 3 feet. Woodtell soils have a loamy surface layer which is about 9 inches thick and which is over a clayey subsoil. All of these soils have a seasonal high water table during the months of December through April.

Minor in this unit are poorly drained Guyton soils in drainageways; moderately well drained Bowie soils on lower side slopes; well drained Meth soils on upper parts of side slopes; and moderately well drained Messer soils on low, circular mounds.

This unit is used mainly for pasture and woodland, but a few small areas are used for cultivated crops and homesites.

This unit has fair potential for cultivated crops. The use of modern multi-row equipment is limited because farms are small. Wetness and numerous mounds are limitations in low areas. The potential for homesites, landscaping, and vegetable gardening is good; however, the potential for most urban uses is poor. High shrink-swell potential, wetness in low areas, and slow permeability are the main limitations for urban uses. This map unit has fair potential for intensive recreation areas. The potential for pasture is fair. The potential for the development of openland wildlife habitat is good, but it is poor for the development of wetland wildlife habitat. The potential for producing and harvesting timber is good for the Keithville and Metcalf soils but fair for the Woodtell soil. The main limitations of the Woodtell soil for timber production are moderate growth rates, moderate seedling mortality, and moderate equipment limitations.

2. Bowie-Metcalf-Keithville

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

This map unit is in the southwestern and northwestern part of the parish on low ridgetops and in swales. Elevations range from about 220 to 465 feet above sea level.

This unit makes up about 6 percent of the parish. It is about 60 percent Bowie soils, 20 percent Metcalf soils, 10 percent Keithville soils, and 10 percent minor soils.

Gently sloping Bowie and Keithville soils are on broad ridgetops and are moderately well drained. Nearly level Metcalf soils are in broad swales between ridges and are somewhat poorly drained. Bowie soils are loamy throughout. Keithville and Metcalf soils have a thick, loamy layer over clayey materials that are at a depth of about 3 feet.

The minor soils in this unit are poorly drained Guyton soils in drainageways, moderately well drained Beauregard soils on lower side slopes, moderately well drained Woodtell soils on side slopes, and well drained Meth soils on higher ridgetops.

This unit is used mainly for pasture and woodland, but a few tracts are used for cultivated crops and homesites. The low fertility of these soils and the small size of farms are the main limitations for farming.

This unit has fair potential for cultivated crops. The low fertility of these soils can be corrected, but the use of modern, multi-row equipment is limited because farms are small. Wetness and numerous mounds are the limitations in low areas. This map unit has good potential for landscaping, vegetable gardening, and most urban uses. Wetness and the clayey subsoil are the main limitations. This unit has fair potential for intensive recreation areas. The potential for woodland, pasture, and woodland and wetland wildlife habitat is good. There are few limitations for producing and harvesting timber. Growth rates of loblolly pine, shortleaf pine, and slash pine are moderately high to high.

3. Forbing-Gore-Wrightsville

Nearly level to moderately sloping, moderately well drained and poorly drained soils that have a loamy surface layer and clayey subsoil

This map unit is adjacent to Black Bayou and Caddo, Cross, and Wallace Lakes. The area is dissected by many small drainageways.

This unit makes up about 10 percent of the parish. It is about 35 percent Forbing soils, 17 percent Gore soils, 13 percent Wrightsville soils, and 35 percent minor soils.

Forbing soils are very gently sloping to moderately sloping, moderately well drained, and on side slopes. Gore soils are gently sloping, moderately well drained, and on low ridges or upper parts of side slopes. Wrightsville soils are nearly level or in depressional areas, are poorly drained, and have a seasonal high water table during December through April. All of these soils have a silt loam surface layer and a clay or silty clay subsoil.

Minor in this unit are poorly drained Guyton soils in drainageways; moderately well drained Keithville soils on broad ridgetops; moderately well drained Messer soils on low, rounded mounds; and somewhat poorly drained Metcalf soils in broad swales.

This unit is used mainly for woodland. Several tracts adjacent to the major lakes have recreational and residential developments. The main limitations of these soils for cultivated crops are low fertility, wetness, and a thin surface layer over a clayey subsoil.

Seasonal wetness is a limitation for most land uses in the nearly level or depressional areas. Overall, this map unit has poor potential for residential and other urban uses. High shrink-swell potential is the main limitation. This unit has poor potential for crops or vegetable gardens and intensive recreation because of seasonal wetness and susceptibility to erosion. It has fair potential for pasture. The potential for woodland production and for the development of woodland and wetland wildlife habitat is fair.

Areas on uplands dominated by very gently sloping to moderately steep soils that have a loamy surface layer and a clayey subsoil

The two map units in this group consist of well drained and moderately well drained soils on uplands that are dissected by well-defined drainageways. These map units make up about 28 percent of the parish. Most areas are in woodland and pasture. Susceptibility to erosion and slow permeability are the main limitations for most uses.

4. Woodtell-Meth

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

This map unit is in the central and southern part of the parish and consists of high hills and long side slopes above well-defined drainageways.

This unit makes up about 19 percent of the parish. It is about 65 percent Woodtell soils, 17 percent Meth soils, and 18 percent minor soils.

Woodtell soils commonly are on side slopes, but in places they are on ridgetops at slightly lower elevations than the Meth soils. Meth soils are on narrow ridgetops and upper parts of side slopes. Woodtell soils are moderately well drained, and Meth soils are well drained. Both soils have a loamy surface layer and a clayey subsoil.

Minor in this unit are poorly drained Guyton soils in drainageways; moderately well drained Keithville soils and well drained Ruston soils on long side slopes; and somewhat poorly drained Metcalf soils on broad ridgetops.

The unit is used mainly for woodland and pasture. A large acreage was cleared and cultivated at one time but is now woodland or pasture. This unit has poor potential for cultivated crops. The main limitations for cultivated crops are susceptibility to erosion, low fertility, a thin surface layer over a clayey subsoil, and complex slopes.

The potential for most urban uses is poor. The main limitation for this use is high shrink-swell potential and slow permeability. Moderately steep slope is also a limitation in some areas. This unit has fair potential for pasture and intensive recreation areas. The potential for woodland production and for woodland wildlife habitat is fair.

5. Sacul-Ruston

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

This map unit is in the northern part of the parish. The landscape consists of high ridgetops and side slopes, which are beside many small drainageways. This unit is on some of the most highly elevated landscape in the parish.

This unit makes up about 9 percent of the parish. It is about 40 percent Sacul soils, 20 percent Ruston soils, and 40 percent minor soils.

Moderately well drained Sacul soils occur throughout the unit, but well drained Ruston soils are generally on high ridgetops and upper parts of side slopes. Sacul soils have a loamy surface layer and a clayey subsoil. Ruston soils are loamy throughout.

Minor in this unit are well drained Briley soils on some narrow ridgetops, moderately well drained Bowie soils on some of the broader ridgetops, poorly drained Guyton soils in drainageways, and well drained Smithdale soils on the steeper, lower side slopes.

This unit is used mainly for woodland and pasture. It has good potential for these uses.

This unit has only fair potential for cultivated crops because erosion is a hazard and the nature of the terrain restricts the efficient use of farm equipment. This unit has only fair potential for vegetable gardens because of low fertility and periods of drought in summer. It has good to poor potential for residential and other urban uses. Slow permeability and shrink-swell potential are limitations for the Sacul soils. Slope is a limitation on some of the strongly sloping soils. This unit has good potential for pasture, for intensive recreation areas, and for woodland wildlife habitat.

Areas on uplands dominated by gently sloping to strongly sloping sandy soils

Only one map unit is in this group. It consists of well drained and somewhat excessively drained, sandy soils on uplands. Most areas are in woodland or pasture. A few small areas are used for specialty crops, such as peanuts and watermelons. Erosion and soil droughtiness are the main limitations.

6. Betis-Briley-Darden

Gently sloping to strongly sloping, somewhat excessively drained and well drained soils

This map unit is in the northern part of the parish. The soils are on ridgetops, side slopes, and low terraces. The areas are dissected by many small drainageways.

This unit makes up about 2 percent of the parish. It is about 45 percent Betis soils, 25 percent Briley soils, 20 percent Darden soils, and 10 percent minor soils.

Betis and Briley soils are on ridgetops and side slopes, and the Darden soils are on low terraces. Betis soils are somewhat excessively drained. Darden soils are well drained to somewhat excessively drained and are sandy throughout. Briley soils are well drained and have a thick, sandy surface layer over a loamy subsoil.

Minor in this unit are well drained Ruston and Smithdale soils and moderately well drained Sacul soils.

This unit is used mainly for woodland and pasture. The main limitations of these soils for cultivated crops are low fertility, low available water capacity, and a severe hazard of erosion.

This unit has poor potential for most cultivated crops, but it has good potential for specialty crops, such as peanuts and watermelons.

This unit has good potential for most urban uses. The potential for pasture and intensive recreation areas is only fair because of sandy texture and a hazard of erosion.

The potential for woodland production and woodland wildlife habitat is fair.

Areas on flood plains dominated by level to gently undulating, loamy or clayey soils

The five map units in this group consist of well drained to poorly drained, loamy and clayey soils that formed in alluvium on bottom lands. Most of the acreage is in crops or pasture. A few large areas are woodland. Wetness from flooding and a seasonal high water table are the main limitations for most uses.

7. Guyton

Nearly level, poorly drained soils that are loamy throughout

This map unit is throughout the parish. The soils are on the alluvial plains of the major and minor streams that drain the uplands. These soils are subject to frequent flooding, especially during the winter months.

This unit makes up about 6 percent of the parish. It consists of about 80 percent Guyton soils and 20 percent soils of minor extent.

Guyton soils are poorly drained and have a seasonal high water table. They have a silt loam surface layer and a silty clay loam subsoil. These soils are wet for long periods during the winter and spring.

Minor in this unit are well drained Bernaldo soils at slightly higher elevations than Guyton soils and poorly drained Bonn soils. Bonn and Guyton soils are in similar parts of the landscape. Some areas of the Bernaldo soils are not subject to flooding.

This unit is used mainly for woodland, but a few tracts have been cleared and are used for pasture. The main limitation of this soil for cultivated crops is wetness from flooding and a seasonal high water table.

This unit has very poor potential for most uses because of the flooding hazard. It has only fair potential for pasture because of flooding. The potential for woodland production and woodland and wetland wildlife habitat is good.

8. Moreland-Armistead

Level to gently undulating, somewhat poorly drained soils that have a clayey or loamy surface layer and a clayey or loamy subsoil

This map unit is in the eastern part of the parish on the Red River alluvial plain. The soils are on the lower parts of the natural levees of the Red River and its tributaries.

This unit makes up about 11 percent of the parish. It is about 68 percent Moreland soils, 22 percent Armistead soils, and 10 percent minor soils.

Moreland soils, in most places, are at slightly lower elevations than Armistead soils. Most Moreland soils are clayey throughout; however, some have a loamy surface layer. Armistead soils have a thick, clay surface layer over a loamy subsoil. Both soils are wet for long periods during the winter and early spring.

Minor in this unit are the well drained Caspiana, Gallion, and Norwood soils on the higher parts of the landscape and poorly drained Buxin soils on the lower parts of the landscape. Other minor soils are moderately well drained Messer Variant and poorly drained Guyton Variant that are in one small area east of the village of Oil City.

This unit is used mainly for cultivated crops and pasture. The main limitations are wetness and the clayey surface texture.

This unit has good potential for cultivated crops and pasture. It has poor potential for landscaping, vegetable gardening, and intensive recreation because of wetness and the clayey surface texture. This unit has poor potential for most urban uses because of wetness and a high shrink-swell potential. The potential for woodland production and openland and wetland wildlife habitat is good.

9. Buxin

Level, poorly drained soils that are clayey throughout

This map unit is on the lower parts of the Red River alluvial plains. These soils are in old lake beds and on the lower parts of the natural levees of the Red River and its tributaries. The largest area is within the levee system along Twelve Mile Bayou.

This unit makes up about 2 percent of the parish. It is about 85 percent Buxin soils and 15 percent minor soils.

The Buxin soils are poorly drained and are clayey throughout. They have a seasonal high water table and are subject to occasional flooding. The soils are wet for long periods in the winter and spring.

Minor in this unit are well drained Norwood and Severn soils and somewhat poorly drained Armistead and Moreland soils.

This unit is used mostly for pasture and woodland, but some small tracts are used for cultivated crops. Wetness and clayey surface texture are the main limitations.

Where drained and properly managed, this unit has good potential for cultivated crops. Wetness from flooding is the main limitation for cultivated crops. The potential for residential and other urban uses and for intensive recreation areas is very poor because of flooding, a seasonal high water table, and a high shrink-swell potential. The potential for pasture, woodland production, and wetland wildlife habitat is good.

10. Severn-Norwood

Nearly level to gently undulating, well drained, calcareous soils that are loamy throughout

This map unit is in the eastern part of the parish on the Red River alluvial plain. The soils are on recent natural levees of the Red River. If not protected by the Red River levee system, these soils are subject to flooding.

This unit makes up about 11 percent of the parish. It is about 50 percent Severn soils, 40 percent Norwood soils, and 10 percent minor soils.

Severn soils are generally at slightly higher elevations than Norwood soils. Severn soils are stratified, very fine sandy loam throughout. Norwood soils have a silt loam or silty clay loam surface layer and a silt loam subsoil.

Minor in this unit are well drained Caspiana and Gallion soils and somewhat poorly drained Armistead and Moreland soils on lower parts of the landscape.

This unit is used mainly for cultivated crops, but a few large tracts on the unprotected side of the levee system are used for pasture.

Where protected from flooding, this unit has excellent potential for cultivated crops and has only slight limitations for this use. It has good potential for landscaping, vegetable gardening, and most urban uses. It has excellent potential for intensive recreation areas. The potential for pasture, woodland production, and openland wildlife habitat is good.

11. Caspiana-Gallion

Level and nearly level, well drained, noncalcareous soils that are loamy throughout

This map unit is in the eastern part of the parish in the Red River alluvial plain. The soils are on old natural levees.

This unit makes up about 4 percent of the parish. It is about 50 percent Caspiana soils, 25 percent Gallion soils, and 25 percent minor soils.

Caspiana soils, in most places, are at slightly lower elevations than Gallion soils. Caspiana soils have a loamy, dark colored surface layer and a loamy subsoil. Gallion soils have a loamy, light colored surface layer and a loamy subsoil.

Minor in this unit are somewhat poorly drained Armistead and Moreland soils on lower parts of the landscape and well drained Norwood soils.

This unit is used mainly for cultivated crops, but some tracts are used for pasture. The potential for cultivated crops and pasture is good. This unit has few limitations for these uses.

Potential for urban development and intensive recreation areas is excellent. This unit has excellent potential for landscaping and vegetable gardening. The potential for woodland production and openland wildlife habitat is good.

Soil maps for detailed planning

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

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, Moreland clay is one of several phases in the Moreland 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. Metcalf-Messer complex 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.

The soil lines and the names of some soils are unlike those that appear in the previously published surveys of Bossier Parish, Louisiana, and Panola County, Texas, and the completed unpublished survey of Red River Parish, Louisiana. This is the result of differences in map unit designs and changes in concepts in the application of the soil classification system.

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.

Soil descriptions

1—Buxin clay, occasionally flooded. This poorly drained, level, clayey soil is in depressional areas and on the lower parts of the natural levees of the Red River alluvial plain. It formed in clayey sediments. This soil is subject to occasional flooding. Slope is less than 1 percent. Tracts range from about 15 to 350 acres.

Typically, the surface layer is dark reddish brown, neutral clay about 10 inches thick. The subsoil is dark reddish brown, neutral clay about 10 inches thick. A buried soil is below. To a depth of about 26 inches, it is dark gray, neutral clay mottled in shades of brown. To a depth of about 41 inches, it is clay mottled in shades of brown. The underlying material, to a depth of about 63 inches, is reddish brown, mildly alkaline clay mottled in shades of brown.

This soil has high fertility. Wetness causes poor aeration and restricts root development of many plants. Water and air move at a very slow rate through the soil. Water runs off the surface at a slow to very slow rate. The soil is generally flooded at least 1 year in 5 from short to long periods during the months of December through April. When it is not flooded, this soil has a seasonal high water table that fluctuates from a depth of 3 feet to the surface during the months of December through April. It has a high shrink-swell potential. It cracks when dry and seals over when wet. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of Armistead, Gallion, and Moreland soils. All of these soils are on slightly higher parts of the landscape than this Buxin soil and are better drained. The included soils make up about 15 percent of any given area.

Most of the acreage is in pasture. A small acreage is used for crops or is in woodland.

The potential for crops is poor, and the potential for pasture is good. This level, highly fertile soil is favorable for growing cultivated crops; however, its susceptibility to flooding, wetness, and clayey texture are less favorable features for this use. Short season crops, such as soybeans and grain sorghum, are the more suitable crops. The more suitable pasture plants are common bermudagrass and Pensacola bahiagrass.

Because it is sticky when wet and hard when dry, this soil is difficult to keep in good tilth. It can be worked only within a narrow range of moisture content and is subject to becoming cloddy when worked. Wetness may delay planting and harvesting of crops. A drainage system is needed. Land grading or smoothing improves surface drainage and increases the efficiency of farm equipment. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil losses by erosion. Most crops, other than legumes, respond well to nitrogen fertilizer. Lime or other fertilizers generally are not needed.

The potential for urban use and for intensive recreation is very poor because of flooding hazards. The potential for woodland is good; however, wetness restricts the use of equipment.

This soil is in capability subclass IVw and woodland suitability group 3w6.

2—Armistead clay. This somewhat poorly drained, level, clayey soil is on natural levees of the Red River. This soil formed in clayey sediment over loamy sediment. In most areas, slope is less than 1 percent. Tracts range from about 20 to 300 acres.

Typically, the surface layer is moderately alkaline and mildly alkaline, dark reddish brown clay about 15 inches thick. The next layer is neutral, dark reddish brown silty clay loam about 10 inches thick. Between depths of about 25 and 63 inches, the soil is neutral, yellowish red silt loam.

This soil has high fertility. Water and air move at a slow rate through the upper part of the soil and at a moderately slow rate through the lower part. Water runs off the surface at a slow rate and stands in low areas for short periods after heavy rains. The surface layer is wet for long periods in the winter and spring. The seasonal high water table fluctuates from a depth of 1.5 to 3 feet during the months of December through April. The clayey upper part of the soil has a high shrink-swell potential. It cracks when dry and seals over when wet. Adequate water is available to plants in most years.

Included with this soil in mapping are small areas of Buxin, Gallion, and Moreland soils. Buxin and Armistead soils are in similar parts of the landscape. The Buxin soils are clayey throughout. The well drained Gallion soils are in slightly higher parts of the landscape. The poorly drained Moreland soils are in lower parts of the landscape. These included soils make up about 10 percent of any given area.

Most areas of this soil are in cropland and pasture. A small acreage is used for woodland, pecan orchards (fig. 3), and oilfields.

The potential for crops and pasture is good. The level slopes and high fertility make this soil well suited to use as cropland. Cotton, soybeans, and grain sorghum are the main crops grown. The main suitable pasture plants are common bermudagrass, improved bermudagrass, ryegrass, Pensacola bahiagrass, tall fescue, white clover, and southern wild winter peas. Wetness, slow permeability, and poor tilth are the main limitations. This soil is

Figure 3.—A pecan orchard on Armistead clay.

sticky when wet, hard when dry, and difficult to keep in good tilth. It can be worked only within a narrow range of moisture content and is subject to becoming cloddy when worked.

Proper management of crop residues helps maintain organic matter content, improve tilth, and increase water infiltration. A drainage system is needed for maximum production of crops and pasture. Land grading or smoothing improves surface drainage and increases the efficiency of farm equipment. Most crops, other than legumes, respond well to additions of nitrogen fertilizer. Lime or other fertilizers generally are not needed.

The potential for intensive recreation areas is poor because of wetness and the clayey surface texture.

The potential for urban use is fair. Wetness is a limitation for such uses as septic tank absorption fields, sanitary landfills, homesites, and local roads and streets. The soil has good potential for woodland, but most areas are used for cropland and pasture.

This soil is in capability subclass IIw and woodland suitability group 2w5.

3—Beauregard silt loam, 1 to 3 percent slopes. This moderately well drained, very gently sloping, loamy soil is on terraces and lower slopes adjacent to drainageways in the uplands. It formed in loamy alluvium. Tracts range from about 10 to 150 acres.

Typically, the surface layer is a medium acid to strongly acid, brown silt loam about 9 inches thick. The subsoil, to a depth of 32 inches, is strongly acid, yellowish brown silt loam with brown, gray, and red mottles. Between depths of 32 and 43 inches, the subsoil is strongly acid, light brownish gray silt loam that has yellowish brown and red mottles. Between depths of 43 and 60 inches, it is mottled gray, brown, and red silt loam.

This soil has low fertility. Water runs off the surface at a slow to medium rate. Water and air move at a slow rate through the soil. The surface layer remains wet for relatively long periods in winter and spring. The seasonal high water table fluctuates from a depth of 1.5 to 3.0 feet during the months of December through March. Plants may suffer from lack of water during dry periods in summer and fall.

Included with this soil in mapping are a few small areas of poorly drained Guyton soils in swales and flats and Bowie soils that are at slightly higher elevations than this Beauregard soil. The Bowie soils contain more sand in the subsoil than Beauregard soils do. The included soils make up less than 10 percent of any given area.

Most of the acreage is in woodland and pasture. A small acreage is used for crops and homesites.

The potential for crops is fair, and the potential for pasture is good. The nearly level to very gentle slopes make this soil favorable for growing cultivated crops; however, the wetness and low fertility are less favorable features for this use. The main suitable crops are cotton, corn, and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, crimson clover, and southern winter peas.

This soil is friable and easy to keep in good tilth. Traffic pans develop easily but can be broken up by deep plowing or chiseling. Proper management of crop residues helps maintain organic matter content, which in turn reduces surface crusting and soil loss by erosion. Lime and fertilizer are needed for most crops and pasture plants.

The potential for urban use is fair. Wetness is a limitation when this soil is used for septic tank absorption fields and sanitary landfills. The potential for woodland is good. Wetness may limit the use of some equipment during the winter and early spring. The potential for intensive recreation areas is fair because this soil is limited by wetness.

This soil is in capability subclass IIe and woodland suitability group 2w8.

4—Bernaldo fine sandy loam, 1 to 3 percent slopes. This well drained, very gently sloping, loamy soil is on low terraces adjacent to the major drainageways in the uplands. It formed in loamy sediments. Tracts range from 10 to 150 acres.

Typically, the surface layer is dark grayish brown and yellowish brown, slightly acid fine sandy loam about 5 inches thick. The subsurface layer is yellowish brown, medium acid fine sandy loam about 15 inches thick. The subsoil, to a depth of 52 inches, is strong brown and yellowish brown, strongly acid loam mottled in shades of brown. Below this, to a depth of 80 inches, is yellowish brown, strongly acid sandy clay loam that has red, gray, and brown mottles.

This soil is low in fertility. Water and air move through the soil at a moderate rate. Water runs off the surface at a medium rate. It dries quickly after rains. The seasonal high water table is at a depth of 4 to 6 feet. Crops may suffer from lack of water during dry periods in summer and fall.

Included with this soil in mapping are a few small areas of the poorly drained Guyton soils adjacent to drainageways. The included soils make up about 10 percent of any mapped area.

Most of the acreage is in pasture and woodland. A small acreage is used for crops and homesites.

The potential for crops and pasture is good. Where the vegetative cover is inadequate, this soil erodes easily. The main suitable crops are cotton, corn, and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, and crimson clover. The soil is friable and easy to keep in good tilth. It can be cultivated over a wide range in moisture content. Conservation practices, such as proper management of crop residues, contour farming, and terraces, are needed to help reduce soil loss by erosion. Most crop and pasture plants respond well to additions of lime and fertilizers.

The potential for woodland and intensive recreation areas is good. There are no significant limitations for these uses. The potential for urban use is good. Wetness is a limitation for such uses as septic tank absorption fields.

This soil is in capability subclass IIe and woodland suitability group 2o1.

5—Bonn silt loam. This poorly drained, level, loamy soil is on low terraces adjacent to local drainageways in the uplands. It contains high concentrations of sodium salts in the subsoil. This soil formed in loamy sediments. Slope is dominantly less than 1 percent. Tracts range from 10 to 60 acres.

Typically, the surface layer is very dark grayish brown, medium acid silt loam about 2 inches thick. The subsurface layer, to a depth of 12 inches, is gray and brown silt loam. The subsoil, to a depth of 64 inches, is grayish brown, strongly alkaline silty clay loam mottled in shades of yellow and brown. In places the subsoil contains only small amounts of sodium salts. In some of the lower parts of the landscape, this soil is occasionally flooded.

This soil has low fertility. Plant roots are restricted below a depth of 15 inches by the high content of sodium. Water and air move at a very slow rate through the soil. Water runs off the surface at a slow rate. The seasonal high water table is perched upon the subsoil and rises near the surface during wet periods in December through April. The surface layer is wet for long periods in winter and spring. The soil is droughty and plants suffer from lack of water during dry periods in summer and fall.

Included with this soil in mapping are small areas of Guyton soils, which do not contain high concentrations of sodium. The included soils make up less than 10 percent of any given area.

Most of the acreage is in native vegetation. A small acreage is in pasture.

The potential for crops and pasture is poor. The high content of sodium and wetness are unfavorable features for these uses. Suitable pasture plants are common bermudagrass and Pensacola bahiagrass.

The soil is hard when dry and difficult to keep in good tilth. Wetness may delay planting and harvesting of crops. A drainage system is needed for crops and pasture. Proper management of crop residues helps maintain content of organic matter, which in turn reduces surface crusting and improves tilth. The response to fertilizers is poor.

The potential for intensive recreation areas is poor because of wetness. The potential for urban use is also poor. Wetness is the main limitation for such uses as septic tank absorption fields, sanitary landfills, homesites, and local roads and streets. Low strength and susceptibility to piping are limitations for local roads and for embankments.

This soil has poor potential for woodland. Wetness and the toxic effect of high sodium concentrations on some tree species are the chief limitations for such uses.

This soil is in capability subclass IVs and woodland suitability group 5t0.

6—Woodtell fine sandy loam, 1 to 3 percent slopes. This moderately well drained, very gently sloping, loamy soil has a clayey subsoil. It is on convex ridgetops in the uplands. It formed in clayey sediments. Individual areas range from 200 to 500 acres.

Typically, the surface layer is dark brown, medium acid and strongly acid fine sandy loam about 9 inches thick. The subsoil, to a depth of about 24 inches, is red, very strongly acid clay mottled with brown and gray. The next layer, to a depth of about 44 inches, is mottled gray, red, and brown, very strongly acid clay. The underlying material, to a depth of about 54 inches, is light brownish gray clay. Below this, to a depth of about 65 inches, is gray, very strongly acid shaly silty clay.

This soil has low fertility. Water runs off the surface at a medium rate. Water and air move at a very slow rate through the soil. The seasonal high water table fluctuates from a depth of 1.5 to 4 feet during the months of December through April. Most crops and pasture plants suffer from lack of water during dry periods in summer and fall.

Included with this soil in mapping are a few small areas of Bowie, Keithville, and Meth soils at slightly higher elevations. The included soils make up about 15 percent of this map unit.

Most of the acreage is in woodland. A small acreage is in pasture and homesites.

The potential for crops and pasture is fair. Low fertility and the hazard of erosion are unfavorable features for these uses. The main suitable crops are cotton, corn, and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, and crimson clover. Conservation practices, such as proper management of crop residues, stripcropping, contour farming, and terraces, help reduce soil loss by erosion. Response of most crops and pasture plants to fertilizers is fair. Lime is generally needed.

The potential for urban use is poor. Very slow permeability and wetness are limitations for such uses as septic tank absorption fields. High shrink-swell potential is a limitation for use as foundations or as construction material.

The potential for woodland is fair. The potential for intensive recreation is fair because it furnishes poor support for vehicular traffic during wet seasons.

This soil is in capability subclass IIIe and woodland suitability group 4c2.

7—Woodtell fine sandy loam, 3 to 8 percent slopes. This moderately well drained, gently sloping to moderately sloping, loamy soil has a clayey subsoil. It is on side slopes bordering drainageways in the uplands. It formed in clayey sediments. Areas of this soil range from 20 to 300 acres.

Typically, the surface layer is brown, medium acid fine sandy loam about 5 inches thick. The subsoil, to a depth of about 22 inches, is red, strongly acid silty clay mottled in shades of brown. The next layer, to a depth of about 45 inches, is light brownish gray, very strongly acid clay mottled in shades of red and yellowish brown. The underlying material, to a depth of about 63 inches, is stratified, light yellowish brown, very strongly acid loam and clay loam mottled in shades of brown and gray.

This soil has low fertility. Water runs off the surface at a medium rate. Water and air move at a very slow rate through the soil. The seasonal high water table fluctuates between a depth of 1.5 to 4 feet during the months of December through April. Most crops and pasture plants suffer from lack of water during dry periods in summer and fall.

Included with this soil in mapping are a few small areas of Bowie, Keithville, and Meth soils at slightly higher elevations. The included soils make up about 14 percent of this map unit.

Most of the acreage is in woodland. A small acreage is in pasture.

The potential for crops is poor, and the potential for pasture is fair. Erosion is the main hazard. The main suitable crops are cotton, corn, and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, and crimson clover. Conservation practices, such as contour farming, terracing, and stripcropping, help to reduce soil loss by erosion. Lime and complete fertilizers are generally needed.

The potential for urban use is poor. Very slow permeability and wetness are limitations for use as septic tank absorption fields. High shrink-swell potential is a limitation for use as foundations or as construction material.

The soil has fair potential for woodland. The potential for intensive recreation is also only fair because this soil furnishes poor support for vehicular traffic during wet seasons. There are severe limitations for playgrounds.

This soil is in capability subclass IVe and woodland suitability group 4c2.

8—Woodtell fine sandy loam, 8 to 20 percent slopes. This moderately well drained, strongly sloping to moderately steep, loamy soil has a clayey subsoil. It is on side slopes in uplands that are dissected by many drainageways. Areas of this soil range from 15 to 150 acres.

Typically, the surface layer is yellowish brown, medium acid fine sandy loam about 4 inches thick. The subsoil, to a depth of about 15 inches, is red, very strongly acid clay that has yellowish brown mottles. The next layer, to a depth of about 51 inches, is light brownish gray, very strongly acid clay mottled in shades of red, brown, and gray. The underlying material, to a depth of about 65 inches, is brown, strongly acid sandy loam and sandy clay.

This soil has low fertility. Water runs off the surface at a rapid rate. Water and air move at a very slow rate through the soil. The seasonal high water table fluctuates between a depth of 1.5 to 4 feet during the months of December through April. Most plants suffer from lack of water during dry periods in summer and fall.

Included with this soil in mapping are a few small areas of Meth and Ruston soils. Also included are Woodtell soils on gentle slopes. The included soils make up about 15 percent of this map unit.

Most of the acreage is in woodland. A small acreage is in pasture.

The potential for crops is very poor, and the potential for pasture is poor. Erosion hazard is too severe for cultivated crops. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, and crimson clover. Response to fertilizer is fair. Lime is generally needed.

The potential for urban use is poor. Slope is a limitation for most uses. Very slow permeability and wetness are limitations for use as septic tank absorption fields. High shrink-swell potential is a limitation for foundations or as construction material.

The soil has fair potential for woodland. The potential for intensive recreation is poor because of slope.

This soil is in capability subclass VIe and woodland suitability group 4c2.

9—Betis loamy fine sand, 1 to 5 percent slopes. This somewhat excessively drained, gently sloping, sandy soil is on ridges in the uplands. It formed in sandy sediments. Tracts range from about 10 to 150 acres.

Typically, the surface layer is brown, strongly acid loamy fine sand about 5 inches thick. The subsurface layer is yellowish brown, strongly acid loamy fine sand about 13 inches thick. The subsoil, to a depth of about 62 inches, is yellowish red and strong brown, very strongly acid loamy fine sand.

This soil has low fertility. Water and air move rapidly through the soil. Water runs off the surface at a slow rate. This soil dries quickly after heavy rains. The seasonal high water table is at a depth of greater than 6 feet. Most crop and pasture plants suffer from lack of water during summer and fall in most years.

Included with this soil in mapping are a few small areas of the well drained Briley and Ruston soils. The included soils make up about 10 percent of the areas mapped.

Most of the acreage is in woodland. A small acreage is in pasture.

The potential for crops is poor, and the potential for pasture is fair. Low fertility, limited choice of plants, and droughtiness are unfavorable features for these uses. Special crops, such as watermelons and peanuts, are well suited. Suitable pasture plants include improved bermudagrass, Pensacola bahiagrass, and crimson clover.

This soil is friable and easy to keep in good tilth. It is easy to work when moist, but traction is poor when dry. Proper management of crop residues helps maintain content of organic matter, improve tilth, and reduce soil losses by erosion. Contour farming helps control surface runoff and reduce erosion. The response to fertilizer is fair. Lime is generally needed.

The potential for urban use is good; however, cutbanks are subject to caving in shallow excavations, and seepage is excessive for sewage lagoons.

The potential for woodland is fair. The surface layer furnishes poor traction when dry, and seedling mortality is generally high because of droughtiness. The potential for intensive recreation is fair. The sandy surface becomes loose when dry and furnishes poor traction.

This soil is in capability subclass IIIs and woodland suitability group 4s3.

10—Betis loamy fine sand, 5 to 12 percent slopes. This somewhat excessively drained, moderately sloping to strongly sloping, sandy soil is on side slopes in the uplands. It formed in sandy sediments. Slope is dominantly 5 to 12 percent, but slopes of 5 to 20 percent are included along some of the more deeply entrenched drainageways. Tracts range from about 10 to 150 acres.

Typically, the surface layer is dark grayish brown, strongly acid loamy fine sand about 5 inches thick. The subsurface layer, to a depth of 23 inches, is brown, strongly acid loamy fine sand. The subsoil, to a depth of 62 inches, is yellowish red, strongly acid loamy fine sand.

This soil has low fertility. Water and air move rapidly through the soil. Water runs off the surface at a slow rate. This soil dries out quickly after heavy rains. The seasonal high water table is at a depth of greater than 6 feet. Most crop and pasture plants suffer from lack of water during late summer and early fall in most years.

Included with this soil in mapping are a few small areas of well drained Briley and Ruston soils on the upper side slopes. The included soils make up about 10 percent of the mapped areas.

Most of the acreage is in woodland. A small acreage is in pasture.

The potential for crops and pasture is poor. Steep slopes, low fertility, limited choice of plants, and droughtiness are unfavorable features for these uses. The hazard of erosion is too severe for crops. The main suitable pasture plants are improved bermudagrass, Pensacola bahiagrass, and crimson clover. Additions of fertilizer and lime are needed.

The potential for urban use is fair. Slope is the main limitation. Cutbanks are subject to caving in shallow excavations.

The potential for woodland is fair. The surface layer furnishes poor traction when dry, and seedling mortality is generally high because of droughtiness. The potential for intensive recreation is fair for most uses except for playgrounds. The sandy surface becomes loose when dry and furnishes poor traction. In addition, slope is a severe limitation for playgrounds.

This soil is in capability subclass VIe and woodland suitability group 4s3.

11—Caspiana silty clay loam. This well drained, level, loamy soil is on old natural levees of the Red River alluvial plain. It formed in loamy sediments. Slope is less than 1 percent. Tracts are from 25 to 500 acres.

Typically, the surface layer is dark brown, slightly acid silty clay loam about 14 inches thick. The subsoil, to a depth of about 34 inches, is yellowish red, neutral silty clay loam. The next layer, to a depth of about 45 inches, is reddish brown, neutral silty clay loam. The underlying material, to a depth of about 60 inches, is reddish brown, moderately alkaline silt loam. In places the surface layer is silt loam.

This soil has high fertility. Water runs off the surface at a slow rate. Water and air move at a moderate rate through the soil. The water table fluctuates from a depth of 4 feet to greater than 6 feet for short periods during December through April. The surface layer of this soil dries out somewhat slowly. Plants may suffer from lack of water during dry periods in summer and fall of some years.

Included with this soil in mapping are a few small areas of Gallion soils on slight rises in the landscape. Also included are small areas of the somewhat poorly drained Armistead soils at slightly lower elevations than this Caspiana soil. The included soils make up about 10 percent of any given area.

Most of the acreage is in crops and pasture. A small acreage is used for homesites and oilfields.

The potential for crops and pasture is good. Level slopes and high fertility make this soil highly favorable for growing cultivated crops. The main suitable crops are cotton, soybeans, corn, oats, and grain sorghum. The main suitable pasture plants are common bermudagrass, improved bermudagrass, ryegrass, dallisgrass, tall fescue, Pensacola bahiagrass, white clover, and southern wild winter peas. This soil is somewhat difficult to keep in good tilth because of the silty clay loam surface layer. Land smoothing and leveling improve surface drainage and increase the efficiency of farm equipment. Proper management of crop residues helps maintain content of organic matter, improve tilth, and reduce soil losses by erosion. Crop response to fertilizers is good. Lime is generally not needed.

The potential for urban use is good. Moderate shrink-swell potential is a limitation when this soil is used for foundations and as construction material, but this problem is easy to overcome.

This soil has good potential for woodland, but most areas are used for crops and pasture. The potential for intensive recreation is fair. The silty clay loam surface layer is the main limitation.

This soil is in capability subclass IIw and woodland suitability group 2o4.

12—Caspiana silt loam. This well drained, level, loamy soil is on natural levees of the Red River alluvial plain (fig. 4). It formed in loamy sediments. Slope is dominantly less than 1 percent. Small areas along drainageways are included that have slopes of 2 and 3 percent. Individual areas of this soil range from 25 to 300 acres.

Typically, the surface layer is dark brown and very dark brown, slightly acid and neutral silt loam about 11 inches thick. The subsoil, to a depth of about 59 inches, is reddish brown and yellowish red, dominantly mildly alkaline silt loam. The underlying material is yellowish red, moderately alkaline silt loam. In places the surface layer is silty clay loam.

The soil has high fertility. Water runs off the surface at a slow rate. Water and air move at a moderate rate through the soil. The water table fluctuates from a depth of 4 feet to greater than 6 feet during December through April. The surface layer dries quickly after heavy rains. Plants may suffer from lack of water during dry periods in summer and fall of some years.

Included with this soil in mapping are a few small areas of Gallion soils that are at slightly higher elevations and have a lighter colored surface layer than that of the Caspiana soils. Included soils make up less than 10 percent of any one mapped area.

Most of the acreage is in crops and pasture. A small acreage is used for homesites and oilfields.

The potential for crops and pasture is good. Level slopes and high fertility make this soil well suited to growing cultivated crops and pasture plants. The main suitable crops are cotton, soybeans, corn, oats, and grain sorghum. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, tall fescue, dallisgrass, white clover, and southern wild winter peas.

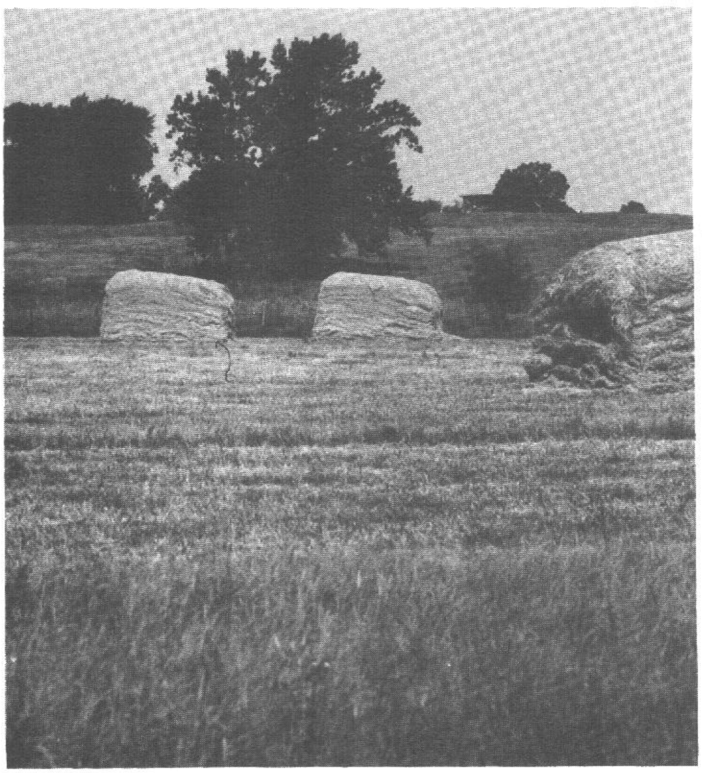


Figure 4.—An area of Caspiana silt loam on the Red River alluvial plain, foreground, and Forbing silt loam, 3 to 8 percent slopes, on uplands, background.

This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture conditions. Traffic pans develop when under continuous cultivation, but these can be broken easily by deep plowing or chiseling. Land smoothing and leveling improve surface drainage and increase the efficiency of farm equipment. Proper management of crop residues helps maintain content of organic matter, improve tilth, and reduce soil losses by erosion. Crop response to fertilizer is good. Lime is generally not needed.

The potential for intensive recreation is good. There is no significant limitation. The potential for urban use is also good; however, moderate shrink-swell potential is a limitation when this soil is used for foundations and as construction material. This problem is easy to overcome. The potential for woodland is good, but this use is overshadowed by its value for crops and pasture.

This soil is in capability class I and woodland suitability group 2o4.

13—Keithville very fine sandy loam, 2 to 5 percent slopes. This moderately well drained, gently sloping, loamy soil is on ridgetops or drainage divides in the uplands. It is over clayey sediments, which are at moderate depths. Individual areas range from 25 to 200 acres.

Typically, the surface layer is brown and yellowish brown, medium acid very fine sandy loam about 9 inches thick. The subsoil, to a depth of about 35 inches, is yellowish red and strong brown, strongly acid loam. Below this, to a depth of about 70 inches, is gray, very strongly acid silty clay mottled in shades of red, brown, and yellow.

This soil is low in fertility. Water and air move at a very slow rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table is perched within 2 to 3 feet of the surface for short periods during the months of December through April. Plants generally suffer from lack of water during dry periods in summer and fall.

Included with this soil in mapping are a few small areas of somewhat poorly drained Metcalf soils in lower parts of the landscape and more sloping Woodtell soils. The included soils make up about 15 percent of the mapped areas.

Most of the acreage is in pasture. A small acreage is in woodland and in homesites.

The potential for crops is fair, and the potential for pasture is good. Erosion is the main hazard when this soil is used for cultivated crops. The main suitable crops are cotton, corn, and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, crimson clover, and southern wild winter peas.

This soil is friable and easy to keep in good tilth. It dries quickly after rains and can be worked over a wide range of moisture content. Conservation practices, such as the proper management of crop residues, stripcropping, contour farming, and terraces, help control runoff and reduce soil loss by erosion. Most crops and pasture plants respond well to fertilizers. Lime is generally needed.

The potential for urban use is fair. Wetness is a limitation for most urban uses. High shrink-swell potential is the main limitation where this soil is used for foundations or as construction material.

The potential for woodland is good; however, wetness may restrict the use of equipment in the winter and spring. The potential for intensive recreation is good; however, slope is a limitation for playgrounds.

This soil is in capability subclass IIIe and woodland suitability group 3w8.

14—Gallion silt loam. This well drained, nearly level, loamy soil is on natural levees of the Red River alluvial plain. This soil formed in loamy sediments. Slopes are 0 to 1 percent. Tracts range from 5 to 150 acres.

Typically, the surface layer is brown, slightly acid silt loam about 9 inches thick. The subsoil, to a depth of about 46 inches, is yellowish red, slightly acid silty clay loam and silt loam. The underlying layer, to a depth of about 63 inches, is yellowish red, neutral, stratified silt loam and very fine sandy loam.

This soil is moderately high in fertility. Water runs off the surface at a slow rate. Water and air move at a moderate rate through the soil. This soil dries somewhat quickly after heavy rains. The seasonal high water table is at a depth of greater than 6 feet, but in places it may fluctuate from a depth of 4 feet to greater than 6 feet during December through April. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of Caspiana soils and Gallion silty clay loam. The included soils make up about 10 percent of the map unit.

Most of the acreage is in crops. A small acreage is used for pasture, homesites, and oilfields.

The potential for crops and pasture is excellent. Because this soil is level and has moderately high fertility, it is well suited for growing cultivated crops. The main suitable crops are cotton, soybeans, corn, oats, and grain sorghum. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, dallisgrass, tall fescue, white clover, and southern wild winter peas.

This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture conditions. Traffic pans develop when under continuous cultivation but can be broken easily by deep plowing or chiseling. Land smoothing and leveling improve surface drainage and increase the efficiency of farm equipment. Aligning crop rows across the slopes also improves surface drainage. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil losses by erosion. Crop response to fertilizers is good. Lime generally is needed.

The potential for intensive recreation is good. There are no significant limitations for this use.

The soil has good potential for urban use. Shrink-swell potential, however, is a limitation where this soil is used for foundations and as construction materials, but this limitation is easy to overcome. This soil also has good potential for woodland, but most areas are used for crops and pasture.

The soil is in capability class I and woodland suitability group 2o4.

15—Gallion silty clay loam. This well drained, nearly level, loamy soil is on the lower parts of natural levees of the Red River alluvial plain. It formed in loamy sediments. Slopes are 0 to 1 percent. Tracts range from 5 to 100 acres.

Typically, the surface layer is brown, slightly acid silty clay loam about 5 inches thick. The subsoil, to a depth of about 13 inches, is reddish brown, medium acid silty clay loam. The next layer, to a depth of about 47 inches, is dark reddish brown, yellowish red, and reddish brown silt loam that is medium acid and slightly acid. The underlying material, to a depth of about 62 inches, is a slightly acid, yellowish red, stratified silt loam and very fine sandy loam.

This soil is moderately high in fertility. Water runs off the surface at a slow rate. The surface layer of this soil dries more slowly than many of the adjacent soils. The seasonal high water table is at a depth of 4 feet to greater than 6 feet during December through April. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of Caspiana soils and Gallion silt loam. These soils are at slightly higher elevations. The included soils make up about 10 percent of the areas mapped.

Most of the acreage is in crops. A small acreage is in pasture.

The potential for crops and pasture is excellent. Because it is level and has moderately high fertility, this soil is favorable for growing cultivated crops. The main suitable crops are cotton, soybeans, corn, oats, and grain sorghum. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, tall fescue, dallisgrass, white clover, and southern wild winter peas.

This soil is somewhat difficult to keep in good tilth. Land smoothing and leveling improve surface drainage. A surface drainage system is generally needed. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil losses by erosion. Crop response to fertilizers is good. Lime may be needed.

The potential for urban use is good. Shrink-swell potential is a limitation where this soil is used for foundations or as construction material. These limitations are easy to overcome.

This soil has good potential for woodland, but most areas are used for crops and pasture. The potential for intensive recreation is fair. The clayey surface that is sticky when wet is the main limitation.

This soil is in capability subclass IIw and woodland suitability group 2o4.

16—Gore silt loam, 1 to 5 percent slopes. This moderately well drained, gently sloping loamy soil has a clayey subsoil. This soil formed in clayey sediments. It is on broad ridgetops and side slopes in the uplands. Mapped areas are adjacent to major lakes and range from about 10 to 150 acres.

Typically, the surface layer is dark grayish brown and light yellowish brown, strongly acid silt loam about 8 inches thick. The subsoil, to a depth of about 17 inches, is red, very strongly acid silty clay that has pale brown mottles. The next layer, to a depth of about 46 inches, is light brownish gray, very strongly acid silty clay mottled in shades of red. The next layer, to a depth of about 56 inches, is yellowish red, medium acid clay that has light brownish gray mottles. The underlying material, to a depth of about 65 inches, is medium acid, dark red clay.

This soil has low fertility. Water and air move at a very slow rate through the soil. Water runs off the surface at a medium rate. The subsoil has a high shrink-swell potential. The seasonal high water table is at a depth of greater than 6 feet. This soil erodes easily where the vegetative cover is thin. Plants generally suffer from lack of water during dry periods in summer and fall.

Included with this soil in mapping are a few small areas of Forbing soils adjacent to drainageways and poorly drained Wrightsville soils on level or in depressional areas. The included soils make up about 10 percent of the areas mapped.

Most of the acreage is in woodland or pasture. A small acreage is in homesites.

The potential for crops is poor, and it is fair for pasture. The hazard of erosion and low fertility are limitations for these uses. The main suitable crops are grain sorghum and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, and crimson clover.

This soil is friable and easy to keep in good tilth. Conservation practices, such as proper management of crop residues, contour farming, stripcropping, and terracing, are needed to help reduce runoff and soil loss by erosion. Lime and fertilizers are generally needed.

The potential of this soil for urban use is poor. Very slow permeability is a limitation for septic tank absorption fields. The clayey subsoil is a limitation for sanitary landfills. High shrink-swell potential is a limitation where this soil is used as foundations or as construction materials.

The soil has fair potential for woodland and intensive recreation. This soil furnishes poor support for vehicular traffic during wet seasons.

This soil is in capability subclass IVe and woodland suitability group 3c2.

17—Messer Variant-Guyton Variant complex, gently undulating. This complex consists of areas of moderately well drained Messer Variant and poorly drained Guyton Variant that are so intermingled that they cannot be separated at the scale selected for mapping. The entire acreage of this complex is in one mapped area near the village of Oil City. Messer Variant makes up 45 percent of the complex, and Guyton Variant makes up 35 percent. The soils are on parallel ridges and swales in the uplands. The ridges are 3 to 4 feet high and 50 to 150 yards wide. The swales are 25 to 100 yards wide. Slopes range from 0 to 1 percent in the swales and up to 3 percent on the ridges.

The Messer Variant is on low ridges. Typically, the surface layer is dark reddish brown, slightly acid silty clay about 6 inches thick. Below this, to a depth of about 60 inches, are layers of brown, slightly acid fine sandy loam and sandy loam.

The soil is low in fertility. Water and air move at a moderately rapid rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table fluctuates from a depth of 1.5 to 3.0 feet during December through April. This soil cracks when dry and seals over when wet.

Guyton Variant is in the swales. Typically, the surface layer is dark gray, slightly acid silty clay about 6 inches thick. The next layer, to a depth of about 14 inches, is light brownish gray, medium acid silt loam. The subsoil, to a depth of about 60 inches, is brown and gray, medium acid silty clay loam and loam.

This soil is low in fertility. Wetness causes poor aeration and restricts root development of many plants. Water and air move at a slow rate through the soil. Water runs off the surface at a slow rate. It is wet for long periods during the winter and spring. The seasonal high water table fluctuates from a depth of 1.5 feet to the soil surface during December through April. Crops and pasture plants generally suffer from lack of water during dry periods in summer and fall.

Included with these soils in mapping are a few small areas of poorly drained Bonn and Wrightsville soils in the swales. Also included are small areas of oil-waste land. The included soils and oil-waste land make up about 20 percent of this unit.

Most of the acreage is used for woodland and oil wells. A small acreage is in pasture.

The potential for crops and pasture is poor. The numerous oil wells, pipelines, and areas of oil-waste land interfere with tillage. The short irregular slopes and wetness in low areas interfere with tillage.

The main suitable crops are soybeans and grain sorghum. The main suitable pasture plants are common bermudagrass, Pensacola bahiagrass, ryegrass, dallisgrass, and white clover.

The potential for urban use is poor. The numerous oil wells, pipelines, and areas of oil-waste land are the primary limitations, although wetness of the Guyton Variant is also a limitation for many uses.

The potential for woodland is fair. Wetness of the Guyton Variant restricts use of equipment in the winter and spring. The oil wells and pipelines also interfere with timber operations. The potential for intensive recreation is poor because of a clayey surface, short irregular slopes, and wetness in swales.

This unit is in capability subclass IIIw. The Messer Variant is in woodland suitability group 2w8, and the Guyton Variant is in woodland suitability group 2w9.

18—Guyton soils, frequently flooded. These poorly drained, nearly level, silty soils are on alluvial plains of streams that drain the uplands. These soils are subject to frequent flooding. They formed in silty sediments. The Guyton soil and a soil similar to the Guyton soil are in an irregular pattern on the landscape. The similar soil is coarser textured and better drained than the Guyton soil. Individual areas of each soil are large enough to map separately, but because of present and predicted uses, they are mapped as one unit. Most mapped areas contain both soils, but a few areas contain only one of the soils. About 70 percent of the map unit is Guyton soils. Slopes range from 0 to 1 percent. Tracts range from 10 acres to several hundred acres.

Typically, the surface layer is brown, strongly acid silt loam about 3 inches thick. The subsurface layer, to a depth of about 21 inches, is light brownish gray, strongly acid silt loam. The subsoil, to a depth of about 60 inches, is grayish brown, strongly acid silty clay loam mottled in shades of brown.

Guyton soils have low fertility. Wetness causes poor aeration and restricts root development of many plants. Water and air move at a slow rate through the soil. Water runs off the surface at a slow rate. These soils are wet for long periods during the winter and spring. They are flooded several times each year, mostly during December through April (fig. 5). Flooding duration ranges from 3 or 4 hours to 24 hours or longer. Flooding depths range from a few inches to a foot or more. The seasonal high water table fluctuates from a depth of 1.5 feet to the surface throughout the year. Plants may suffer from lack of water during dry periods in summer and fall of some years. In a few places these soils are protected from flooding by channel improvement.

Included with these soils in mapping are soils which are similar to Guyton soils but which are slightly more alkaline in the subsoil, soils that are slightly better drained, and soils that are slightly coarser textured. The better drained soils and coarser textured soils are on low, elongated ridges. Also included are narrow areas of better drained, coarser textured soils on the natural levees of the larger streams. These included soils make up about 30 percent of the unit.

Most of the acreage is in woodland. A small acreage is in pasture.

The potential for crops is very poor, and the potential for pasture is fair. Flooding is too severe for most crops. The main suitable pasture plants are common bermudagrass and Pensacola bahiagrass.

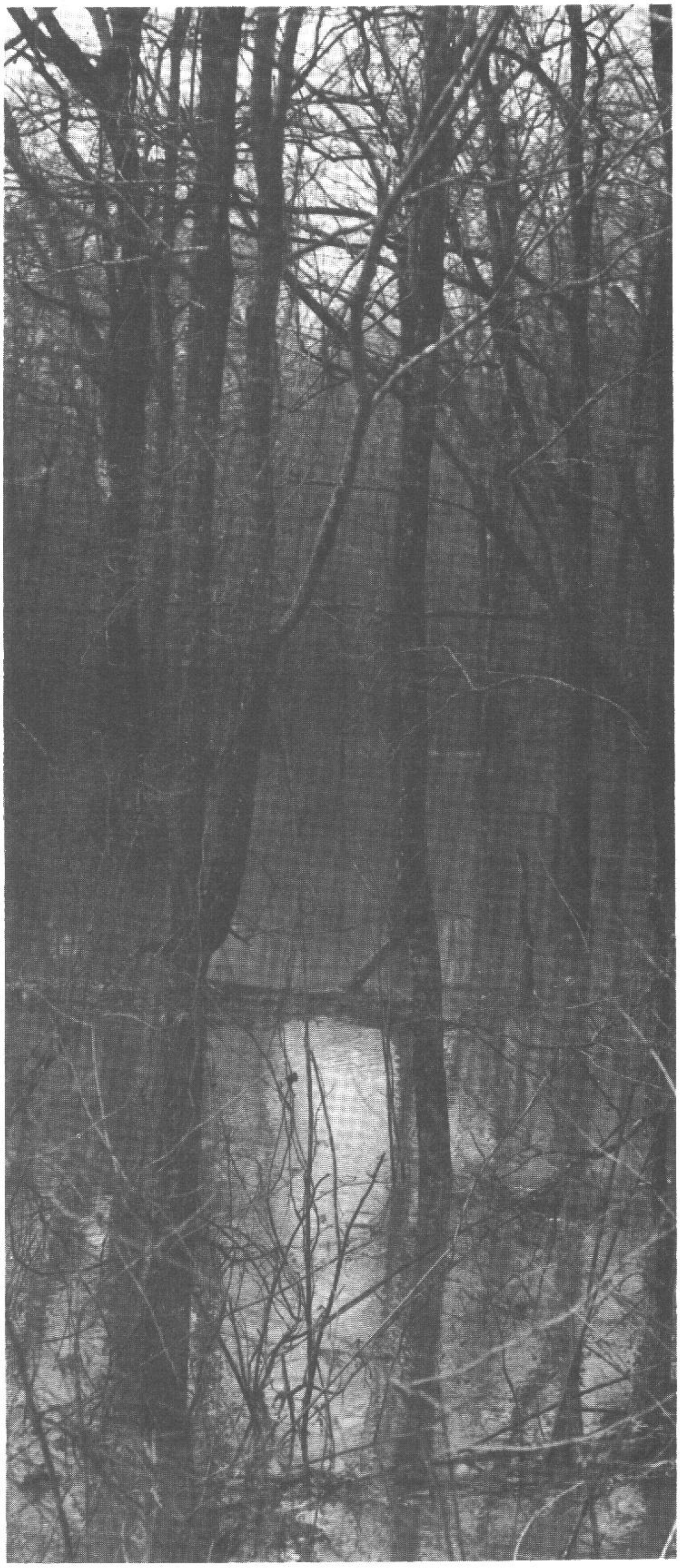


Figure 5.—Flooding on Guyton soils, frequently flooded.

The potential for urban use is very poor. Flooding and wetness are the main limitations for most urban uses. The potential for woodland is good. Wetness limits the use of equipment during the winter and spring months. The potential for intensive recreation is very poor because of flooding.

This soil is in capability subclass Vw and woodland suitability group 2w9.

19—Briley loamy fine sand, 1 to 5 percent slopes. This well drained, gently sloping soil is on broad, convex ridgetops in the uplands. It formed in sandy sediments. Tracts range from about 10 to 250 acres.

Typically, the surface layer is brown, strongly acid loamy fine sand about 10 inches thick. The subsurface layer, to a depth of about 28 inches, is yellowish brown, strongly acid loamy fine sand. The subsoil, to a depth of about 37 inches, is red, very strongly acid fine sandy loam. The next layer, to a depth of about 52 inches, is red, very strongly acid sandy clay loam. Below this, to a depth of about 80 inches, is red, very strongly acid fine sandy loam.

This soil is low in fertility. Water and air move at a moderate rate through the soil. Water runs off the surface at a slow rate. The soil dries out quickly and is droughty. The seasonal high water table is at a depth of greater than 6 feet from the surface. Most plants suffer from lack of water during summer and fall of most years.

Included with this soil in mapping are a few small areas of Betis and Ruston soils. Betis soils are on lower side slopes and have a more sandy subsoil. Ruston soils are on slightly higher, convex ridgetops and have a thinner sandy surface and subsurface layer than the Briley soils. The included soils make up about 15 percent of any given area.

Most of the acreage is in woodland. A small acreage is used for pasture and homesites.

The potential for crops and pasture is fair. Droughtiness limits the choice of crops and pasture plants. The main suitable crops are peanuts and watermelons. Cotton and corn can be grown, but production will be low. The main suitable pasture plants are improved bermudagrass, Pensacola bahiagrass, and crimson clover.

This soil is friable and easy to keep in good tilth. It is easy to work when moist, but traction is poor when dry. Conservation practices, such as proper management of crop residues, contour farming, and stripcropping, are needed to control runoff and to help control erosion. Crop response to fertilizer is fair. Lime is generally needed.

The potential for urban use is good. Seepage and piping are limitations, however, where the soil is used for sewage lagoons and embankments, dikes, and levees.

The potential for woodland is good. Poor traction may restrict equipment use during dry periods. Seedling mortality is generally high because of droughtiness. The potential for intensive recreation is fair. The sandy surface becomes loose when dry and furnishes poor traction.

This soil is in capability subclass IIIs and woodland suitability group 3s3.

20—Moreland clay, gently undulating. This somewhat poorly drained, clayey soil is on low, parallel ridges and swales on the Red River alluvial plain. It formed in clayey sediments. The ridges are 2 to 4 feet high and are mostly less than 200 feet in width. Slopes range from 0 to 3 percent. Tracts range from 20 to 150 acres.

Typically, the surface layer is dark reddish brown, mildly alkaline clay about 13 inches thick. The next layer, to a depth of about 40 inches, is dark reddish brown, moderately alkaline clay mottled in shades of gray. Below this, to a depth of 60 inches, are layers of dark brown and reddish brown, mildly alkaline silty clay loam.

This soil has high fertility. Wetness causes poor aeration and restricts root development of many plants. Water and air move at a very slow rate through the soil. Water runs off the surface at a medium rate on the ridges and very slowly in the swales. The seasonal high water table fluctuates from a depth of 1.5 feet to the surface during December through April. The surface layer is wet for long periods in the winter and spring. In the swales this soil dries out more slowly than the adjoining soils that are at higher elevations. It has a very high shrink-swell potential, and it cracks when dry and seals over when wet. Plants may suffer from lack of water during dry periods in the summer and fall of some years.

Included with this soil in mapping are a few small areas of Armistead soils at slightly higher elevations and the poorly drained Buxin soils in slightly depressional areas. Also included are a few narrow ridges where slopes are greater than 3 percent. The included soils make up about 10 percent of this map unit.

Most of the acreage is in crops and pasture. A small acreage is in woodland.

The potential for crops is fair, and the potential for pasture is good. The high fertility is a favorable feature for growing cultivated crops (fig. 6). Wetness, clayey textures, and short irregular slopes, however, are less favorable features for this use. The main suitable pasture plants are common bermudagrass, tall fescue, improved bermudagrass, Pensacola bahiagrass, ryegrass, white clover, and southern wild winter peas.

This soil is sticky when wet, hard when dry, and difficult to keep in good tilth. It can be worked only within a narrow range of moisture content and is subject to becoming cloddy when worked. Wetness may delay planting and harvesting of crops. A surface drainage system is needed to remove excess water from the swales. Land grading or smoothing improves surface drainage and increases the efficiency of farm equipment, but a large amount of soil will have to be moved. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Most crops, other than legumes, respond well to nitrogen fertilizer. Lime or other fertilizers generally are not needed.

The potential for urban use is poor. Wetness is a limitation for such uses as septic tank absorption fields, sanitary landfills, and homesites. High shrink-swell potential is a limitation for use as foundations or as construction material.

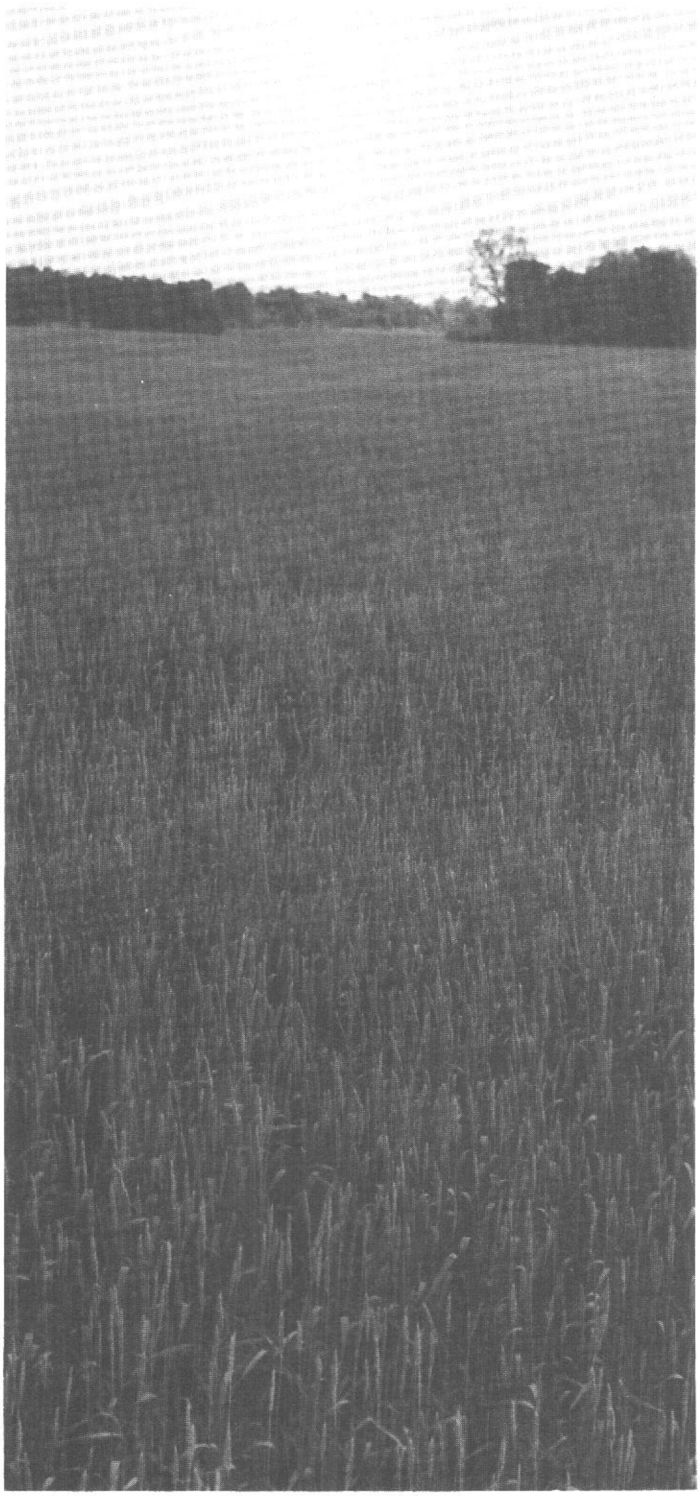


Figure 6.—Excellent crop of wheat on Moreland clay, gently undulating.

This soil has good potential for woodland, but most areas are used for crops and pasture. The potential for intensive recreation is poor because of wetness and clayey surfaces.

This soil is in capability subclass IIIw and woodland suitability group 2w6.

21—Forbing silt loam, 1 to 3 percent slopes. This moderately well drained, very gently sloping, loamy soil has a clayey subsoil. It formed in clayey sediments. It is on ridgetops in the uplands. Individual areas are adjacent to the major lakes in the parish and range from 25 to 200 acres.

Typically, the surface layer is brown, strongly acid silt loam about 4 inches thick. The subsoil, to a depth of about 18 inches, is yellowish red, medium acid clay. Below this, to a depth of about 75 inches, is red and dark red, neutral and moderately alkaline clay.

The soil is low in fertility. Water and air move at a very slow rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table is at a depth of greater than 6 feet. The subsoil has a very high shrink-swell potential. Plants generally suffer from lack of water during dry periods in summer and fall in most years.

Included with this soil in mapping are a few small areas of Gore soils and small areas of Forbing soils that are severely eroded. The included soils make up about 10 percent of the mapped areas.

Most of the acreage is woodland. A small acreage is used for homesites, pasture, and crops.

The potential for crops is fair, and the potential for pasture is good. Erosion is the main hazard. The main suitable crop is soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, and southern wild winter peas.

This soil is somewhat difficult to keep in good tilth. Conservation practices, such as management of crop residues, contour farming, terracing, and stripcropping, help reduce soil loss by erosion and help improve soil tilth. Lime and complete fertilizers are generally needed.

The potential for urban use is poor. Very slow permeability is a limitation for septic tank absorption fields. The clayey subsoil is a limitation for sanitary landfills and shallow excavations. Very high shrink-swell potential is a limitation for use as foundations or as construction material.

The potential for woodland is fair. Use of equipment is limited because of low traffic-supporting capacity. The potential for intensive recreation is fair because the soil furnishes poor support for vehicular traffic during wet seasons.

This soil is in capability subclass IIIe and woodland suitability group 3c2.

22—Moreland silt loam. This somewhat poorly drained, level, loamy soil has a clayey subsoil. It formed in clayey sediments. It is on the lower parts of the natural levees of the Red River alluvial plain. Slopes are less than 1 percent. Tracts range from 10 to 100 acres.

Typically, the surface layer is yellowish red, neutral silt loam about 8 inches thick. The next layers, to a depth of about 48 inches, are dark reddish brown, mildly alkaline and moderately alkaline clay. Below this, to a depth of about 60 inches, are layers of dark brown, mildly alkaline silty clay and reddish brown, mildly alkaline silty clay loam.

This soil has high fertility. Wetness causes poor aeration and restricts root development of many plants. Water and air move at a very slow rate through the soil. Water runs off the surface at a slow rate. The seasonal high water table fluctuates from a depth of 1.5 feet to the surface during December through April. The surface layer is wet for long periods in the winter and spring. This soil dries out more slowly than most of the adjoining soils at higher elevations. The subsoil has a very high shrink-swell potential. It cracks when dry and seals over when wet. Plants may suffer from lack of water during dry periods in the summer and fall of some years.

Included with this soil in mapping are small areas of Moreland clay and Moreland silty clay loam in lower parts of the landscape and well drained Norwood soils on slightly higher parts of the landscape. The included soils make up about 10 percent of this map unit.

Most of the acreage is in crops and pasture. A small acreage is used for woodland and homesites.

The potential for crops and pasture is good. Because this soil is level and has high fertility, it is favorable for growing cultivated crops. Its wetness, however, is a less favorable feature for this use. The main suitable crops are soybeans, cotton, rice, and grain sorghum. The main suitable pasture plants are common bermudagrass, tall fescue, improved bermudagrass, Pensacola bahiagrass, ryegrass, white clover, and southern wild winter peas.

The surface layer is friable, but it is somewhat difficult to keep in good tilth where it has been mixed in cultivation with the clayey subsoil. Wetness may delay planting and harvesting crops in some years. Land grading or smoothing improves surface drainage and increases the efficiency of farm equipment; however, the clayey subsoil will be exposed in places. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Most crops, other than legumes, respond well to nitrogen fertilizer. Lime or other fertilizers generally are not needed.

The potential for urban use is poor. Wetness is a limitation for such uses as septic tank absorption fields, sanitary landfills, and homesites. High shrink-swell potential is a limitation for use as foundations or as construction material. This soil has good potential for woodland, but most areas are used for crops and pasture. The potential for intensive recreation is poor because of wetness.

This soil is in capability subclass IIIw and woodland suitability group 2w6.

23—Moreland silty clay loam. This somewhat poorly drained, level, loamy soil has a clayey subsoil. It formed in clayey sediments. It is on the lower parts of the natural levees of the Red River alluvial plain. Slopes are less than 1 percent. Tracts range from 10 to 200 acres.

Typically, the surface layer is dark reddish brown, mildly alkaline silty clay loam about 9 inches thick. The next layers, to a depth of about 60 inches, are dark reddish brown, mildly alkaline and moderately alkaline clay.

This soil has high fertility. Wetness causes poor aeration and restricts root development of many plants. Water and air move at a very slow rate through the soil. Water runs off the surface at a slow rate. The seasonal high water table fluctuates from a depth of 1.5 feet to the surface during December through April. The surface layer is wet for long periods in the winter and spring. This soil dries out more slowly than most of the adjoining soils that are at higher elevations. The subsoil has a very high shrink-swell potential. This soil cracks when dry. Plants may suffer from lack of water during dry periods in the summer and fall of some years.

Included with this soil in mapping are small areas of Moreland silt loam on slightly higher parts of the landscape and Moreland clay and Norwood soils in lower parts of the landscape. The included soils make up about 10 percent of this map unit.

Most of the acreage is in crops and pasture. A small acreage is used for woodland and homesites.

The potential for crops and pasture is good. Because it is level and has high fertility, this soil is favorable for growing cultivated crops. Its wetness, however, is a less favorable feature for this use. The main suitable crops are soybeans, cotton, rice, and grain sorghum. The main suitable pasture plants are common bermudagrass, tall fescue, improved bermudagrass, Pensacola bahiagrass, ryegrass, white clover, and southern wild winter peas (fig. 7).

This soil is somewhat difficult to keep in good tilth. It can be worked only within a narrow range of moisture content without becoming cloddy. Wetness may delay planting and harvesting crops. Land grading or smoothing improves surface drainage and increases the efficiency of farm equipment; however, the clayey subsoil will be exposed in places. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Most crops respond well to nitrogen fertilizer. Lime or other fertilizers generally are not needed.

The potential for urban use is poor. Wetness is a limitation for such uses as septic tank absorption fields, sanitary landfills, and homesites. High shrink-swell potential is a limitation for use as foundations or as construction material.

Figure 7.—Cattle grazing common bermudagrass on Moreland silty clay loam.

This soil has good potential for woodland, but most areas are used for crops and pasture. The potential for intensive recreation is poor because of wetness.

This soil is in capability subclass IIIw and woodland suitability group 2w6.

24—Moreland clay. This somewhat poorly drained, level, clayey soil is on the lower parts of the natural levees of the Red River alluvial plain. It formed in clayey sediments. Slopes are less than 1 percent. Tracts range from 50 to several hundred acres.

Typically, the surface layer is dark reddish brown, mildly alkaline clay about 13 inches thick. Between 13 inches and about 65 inches is dark reddish brown, moderately alkaline silty clay and clay that has gray mottles.

This soil has high fertility. Wetness causes poor aeration and restricts root development of many plants. Water and air move at a very slow rate through the soil. Water runs off the surface at a slow rate. The seasonal high water table fluctuates from a depth of 1.5 feet to the surface during December through April. The surface layer is wet for long periods in the winter and spring. This soil dries out more slowly than the adjoining soils that are at higher elevations. It has a very high shrink-swell potential. It cracks when dry and seals over when wet. Plants may suffer from lack of water during dry periods in the summer and fall of some years.

Included with this soil in mapping are areas of Armistead and Buxin soils that are also in lower parts of the landscape. The included soils make up about 10 percent of this map unit.

Most of the acreage is in crops and pasture. A small acreage is used for woodland and homesites.

The potential for crops and pasture is good. Because it is level and has high fertility, this soil is favorable for growing cultivated crops. Its wetness and clayey texture, however, are less favorable features for this use. The main suitable crops are soybeans, grain sorghum, oats, and rice (fig. 8). The main suitable pasture plants are

Figure 8.—Soybeans on Moreland clay.

common bermudagrass, tall fescue, improved bermudagrass, Pensacola bahiagrass, ryegrass, white clover, and southern wild winter peas.

This soil is sticky when wet, hard when dry, and difficult to keep in good tilth. It can be worked only within a narrow range of moisture content, and it is subject to becoming cloddy when worked (fig. 9). Wetness often delays the planting and harvesting of crops. Land grading or smoothing improves surface drainage and increases the efficiency of farm equipment. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Most crops, other than legumes, respond well to nitrogen fertilizer. Lime or other fertilizers generally are not needed.

The potential for urban use is poor. Wetness is a limitation for such uses as septic tank absorption fields, sanitary landfills, and homesites. High shrink-swell potential is a limitation for use as foundations or as construction materials.

This soil has good potential for woodland, but most areas are used for crops and pasture. The potential for intensive recreation is poor because of wetness and clayey surfaces.

This soil is in capability subclass IIIw and woodland suitability group 2w6.

25—Forbing silt loam, 3 to 8 percent slopes. This moderately well drained, gently sloping to moderately sloping, loamy soil has a clayey subsoil. It formed in clayey sediments. It is on side slopes along drainageways. Individual areas are adjacent to major lakes in the uplands and range from about 25 to 300 acres.

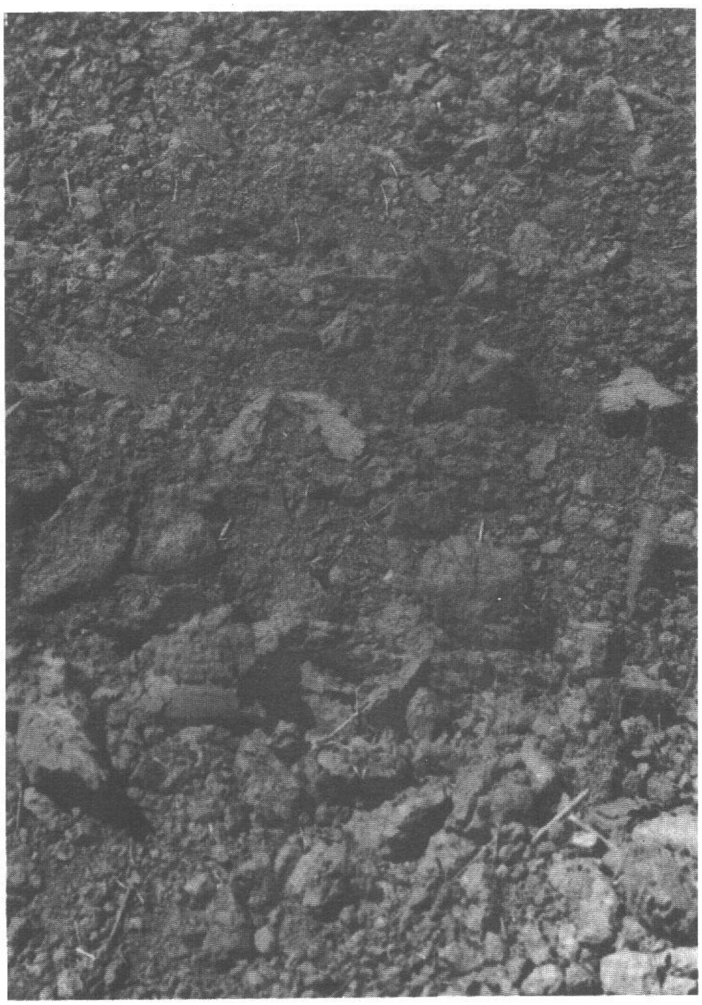


Figure 9.—Cloddy surface of Moreland clay. Tilth is difficult to maintain on this soil.

Typically, the surface layer is brown, slightly acid silt loam about 4 inches thick. The subsoil, to a depth of about 24 inches, is yellowish red, medium acid to neutral clay. Between 24 and 60 inches, the subsoil is yellowish red, moderately alkaline clay.

This soil is low in fertility. Water and air move at a very slow rate through the soil. Water runs off the surface at a medium to rapid rate. The seasonal high water table is at a depth of greater than 6 feet. The subsoil has a very high shrink-swell potential. Plants generally suffer from lack of water during dry periods in summer and fall of most years.

Included with this soil in mapping are a few small areas of Gore soils and small areas of Forbing soils that are severely eroded. Also included are small areas of Forbing soils that have slopes of greater than 8 percent. The included soils make up about 10 percent of the mapped areas.

Most of the acreage is in woodland. A small acreage is used for homesites and pasture.

The potential for crops is poor, and the potential for pasture is good. This soil is better suited to close-grown crops than to row crops. The hazard of erosion is the main problem. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, and southern wild winter peas. Lime and fertilizers are generally needed.

The potential for urban use is poor. Very slow permeability is a limitation for septic tank absorption fields. The clayey texture of the subsoil is a limitation for sanitary landfills and shallow excavations. Very high shrink-swell potential is a limitation for use as foundations or as construction material.

The potential for woodland is fair. The use of equipment is limited because of low traffic-supporting capacity. The potential for intensive recreation is fair. The hazard of erosion and the soil's poor support for vehicular traffic during wet seasons are the main limitations.

This soil is in capability subclass IVe and woodland suitability group 3c2.

26—Darden loamy fine sand, 1 to 5 percent slopes. This well drained to somewhat excessively drained, gently sloping, sandy soil is on terraces adjacent to drainageways in the uplands. It formed in sandy sediments. Slope is dominantly less than 3 percent but ranges to 5 percent. Tracts range from about 10 acres to over 100 acres.

Typically, the surface layer is very dark grayish brown, medium acid loamy fine sand about 8 inches thick. The next layers, to a depth of about 66 inches, are loamy fine sand. Reaction is medium acid to very strongly acid. The lower part is mottled in shades of brown.

This soil has low fertility. Water and air move at a rapid rate through the soil. Water runs off the surface at a slow rate. This soil dries out quickly after rains. The seasonal high water table is at a depth of greater than 6 feet. Adequate water is not available to plants in the summer and fall of most years. Traction for equipment is poor when the soil is dry because of loose sand.

Included with this soil in mapping are a few small areas of Bernaldo soils that contain less sand and more clay than Darden soils. These soils make up about 10 percent of the map unit.

Most of the acreage is in woodland. A small acreage is in pasture.

The potential for crops is poor. The potential for pasture is fair. Low fertility, droughtiness, limited choice of plants, and the soil's poor traction for equipment are the main limitations for this use. The main suitable crops are watermelons and peanuts. The main suitable pasture plants are Pensacola bahiagrass, coastal bermudagrass, and vetch.

This soil is friable and somewhat easy to keep in good tilth; however, plant seedling mortality is high because of droughtiness. This soil can be worked over a wide range in moisture content. Proper management of crop residues helps maintain organic matter content, improve tilth, and reduce soil loss by erosion. Contour cultivation helps to control erosion. The response to fertilizers is generally poor for most crops. Lime is generally needed.

The potential for urban use is good; however, cutbanks in shallow excavations are subject to caving, and seepage is a problem where this soil is used for sewage lagoons or sanitary landfills. The potential for pine woodland is fair. High seedling mortality because of droughtiness is the main limitation. The potential for intensive recreation areas is fair; however, the sandy surface becomes loose when dry and furnishes poor traction.

This soil is in capability subclass IIIs and woodland suitability group 3s3.

27—Norwood silt loam. This well drained, level, loamy soil is on natural levees of the Red River alluvial plain. It formed in loamy sediments. Slopes range from 0 to 1 percent. Tracts range from 15 to 150 acres.

Typically, the surface layer is reddish brown, moderately alkaline silt loam about 10 inches thick. The next layers, to a depth of about 65 inches, are reddish brown, moderately alkaline silt loam and silty clay loam.

This soil has high fertility. Water runs off the surface at a slow rate. Water and air move at a moderate rate through the soil. The soil dries somewhat quickly after heavy rains. The seasonal high water table is commonly at a depth of greater than 6 feet, but in places it fluctuates from a depth of 4 feet to greater than 6 feet during December through April. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of Norwood silty clay loam and Severn soils. The included soils make up about 10 percent of this map unit.

Most of the acreage is in crops. A small acreage is used for pasture and homesites.

The potential for crops and pasture is excellent. Because it is level and has high fertility, this soil is one of the best in the parish for growing cultivated crops. The main suitable crops are cotton, soybeans, corn, oats, and grain sorghum (fig. 10). The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, dallisgrass, tall fescue, white clover, and southern wild winter peas.

This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture content. Traffic pans develop under continuous cultivation, but these can be broken easily by deep plowing or chiseling. Land smoothing improves surface drainage and increases the efficiency of farm equipment. Proper row direction also improves surface drainage. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Most crops, other than legumes, respond well to nitrogen fertilizer. Lime and other fertilizers generally are not needed.

The potential for urban use and woodland is good, but most areas are used for crops and pasture. The potential for intensive recreation also is good.

This soil is in capability class I and woodland suitability group 2o4.

28—Sacul fine sandy loam, 1 to 5 percent slopes. This moderately well drained, gently sloping, loamy soil has a clayey subsoil. The soil formed in loamy and clayey sediments. It is on convex ridgetops in the uplands. Individual areas of this soil range from 20 to 500 acres.

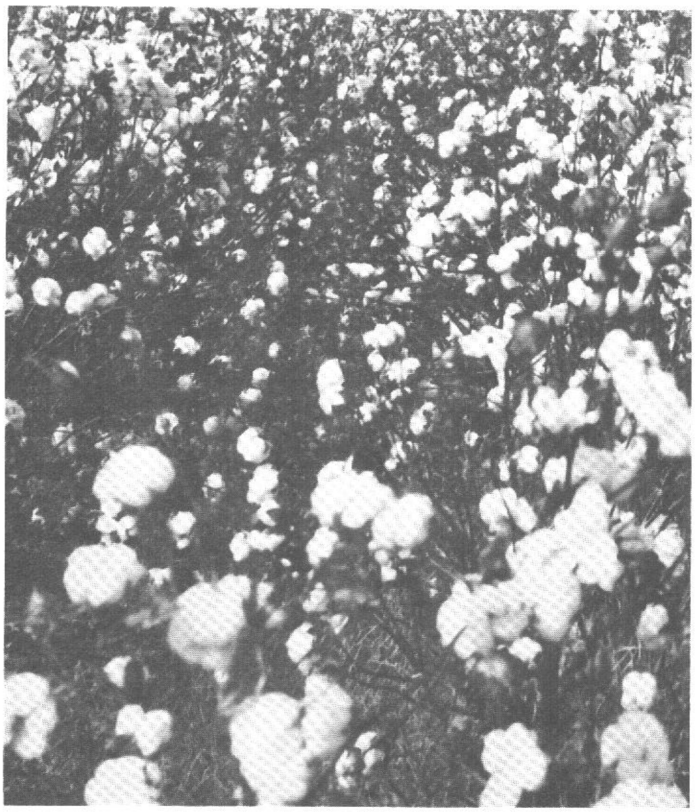


Figure 10.—Mature cotton on Norwood silt loam.

Typically, the surface layer is dark grayish brown, strongly acid fine sandy loam about 4 inches thick. The subsurface layer, to a depth of about 13 inches, is pale brown, strongly acid fine sandy loam. The subsoil is red, strongly acid clay to a depth of about 24 inches. The next layer, to a depth of about 42 inches, is red, very strongly acid sandy clay and clay loam mottled in shades of brown and gray. The underlying material is mottled red, gray, and strong brown, very strongly acid sandy clay loam. Ironstone fragments are present in varying amounts throughout the soil.

This soil has low fertility. Water and air move at a moderately slow rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table is at a depth of greater than 6 feet. Plants suffer from lack of water during dry periods in summer and fall of most years.

Included with this soil in mapping are a few small areas of Bowie and Ruston soils at slightly higher elevations. Both of these soils contain less clay in the subsoil. The included soils make up about 15 percent of this map unit.

Most of the acreage is in woodland and pasture. A small acreage is used for homesites.

The potential for crops is fair, and the potential for pasture is good. The hazard of erosion is an unfavorable feature when this soil is used for cultivated crops. The main suitable crops are cotton, soybeans, and corn. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, and crimson clover.

This soil is friable and easy to keep in good tilth. It dries quickly after rains and can be worked over a wide range of moisture conditions. Conservation practices, such as proper management of crop residues, stripcropping, contour farming, and terracing help reduce soil loss by erosion. Most crops and pasture plants respond well to fertilizers. Lime is generally needed.

The potential for urban use is fair. Slow permeability is a limitation if this soil is used for septic tank absorption fields. The potential for woodland is good. There are no significant limitations for this use. The potential for intensive recreation is good; however, slope is a limitation for playgrounds.

This soil is in capability subclass IIIe and woodland suitability group 3c2.

29—Norwood silty clay loam. This well drained, nearly level, loamy soil is on the lower parts of the natural levees of the Red River alluvial plain. It formed in loamy sediments. Slopes range from 0 to 1 percent. Tracts range from 15 to 100 acres.

Typically, the surface layer is reddish brown, moderately alkaline silty clay loam about 10 inches thick. The next layers, to a depth of about 60 inches, are reddish brown, moderately alkaline silt loam, silty clay loam, and very fine sandy loam.

This soil has high fertility. Water runs off the surface at a slow rate. Water and air move at a moderate rate through the soil. This soil dries out more slowly than most of the adjoining soils that are at higher elevations. The seasonal high water table is commonly at a depth of greater than 6 feet, but in places it fluctuates from a depth of 4 feet to greater than 6 feet during December through April. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of Norwood silt loam and the Severn soils. The Severn soils are at slightly higher elevations than both Norwood soils. The included soils make up about 10 percent of this map unit.

Most of the acreage is in crops. A small acreage is used for pasture and homesites.

The potential for crops and pasture is excellent. Because this soil is level and has high fertility, it is among the best soils in the parish for growing cultivated crops. The main suitable crops are cotton, soybeans, corn, oats, and grain sorghum. Vegetable crops are successfully grown in places (fig. 11). The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, white clover, ryegrass, dallisgrass, tall fescue, and southern wild winter peas.

This soil is somewhat difficult to keep in good tilth. A surface drainage system is generally needed. Land smoothing improves surface drainage and increases the efficiency of farm equipment. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Most crops, other than legumes, respond well to nitrogen fertilizer. Lime and other fertilizers generally are not needed.

The potential for urban use is good. This soil has good potential for woodland, but most areas are used for crops and pasture. The potential for intensive recreation is fair because the surface is clayey.

Figure 11.—Truck crop of cabbage on Norwood silty clay loam.

This soil is in capability subclass IIw and woodland suitability group 2o4.

30—Sacul fine sandy loam, 5 to 15 percent slopes. This moderately well drained, moderately sloping to strongly sloping, loamy soil has a clayey subsoil. It formed in loamy and clayey sediments. It is on side slopes bordering drainageways in the uplands. Areas of this soil range from 15 to 150 acres.

Typically, the surface layer is dark brown, medium acid fine sandy loam about 5 inches thick. The subsurface layer, to a depth of about 15 inches, is pale brown, strongly acid fine sandy loam. The subsoil, to a depth of about 27 inches, is red, strongly acid clay. The underlying material, to a depth of about 60 inches, is very strongly acid clay loam mottled in shades of red, brown, and gray. Ironstone fragments are present in varying amounts throughout the soil.

This soil has low fertility. Water runs off the surface at a medium to rapid rate. Water and air move at a moderately slow rate through the soil. The soil dries quickly after rains. The seasonal high water table is at a depth of greater than 6 feet. Plants suffer from lack of water during dry periods in summer and fall of most years.

Included with this soil in mapping are a few small areas of Bowie and Ruston soils on ridgetops. Also included are small areas of Sacul and Smithdale soils on slopes that are greater than 15 percent. The included soils make up about 15 percent of this map unit.

Most of the acreage is in woodland or pasture.

The potential for crops is very poor, and the potential for pasture is fair. The hazard of erosion is too great for growing most cultivated crops. Erosion is also a hazard during the establishment of pastures. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, and crimson clover. Pasture plants respond well to fertilizers. Lime is generally needed.

The potential for intensive recreation is fair; however, slope is a severe limitation for playgrounds. The potential for urban use is poor. Slope is a limitation for most uses. The slow permeability is a limitation when the soil is used for septic tank absorption fields. The potential for woodland is good. There is no significant limitation for this use.

This soil is in capability subclass VIe and woodland suitability group 3c2.

31—Ruston fine sandy loam, 1 to 5 percent slopes. This well drained, gently sloping, loamy soil is on ridgetops in the uplands. This soil formed in loamy sediments. Individual areas range from about 10 to 150 acres.

Typically, the surface layer is yellowish brown, medium acid fine sandy loam about 12 inches thick. The subsoil, to a depth of about 58 inches, is red, strongly acid sandy clay loam. Below this, to a depth of about 85 inches, is red, strongly acid sandy loam and sandy clay loam and streaks and pockets of light yellowish brown fine sandy loam.

This soil is low in fertility. Water and air move at a moderate rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table is at a depth of greater than 6 feet. Crops and pasture plants suffer from lack of water during dry periods in summer and fall of most years.

Included with this soil in mapping are a few small areas of Bowie fine sandy loam at slightly lower elevations and Smithdale soils on the side slopes. The included soils make up about 15 percent of this map unit.

Most of the acreage is in woodland. A small acreage is used for pasture, crops, and homesites.

The potential for crops and pasture is good. This soil is easily eroded where vegetative cover is thin. The main suitable crops are cotton, corn, and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, and crimson clover.

This soil is friable and easy to keep in good tilth. It dries quickly after rains and can be worked over a wide range in moisture content. Conservation practices, such as proper management of crop residues, stripcropping, contour farming, and terraces, help reduce soil loss by erosion. Most crops and pasture plants respond well to fertilizers. Lime is generally needed.

The potential for urban use and woodland is good. There are few significant limitations for these uses. The potential for intensive recreation is good; however, slope is a moderate limitation for playgrounds.

This soil is in capability subclass IIIe and woodland suitability group 3o1.

32—Smithdale fine sandy loam, 12 to 20 percent slopes. This well drained, strongly sloping and moderately steep, loamy soil is on side slopes in the uplands. It formed in loamy sediments. Individual areas range from about 10 to 150 acres.

Typically, the surface layer is dark grayish brown, strongly acid fine sandy loam about 4 inches thick. The subsurface layer, to a depth of about 11 inches, is dark brown, strongly acid fine sandy loam. The subsoil, to a depth of about 39 inches, is red, strongly acid sandy clay loam. Below this, to a depth of about 63 inches, is red, strongly acid sandy loam.

This soil has low fertility. Water and air move at a moderate rate through the soil. Water runs off the surface at a rapid rate. The seasonal high water table is at a depth of greater than 6 feet. Crops and pasture plants suffer from lack of water during dry periods in summer and fall in most years.

Included with this soil in mapping are a few small areas of Bowie, Briley, and Ruston soils on ridgetops and Sacul soils on side slopes. Also included are areas of Smithdale soils that have slopes that range up to 30 percent. The included soils make up about 15 percent of this map unit.

Most of the acreage is in pasture and woodland. A small acreage is used for homesites.

The potential for crops is very poor, and the potential of pasture is fair. Hazard of erosion is too severe for cultivated crops. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, and crimson clover. The response to fertilizers is good. Lime is generally needed.

The potential for urban use is poor. Slope is a limitation for most uses. The potential for woodland is good. The steep slopes are moderate limitations for equipment usage. The potential for intensive recreation is poor because of slope.

This soil is in capability subclass VIe and woodland suitability group 3o1.

33—Severn very fine sandy loam. This well drained, nearly level, loamy soil is on the natural levees of the Red River alluvial plain. It formed in loamy sediments. Slopes are mainly less than 1 percent. Areas of the soil range from 25 to 200 acres.

Typically, the surface layer is reddish brown, moderately alkaline, very fine sandy loam about 10 inches thick. Below this, to a depth of about 60 inches, are moderately alkaline strata of reddish brown very fine sandy loam, loamy very fine sand, and silt loam.

This soil has high fertility. Water runs off the surface at a slow rate. Water and air move at a moderately rapid rate through the soil. The soil dries quickly after heavy rains. The seasonal high water table is at a depth of greater than 6 feet. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of Norwood soils. The included soils make up about 10 percent of this map unit.

Most of the acreage is in crops and pasture. A small acreage is used for homesites.

The potential for crops and pasture is good. Because it is level and has high fertility, this soil is very well suited to growing cultivated crops. The main suitable crops are cotton, soybeans, corn, oats, and wheat. The main suitable pasture plants are common bermudagrass, improved bermudagrass, ryegrass, dallisgrass, tall fescue, Pensacola bahiagrass, white clover, and southern wild winter peas.

This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture content. Traffic pans may develop under continuous cultivation, but these can be broken easily by deep plowing or chiseling. Land smoothing improves surface drainage and increases the efficiency of farm equipment. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Most crops, other than legumes, respond well to nitrogen fertilizer. Lime and other fertilizers generally are not needed.

The potential for urban use is good; however, the possibility of seepage is a limitation where this soil is used for sewage lagoons and sanitary landfills.

This soil has good potential for woodland, but most areas are used for crops and pasture. The potential for intensive recreation is good.

This soil is in capability class I and woodland suitability group 2o4.

34—Severn very fine sandy loam, gently undulating. This well drained, gently undulating, loamy soil is on low, parallel ridges and in swales on natural levees of the Red River alluvial plain. The ridges are 2 to 4 feet high and seldom exceed 200 feet in width. Slopes range from 0 to 3 percent. Tracts range from 25 to 200 acres.

Typically, the surface layer is dark brown, mildly alkaline very fine sandy loam about 7 inches thick. Below this, to a depth of about 60 inches, is reddish brown, moderately alkaline very fine sandy loam stratified with thin layers of loamy very fine sand.

This soil is high in fertility. Water runs off the surface at a medium rate on the ridges and at a slow rate in the swales. Water and air move at a moderately rapid rate through the soil. It dries quickly after heavy rains. The seasonal high water table is at a depth of greater than 6 feet. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of Armistead, Moreland, and Norwood soils. Also included are soils on narrow ridges where slopes range up to 5 percent. The included soils make up about 10 percent of this map unit.

Most of the acreage is in crops and pasture. A small acreage is used for homesites.

The potential for crops and pasture is excellent, but the low ridges and swales interfere somewhat with tillage. The main suitable crops are cotton, soybeans, corn, oats, and wheat. The main suitable pasture plants are common bermudagrass, improved bermudagrass, ryegrass, dallisgrass, tall fescue, Pensacola bahiagrass, white clover, and southern wild winter peas.

This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture conditions. Traffic pans develop under continuous cultivation, but these can be broken easily by deep plowing or chiseling. Land smoothing or leveling improves surface drainage and increases the efficiency of farm equipment, but a large amount of soil generally has to be moved (fig. 12). Proper row direction helps control runoff and reduce soil loss by erosion. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Most crops, other than legumes, respond well to nitrogen fertilizer. Lime and other fertilizers generally are not needed.

The potential for urban use is good, but the possibility of seepage is a limitation where this soil is used for sewage lagoons and sanitary landfills.

This soil has good potential for woodland, but most areas are used for crops and pasture. The potential for intensive recreation is good.

This soil is in capability subclass IIe and woodland suitability group 2o4.

35—Severn very fine sandy loam, occasionally flooded. This well drained, gently undulating, loamy soil is on low, parallel ridges and in swales on natural levees of the Red River alluvial plain. It formed in loamy sediments. The ridges are 2 to 4 feet high and seldom exceed 200 feet in width. Slopes range from 0 to 3 percent. This soil is on the unprotected side of the levee system and is subject to flooding by the Red River. Individual areas range from 15 to 700 acres.

Typically, the surface layer is dark brown and reddish brown, moderately alkaline very fine sandy loam about 6 inches thick. Below this, to a depth of about 60 inches, are moderately alkaline strata of reddish brown very fine sandy loam and loamy very fine sand.

This soil has high fertility. Water runs off the surface at a moderate rate on the ridges and at a slow rate in the swales. Water and air move at a moderately rapid rate through the soil. Water dries quickly after heavy rains. Most of the acreage is occasionally flooded and subject to scouring and deposition. This soil is flooded for brief periods during December through June at intervals of several years. The swiftly flowing floodwaters may exceed a depth of 5 feet. The seasonal high water table is at a depth of greater than 6 feet, but in places it fluctuates from a depth of 3 feet to greater than 6 feet. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of Armistead, Moreland, and Norwood soils. Also

Figure 12.—Land smoothing on Severn very fine sandy loam, gently undulating.

included are narrow ridges where slopes range up to 5 percent. The included soils make up about 10 percent of this map unit.

Most of the acreage is in pasture. A small acreage is in crops and woodland.

The potential for crops is fair, and the potential for pasture is good. The hazards of occasional flooding, scouring, and deposition are the chief limitations. The main suitable crops are soybeans and grain sorghum. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, and white clover.

This soil is friable and easy to keep in good tilth. It can be worked over a wide range of moisture content. Traffic pans may develop under continuous cultivation, but these can be broken easily by deep plowing or chiseling. Land smoothing improves surface drainage and increases the efficiency of farm equipment. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Most crops, other than legumes, respond well to nitrogen fertilizer. Lime and other fertilizers generally are not needed.

The potential for urban use is poor. Flooding is the main limitation. The potential for woodland is good. The potential for intensive recreation is very poor because of flooding.

This soil is in capability subclass IIw and woodland suitability group 2o4.

36—Severn very fine sandy loam, frequently flooded. This well drained, gently undulating, loamy soil is subject to frequent flooding, scouring, and deposition. It is low-lying, loamy sediments recently deposited between the Red River and the protective levee. Slopes range from 0 to 3 percent. Areas of this soil range from 50 to 500 acres.

Typically, the surface layer is reddish brown, mildly alkaline very fine sandy loam about 5 inches thick. Below this, to a depth of about 63 inches, are strata of yellowish red and reddish brown, moderately alkaline very fine sandy loam.

This soil has high fertility. Most of the acreage is frequently flooded and subject to scouring and deposition. It is flooded one or more times each year for brief periods during December through June. The swiftly flowing floodwaters may exceed a depth of 10 feet at the lower elevations. The seasonal high water table is at a depth of greater than 6 feet, but in places it fluctuates from a depth of 2 feet to greater than 6 feet. Adequate water is available to plants in most years.

Included with this soil in mapping are a few small areas of soils similar to the Severn soils, except they are coarser textured. The included soils make up about 15 percent of this map unit.

Most of the acreage is in pasture. A small acreage is in woodland.

The potential for crops is very poor, and the potential for pasture is poor. Frequent flooding, scouring, and deposition are the chief limitations for this use. Flooding is too severe for most crops. A suitable pasture plant is common bermudagrass.

The potential for urban use is very poor. Flooding is the main limitation. The potential for woodland is good. The potential for intensive recreation is very poor because of flooding.

This soil is in capability subclass Vw and woodland suitability group 2o4.

37—Metcalf-Messer complex. This complex consists of somewhat poorly drained Metcalf soils and moderately well drained Messer soils. Both of these soils formed in loamy and clayey sediments. The landscape consists of broad flats and mounds that are from 2 to 4 feet high and 50 to 150 feet in diameter. The Messer soils are on the mounds. The Metcalf soils are in areas between mounds. Slopes range from 0 to 2 percent in the areas between the mounds and up to 5 percent on the mounds. Metcalf soils make up about 55 percent of each mapped area, and Messer soils make up about 30 percent. The small areas of the Metcalf and Messer soils are so intermingled that they cannot be mapped separately at the scale used.

Typically, the Metcalf soil has a surface layer of very strongly acid silt loam about 3 inches thick. The subsurface layer, to a depth of about 8 inches, is light yellowish brown, very strongly acid silt loam. The subsoil, to a depth of 38 inches, is yellowish brown, very strongly acid loam mottled in shades of red, brown, and yellow. Below this, to a depth of 65 inches, is gray, very strongly acid clay and silty clay with red and brown mottles.

Metcalf soils have low fertility. Water and air move at a very slow rate through the soil. Water runs off the surface at a slow rate. The seasonal high water table is perched within 1.5 to 2.5 feet of the surface during December through April. The surface layer is wet for long periods in the winter and spring. This soil dries out more slowly than most of the adjoining soils that are at higher elevations. Plants generally suffer from lack of water during dry periods in summer and fall of most years.

Typically, the Messer soils have a surface layer of brown, medium acid very fine sandy loam about 7 inches thick. The subsoil, to a depth of 28 inches, is yellowish brown, strongly acid very fine sandy loam. The next layer, to a depth of 53 inches, is yellowish brown, strongly acid loam that has red mottles. Below this, to a depth of 62 inches, is gray, strongly acid clay loam mottled in shades of red and brown.

Messer soils have low fertility. Water and air move at a slow rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table fluctuates from a depth of 2 to 4 feet during December through March. Plants generally suffer from lack of water during dry periods in summer and fall of most years.

Included with these soils in mapping are a few small areas of the moderately well drained Bowie and Keithville soils on convex ridges and the poorly drained Wrightsville soils at lower elevations. The included soils make up about 15 percent of the map unit.

Most of the acreage is in pasture or woodland. A small acreage is used for homesites.

The potential for crops and pasture is fair. The numerous mounds interfere with tillage. The main suitable crops are soybeans, grain sorghum, and cotton. The main suitable pasture plants are common bermudagrass, Pensacola bahiagrass, and southern wild winter peas.

Both soils in this map unit are friable and easy to keep in good tilth. Wetness can delay planting and harvesting in some years. Land grading and smoothing improve surface drainage and increase the efficiency of farm equipment; however, in some places a large amount of soil will have to be moved. Proper management of crop residues helps maintain organic content, improve tilth, and reduce soil loss by erosion. Crop response to fertilizer is good. Lime is generally needed.

The potential for urban use is poor. Wetness is the main limitation for such uses as septic tank absorption fields, homesites, and sanitary landfills. The high shrink-swell potential of the Metcalf soil is a limitation if it is used for foundations or as construction material.

The potential for woodland is good. Wetness may restrict use of equipment in the winter and spring. The potential for intensive recreation is fair because of wetness.

These soils are in capability subclass IIIw and woodland suitability group 2w8.

38—Guyton-Messer complex. This complex consists of poorly drained Guyton soils and moderately well drained Messer soils. These soils are on broad flats throughout the uplands. The Guyton soils are level. The Messer soils are on circular mounds that range from 50 to 200 feet in diameter and from 2 to 4 feet in height. Slopes range from 0 to 1 percent between mounds but are as much as 5 percent on the mounds. Individual areas of this unit range from 10 to 300 acres and contain about 55 percent Guyton soils and about 30 percent Messer soils. Areas of the Guyton and Messer soils are so intermingled that they could not be separated at the scale selected for mapping.

Typically, the Guyton soil has a surface layer of light brownish gray, very strongly acid silt loam about 26 inches thick. The subsoil, to a depth of about 65 inches, is grayish brown, very strongly acid silty clay loam that has yellowish brown mottles.

The Guyton soil is low in fertility. Wetness causes poor aeration and restricts root development of many plants. Water and air move at a slow rate through the soil. Water runs off the surface at a slow rate. The seasonal high water table fluctuates from a depth of 1.5 feet to the surface during December through April. The soil is wet for long periods in winter and spring; however, crops and pasture plants may suffer from lack of water during dry periods in summer and fall.

Typically, the Messer soil has a surface layer of brown, strongly acid very fine sandy loam about 9 inches thick. The subsoil, to a depth of about 30 inches, is yellowish brown, strongly acid very fine sandy loam. The next layer is yellowish brown, strongly acid loam. Below this, to a depth of about 65 inches, is gray, strongly acid loam.

The Messer soil has low fertility. Water and air move at a slow rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table fluctuates from a depth of 2 to 4 feet during December through March. Plants may suffer from lack of moisture during dry periods in summer and fall.

Included with these soils in mapping are a few small areas of the well drained Bernaldo soils at higher elevations. The poorly drained Bonn and Wrightsville soils and the Guyton and Messer soils are at similar elevations. The included soils make up about 15 percent of the areas mapped.

Most of the acreage is in woodland. A small acreage is in pasture.

The potential is poor for crops and fair for pasture. The numerous mounds and wetness in the areas between the mounds interfere with tillage. The main suitable crops are corn and soybeans. The main suitable pasture plants are common bermudagrass, Pensacola bahiagrass, tall fescue, ryegrass, and southern wild winter peas.

Both soils in this map unit are friable, but they are somewhat difficult to keep in good tilth because of surface crusting. Wetness may delay planting and harvesting crops. A drainage system is needed for crops and pasture. Land grading and smoothing improve surface drainage; however, in places a large amount of soil will have to be moved. Proper management of crop residues helps maintain organic content, improve tilth, and reduce surface crusting and soil loss by erosion. Most crops and pasture plants respond well to fertilizers. Lime is generally needed.

The potential for urban use is poor. Wetness is the main limitation for most urban uses. The Messer soils, which are on the mounds, have a better potential for most urban uses than the Guyton soils, but individual areas are generally very small.

This map unit has good potential for woodland; however, wetness may restrict use of equipment in the winter and spring. The potential for intensive recreation is poor because of wetness.

These soils are in capability subclass IIIw. The Guyton soil is in woodland suitability group 2w9, and the Messer soil is in woodland suitability group 2w8.

39—Wrightsville-Messer complex. This complex consists of poorly drained Wrightsville soils and moderately well drained Messer soils adjacent to the major lakes in the uplands. The soils formed in loamy and clayey alluvium. The landscape consists of broad flats and low mounds that are from 2 to 4 feet in height and 50 to 150 feet in diameter. The Messer soil is on the mounds, and the Wrightsville soil is between mounds. Slopes range from 1 percent in the areas between mounds to 5 percent on the mounds. Areas of this complex range from 10 to 200 acres. The Wrightsville soils make up about 60 percent of each mapped area, and the Messer soils make up 30 percent. Areas of the Wrightsville and Messer soils are so intermingled that they could not be separated at the scale selected for mapping.

Typically, the Wrightsville soil has a surface layer of very dark grayish brown, strongly acid silt loam about 4 inches thick. The subsurface layer, to a depth of about 15 inches, is light brownish gray, strongly acid silt loam. The subsoil, to a depth of about 38 inches, is light brownish gray, very strongly acid silty clay loam and silty clay mottled in shades of brown. The next layer, to a depth of about 53 inches, is light brownish gray, very strongly acid silty clay. Below this, to a depth of about 64 inches, is grayish brown, very strongly acid silty clay loam.

The Wrightsville soils have low fertility. Wetness causes poor aeration and restricts root development of many plants. Water and air move at a very slow rate through the soil. Water runs off the surface at a slow rate. The seasonal high water table fluctuates from a depth of 1.5 feet to the surface during December through April. The surface layer is wet for long periods in winter and spring. This soil dries out more slowly than most of the adjoining soils that are at higher elevations. Crops and pasture plants may suffer from lack of moisture during dry periods in summer and fall of most years.

Typically, the Messer soils have a surface layer of brown, medium acid very fine sandy loam about 6 inches thick. The subsoil, to a depth of about 34 inches, is yellowish brown, strongly acid very fine sandy loam. The next layer, to a depth of about 54 inches, is yellowish brown, strongly acid loam. Below this, to a depth of about 62 inches, is gray, strongly acid clay loam mottled in shades of brown and red.

The Messer soils have low fertility. Water and air move at a slow rate through the soil. Water runs off the surface at a moderate rate. The seasonal high water table fluctuates from a depth of 2 to 4 feet during December through March. Plants generally suffer from lack of water during dry periods in summer and fall of most years.

Included with these soils in mapping are a few small areas of Gore and Metcalf soils at slightly higher elevations and Guyton soils along drainageways. The included soils make up about 10 percent of the map unit.

Most of the acreage is in woodland. A small acreage is used for pasture and homesites.

The potential of this map unit for crops and pasture is fair. Wetness and the numerous low mounds, which interfere with tillage, are unfavorable features for these uses. The main suitable pasture plants are common bermudagrass, Pensacola bahiagrass, and southern wild winter peas.

Both soils in this map unit are friable and easy to keep in good tilth, but surface crusting is a problem. Wetness can delay planting and harvesting dates in some years. A drainage system is needed for crops and pasture. Land grading and smoothing improve surface drainage and increase the efficiency of farm equipment, but in places a large amount of soil will have to be moved. Proper management of crop residues helps maintain organic content and helps reduce surface crusting and soil loss by erosion. Crop response to fertilizers is fair. Lime is generally needed.

The potential for urban use is poor. Wetness is the main limitation for most uses. High shrink-swell potential in the Wrightsville soil is a limitation if it is used for foundations or as construction material.

The potential for woodland is fair. Wetness may restrict use of heavy equipment in the winter and spring. The potential for intensive recreation is poor because of wetness.

This soil is in capability subclass IIIw. Wrightsville soil is in woodland suitability group 4w9, and Messer soil is in woodland suitability group 2w8.

40—Bowie fine sandy loam, 1 to 5 percent slopes. This moderately well drained, gently sloping, loamy soil is on convex ridgetops throughout most of the uplands of the parish. It formed in loamy sediments. Tracts range from about 20 to 200 acres.

Typically, the surface layer is grayish brown, medium acid fine sandy loam about 8 inches thick. The subsurface layer, to a depth of about 14 inches, is light yellowish brown, medium acid fine sandy loam. The subsoil, to a depth of about 60 inches, is yellowish brown and strong brown, strongly acid sandy clay loam that has red and brown mottles.

This soil has low fertility. Water and air move at a moderately slow rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table is at a depth of greater than 6 feet from the surface. Crops and pasture plants suffer from lack of moisture during dry periods in summer and fall in most years.

Included with this soil in mapping are a few small areas of Beauregard and Metcalf soils at slightly lower elevations than the Bowie soil and Ruston soils at slightly higher elevations. Beauregard soils contain more clay in the subsoil and Metcalf soils contain less sand than the Bowie soils. The included soils make up about 15 percent of the mapped areas.

Most of the acreage is in pasture or woodland. A small acreage is used for homesites.

The potential for crops and pasture is good; however, areas without a vegetative cover erode easily. The main suitable crops are cotton, corn, and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, and crimson clover.

This soil is friable and easy to keep in good tilth. It can be cultivated over a wide range of moisture content.

Conservation practices, such as proper management of crop residues, stripcropping, contour farming, and terracing, help reduce soil loss by erosion. Most crops respond well to fertilizers. Lime is generally needed.

The potential for urban use is good. Low strength is a limitation for such uses as local roads and streets, but this can be overcome by strengthening or replacing the base material.

The potential for woodland is good. There are no significant limitations for producing and harvesting timber on this soil (fig. 13). The potential for intensive recreation is good; however, slope is a moderate limitation for playgrounds.

This soil is in capability subclass IIIe and woodland suitability group 3o1.

41—Meth fine sandy loam, 1 to 3 percent slopes. This well drained, very gently sloping, loamy soil has a clayey subsoil. It formed in clayey and loamy sediments. It is on ridgetops in the uplands. Slopes range from 1 to 3 percent. Tracts range from about 25 to 150 acres.

Typically, the surface layer is dark yellowish brown, strongly acid fine sandy loam about 7 inches thick. The subsurface layer, to a depth of about 12 inches, is brown, strongly acid fine sandy loam. The subsoil, to a depth of about 32 inches, is red, very strongly acid clay.

Figure 13.—Loblolly pine plantation on Bowie fine sandy loam, 1 to 5 percent slopes.

Below this, to a depth of about 62 inches, is red and yellowish red, very strongly acid sandy clay loam and sandy clay mottled in yellowish brown.

This soil has low fertility. Water and air move at a moderately slow rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table is at a depth of greater than 6 feet. Crops and pasture plants suffer from lack of water during dry periods in summer and fall in most years.

Included with this soil in mapping are a few small areas of moderately well drained Bowie and Woodtell soils on lower parts of the landscape and the well drained Ruston soils. The Ruston and Meth soils are on similar parts of the landscape. The included soils make up about 15 percent of this map unit.

Most of the acreage is woodland. A small acreage is used for pasture and homesites.

The potential for crops and pasture is good. This soil erodes easily where the vegetative cover is inadequate. The main suitable crops are cotton, corn, and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, and crimson clover.

This soil is friable and easy to keep in good tilth. It dries quickly after rains and can be worked over a wide range in moisture content. Conservation practices, such as proper management of crop residues, stripcropping, contour farming, and terracing, help to reduce soil loss by erosion. Most crops respond well to fertilizers. Lime is generally needed.

The potential for urban use is fair. Moderately slow permeability is a limitation if this soil is used for septic tank absorption fields. Shrink-swell potential is a limitation where this soil is used for foundations or as construction material. These limitations, however, can be overcome easily.

The potential for woodland is good. There are no significant limitations for this use. The potential for intensive recreation is good.

This soil is in capability subclass IIe and woodland suitability group 3o1.

42—Meth fine sandy loam, 3 to 8 percent slopes. This well drained, gently sloping to moderately sloping, loamy soil has a clayey subsoil. It formed in clayey and loamy sediments. It is on upper side slopes in the uplands. Slopes range from 3 to 8 percent. Tracts range from about 10 to 100 acres.

Typically, the surface layer is yellowish brown, strongly acid fine sandy loam about 5 inches thick. The subsurface layer, to a depth of about 10 inches, is brown, strongly acid fine sandy loam. The subsoil, to a depth of about 32 inches, is red, strongly acid sandy clay that has yellowish brown mottles. Below this, to a depth of about 70 inches, is red and yellowish red, strongly acid sandy clay loam.

This soil has low fertility. Water and air move at a moderately slow rate through the soil. Water runs off the surface at a medium rate. The seasonal high water table is at a depth of greater than 6 feet. Crops and pasture plants suffer from lack of water during dry periods in summer and fall in most years.

Included with this soil in mapping are a few small areas of well drained Ruston soils and poorly drained Woodtell soils. Ruston soils are at about the same or slightly higher elevations as those of the Meth soil. Woodtell soils are on lower side slopes. The included soils make up about 15 percent of this map unit.

Most of the acreage is in woodland. A small acreage is used for pasture and homesites.

The potential for crops is poor, and the potential for pasture is fair. Erosion is a problem where the vegetative cover is thin. The main suitable crops are cotton, corn, and soybeans. The main suitable pasture plants are common bermudagrass, improved bermudagrass, Pensacola bahiagrass, ryegrass, and crimson clover.

This soil is friable and easy to keep in good tilth. It can be worked over a wide range in moisture content. Conservation practices, such as proper management of crop residues, contour farming, stripcropping, and terracing, help to reduce soil loss by erosion. Most crops respond well to fertilizers. Lime is generally needed.

The potential for urban use is fair. Moderately slow permeability is a limitation if the soil is used for septic tank absorption fields. The soil is moderately limited by shrink-swell potential where it is used for foundations or as construction material. These limitations, however, can be overcome easily.

The potential for woodland is good. There are no significant limitations for this use. The potential for intensive recreation is fair because of slope.

This soil is in capability subclass IIIe and woodland suitability group 3o1.

43—Moreland-Urban land complex. This complex consists of level, somewhat poorly drained, clayey Moreland soils and Urban land. This complex is on the lower parts of the natural levees on the Red River alluvial plain. Tracts range from 50 acres to several hundred acres and contain about 55 percent Moreland soils and about 30 percent Urban land. Areas of Moreland soils and Urban land are so intricately mixed that it is not practical to separate them in mapping.

Typically, the Moreland soil has a surface layer of dark reddish brown, mildly alkaline silty clay about 14 inches thick. The subsoil, to a depth of about 43 inches, is dark reddish brown, moderately alkaline silty clay mottled with dark gray. Below this, to a depth of about 60 inches, are layers of dark brown and reddish brown, mildly alkaline silty clay loam.

Water and air move at a very slow rate through the Moreland soils. Water runs off the surface at a slow rate. This soil is high in fertility. The shrink-swell potential is very high.

The Urban land part of the unit is covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soils so that the identification is not feasible.

Included in mapping are small areas of Armistead, Norwood, and Severn soils at higher elevations. Also included are small areas of soils that have been disturbed by land shaping operations. The included soils make up about 15 percent of the mapped area.

Most areas of this map unit are artificially drained through sewer systems, gutters, subsurface drainage, and surface ditches. Areas of Moreland soil that are not drained have a water table that fluctuates from a depth of 1.5 feet to the surface during December through April.

The Moreland soil in this complex is mainly used for lawns, parks, open space, building sites, and gardens. This soil has poor potential for building sites. Wetness is a limitation for such uses as septic tank absorption fields and homesites. High shrink-swell potential and low strength are limitations if this soil is used for foundations or as construction material. The Moreland soil has good potential for lawn grasses, shade trees, ornamental trees, shrubs, and vines. It has good potential for vegetable gardens because of level slopes and high fertility; however, wetness and clayey texture are less favorable features for this use. Because of wetness and a clayey surface layer, the potential for recreational uses is poor. An onsite investigation is needed to determine the potentials and limitations of this complex for any proposed land use.

The Moreland soil is not assigned to interpretative groups.

44—Norwood-Urban land complex. This complex consists of nearly level, well drained Norwood soils and Urban land. It is on the natural levees on the Red River alluvial plain. Slopes are mainly less than 1 percent. Tracts range from 50 to 350 acres and contain about 50 percent Norwood soils and about 30 percent Urban land. Areas of Norwood soils and Urban land are in such an intricate pattern that it is not practical to separate them in mapping.

Typically, the surface layer of the Norwood soil is reddish brown, moderately alkaline silt loam about 8 inches thick. The next layers, to a depth of about 60 inches, are reddish brown, moderately alkaline silty clay loam, silt loam, and very fine sandy loam.

Water and air move at a moderate rate through the Norwood soil. Water runs off the surface at a slow rate. Adequate water is available to plants in most years. This soil is high in fertility. The shrink-swell potential is low.

The Urban land part of the unit is covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soil so that the identification is not feasible.

Included in mapping are small areas of Armistead soils, Moreland soils that are at lower elevations than Norwood soils, and Severn soils that are at higher elevations. Also included are small areas of soils that have been disturbed by land shaping operations. These included soils make up 20 percent of a mapped area.

The Norwood soil in this complex is mainly used for lawns, parks, open space, and gardens. This soil has good potential for building sites. The Norwood soil has good potential for vegetable gardens, lawn grasses, shade trees, ornamental trees, shrubs, and vines. The potential for recreation is good. Soil erosion generally is not a major problem on this soil, unless it is disturbed and left without a vegetative cover for a considerable period of time. An onsite investigation is needed to determine the potentials and limitations of this complex for any proposed land use.

The Norwood soil is not assigned to interpretative groups.

45—Woodtell-Urban land complex, 3 to 8 percent slopes. This complex consists of gently sloping to sloping, moderately well drained Woodtell soils and Urban land on side slopes bordering drainageways in the uplands. It is mostly within the city of Shreveport. Individual areas range from 30 to 300 acres and contain about 55 percent Woodtell soils and about 30 percent Urban land. Areas of Woodtell soils and Urban land are so intricately mixed that it is not practical to separate them in mapping.

Typically, Woodtell soils have a surface layer of dark grayish brown, medium acid fine sandy loam about 8 inches thick. The subsoil, to a depth of about 31 inches, is red silty clay mottled in shades of brown and gray. The next layer, to a depth of about 47 inches, is mottled gray, red, and yellowish brown clay. The underlying material, to a depth of about 65 inches, is stratified, light brownish gray sandy clay loam and sandy loam.

Water and air move at a very slow rate through the Woodtell soils. Erosion is a hazard where vegetative cover is thin. Fertility is low. The shrink-swell potential is high.

The Urban land part of the unit is covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soil so that the identification is not feasible.

Included in mapping are small areas of Bowie, Keithville, and Meth soils on higher parts of the landscape. These included soils make up to about 15 percent of the unit.

Woodtell soils in this complex are mainly used for lawns, parks, open space, and gardens. These soils have poor potential for building sites. Very slow permeability and the clayey texture are limitations if the soils are used for septic tank absorption fields and sanitary landfills. High shrink-swell potential is a limitation for use as foundations or as construction material. Woodtell soils have fair potential for vegetable gardens, lawn grasses, shade trees, ornamental trees, shrubs, and vines. They have moderate potential for recreational uses because of wetness and clayey textures. An onsite investigation is needed to determine the potentials and limitations of this complex for any proposed land use.

These soils are not assigned to interpretative groups.

46—Woodtell-Urban land complex, 8 to 20 percent slopes. This complex consists of strongly sloping to moderately steep, moderately well drained Woodtell soils and Urban land. These soils are on upland side slopes and are dissected by many drainageways. Individual areas range from 20 to 150 acres and contain about 55 percent Woodtell soils and about 30 percent Urban land. Areas of the Woodtell soil and Urban land are so intricately mixed that it is not practical to separate them in mapping.

Typically, Woodtell soils have a surface layer of dark grayish brown fine sandy loam about 5 inches thick. The subsoil, to a depth of about 34 inches, is yellowish red clay mottled in shades of brown and gray. The next layer, to a depth of about 49 inches, is light brownish gray clay that has red and brown mottles. The underlying material, to a depth of about 60 inches, is stratified, light brownish gray shaly clay mottled in shades of brown.

Water and air move at a very slow rate through Woodtell soils. Runoff is rapid. Fertility is low. The shrink-swell potential is high.

The Urban land part of the unit is covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soil so that the identification is not feasible.

Included in mapping are areas of Bowie, Ruston, and Meth soils at slightly higher elevations. These included soils make up to about 15 percent of the unit.

Woodtell soils are used mainly for lawns, parks, open space, and gardens. They have poor potential for building sites. Slope is a limitation for most uses. Very slow permeability, wetness, and the clayey texture of the subsoil are limitations if Woodtell soils are used for septic tank absorption fields and sanitary landfills. High shrink-swell potential is a limitation for use as foundations or as construction material. Woodtell soils have fair potential for lawn grasses, shade trees, ornamental trees, shrubs, and vines. They have poor potential for vegetable gardens because of steep slopes, low fertility, and erosion hazard. Potential is moderate for recreational uses because of slope, wetness, and clayey textures. An onsite investigation is needed to determine the potentials and limitations of this complex for any proposed land use.

These soils are not assigned to interpretative groups.

47—Urban land. This map unit consists of areas where more than 85 percent of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces. Examples are parking lots, shopping and business centers, and industrial parks in the cities of Shreveport and Vivian. These areas are on the uplands and on the Red River alluvial plain. They are nearly level to moderately sloping. The areas generally range from 20 acres to more than 160 acres.

Included in mapping are areas that are mostly miscellaneous, artificial fill. In some areas several feet of this fill has been placed over streams and flood plains. These areas are now almost totally covered with roads, buildings, and other structures. Also included are a few areas of sloping and strongly sloping soils.

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

Urban land is not assigned to interpretative groups.

48—Keithville-Urban land complex, 2 to 5 percent slopes. This complex consists of gently sloping, moderately well drained Keithville soils and Urban land on ridgetops in the uplands. Individual areas range from 50 acres to several hundred acres and contain about 45 percent Keithville soils and about 30 percent Urban land. Areas of the Keithville soils and Urban land are so intricately mixed that it is not practical to separate them in mapping.

Typically, the Keithville soils have a surface layer of very dark grayish brown and light yellowish brown very fine sandy loam about 9 inches thick. The subsoil, to a depth of about 30 inches, is yellowish red and strong brown loam. Below this, to a depth of about 70 inches, is light brownish gray silty clay mottled in shades of red, brown, and yellow.

The fertility of the Keithville soils is low. Water and air move at a very slow rate through the soil. Runoff is medium.

The Urban land part of the map unit is covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soils so that the identification is not feasible.

Included with these soils in mapping are moderately large areas of Metcalf, Woodtell, and Wrightsville soils. Also included are small areas of cuts and fills. The more poorly drained Metcalf and Wrightsville soils are at slightly lower elevations than the Keithville soils. The Woodtell soils are more sloping. These included soils make up about 25 percent of the unit.

The shrink-swell potential is low in the upper part of the subsoil and high in the lower part of the subsoil. The seasonal high water table fluctuates from a depth of 2 feet to 3 feet during December through April.

The Keithville soils are mainly used for lawns, parks, open space, and gardens. The potential for urban use is fair. Wetness and very slow permeability are limitations for such uses as septic tank absorption fields. High shrink-swell potential is a limitation for foundations or construction material. These soils have good potential for lawn grasses, shade trees, ornamental trees, shrubs, and vines. These soils have a fair potential for vegetable gardens. They have good potential for recreational areas. An onsite investigation is needed to determine the potentials and limitations of this complex and for any proposed land use.

The Keithville soils are not assigned to interpretative groups.

49—Forbing-Urban land complex, 2 to 8 percent slopes. This complex consists of gently sloping to moderately sloping, moderately well drained Forbing soils and Urban land. It is on ridgetops and upper side slopes in the uplands. Individual areas are adjacent to Wallace and Cross Lakes. They range from 25 to 200 acres and contain about 55 percent Forbing soils and about 30 percent Urban land. Areas of the Forbing soils and Urban land are so intricately mixed that it is not practical to separate them in mapping.

Typically, Forbing soils have a surface layer of brown silt loam about 3 inches thick. The subsoil, to a depth of about 34 inches, is yellowish red clay. Between depths of 34 and 60 inches, the subsoil is a yellowish red clay that contains concretions of calcium carbonate.

Water and air move at a very slow rate through the Forbing soils. Runoff is medium to rapid. The seasonal high water table is at a depth of greater than 6 feet. Fertility is low. The shrink-swell potential is very high.

The Urban land part of the unit is covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soils so that identification is not feasible.

Included in mapping are areas of Gore soils on ridgetops and areas of soils disturbed by construction activity. These soils contain more clay in the subsoil than that of Forbing soils. The included soils make up to about 15 percent of the map unit.

The Forbing soils are used for lawns, parks, open space, and gardens. These soils have poor potential for building sites. Very slow permeability is a limitation for septic tank absorption fields. The clayey texture is a limitation for sanitary landfills and shallow excavations. Low strength and high shrink-swell potential are limitations for use as road fill and for local roads and streets. High shrink-swell potential is a limitation for use as foundations or as construction material. The soils of this unit have good potential for lawn grasses, shade trees, ornamental trees, shrubs, and vines. These soils have fair potential for vegetable gardens. Moderate slopes and erosion hazard are the main problems. These soils have fair potential for recreational uses because of very slow permeability and clayey texture of the subsoil. An onsite investigation is needed to determine the potentials and limitations of this complex for any proposed land use.

The Forbing soils are not assigned to interpretative groups.

50—Guyton-Urban land complex. This complex consists of nearly level, poorly drained Guyton soils and Urban land on flood plains of minor streams in the uplands. Slopes range from 0 to 1 percent. Individual areas of this unit range from 10 to 100 acres and contain about 50 percent Guyton soils and about 30 percent Urban land. Areas of the Guyton soils and Urban land are so intricately mixed that it is not practical to separate them in mapping.

Typically areas of this unit range from 10 to 100 acres and contain about 50 percent Guyton soils and about 30 percent Urban land. Areas about 47 inches, is light brownish gray, strongly acid silt loam. Below this, to a depth of about 66 inches, is light gray, slightly acid silty clay loam.

The Guyton soils have low fertility. Water and air move at a slow rate through the soil. Water is moved rapidly off the surface of this soil in many places by concrete lined ditches. The seasonal high water table has been lowered in some areas by drainage systems. In other areas, however, the water table fluctuates from a depth of 1.5 feet to the surface during December through April.

The Urban land part of the unit is mainly concrete lined ditch channels, buildings, or hard surfaced roads that obscure or alter the soils so that identification is not feasible.

Included in mapping are small areas of Beauregard, Metcalf, and Wrightsville soils. Some of the soils that lie immediately adjacent to the concrete lined ditches are subject to flooding for a short time during long periods of rain or high intensity storms. These included soils make up about 20 percent of the areas mapped.

The Guyton soils are used for lawns, parks, and open areas between roads and streams. Guyton soils have fair potential for building sites, but some of the lower lying areas are subject to flooding. These soils have good potential for lawn grasses, shade trees, ornamental trees, shrubs, and vines. They have good potential for vegetable gardens but fair potential for recreational uses.

These soils are not assigned to interpretative groups.

51—Ruston-Urban land complex, 2 to 8 percent slopes. This complex consists of gently sloping to moderately sloping, well drained Ruston soils and Urban land on convex ridges in the uplands. It is mostly within the city of Shreveport. Individual tracts range from 50 to 150 acreas and contain about 50 percent Ruston soils and about 30 percent Urban land. Areas of the Ruston soils and Urban land occur together in such intricate patterns that it is not practical to separate them in mapping.

Typically, the Ruston soils have a surface layer of dark grayish brown fine sandy loam about 10 inches thick. The subsoil, to a depth of 42 inches, is yellowish red sandy clay loam and sandy loam. Below this, to a depth of about 60 inches, is yellowish red, strongly acid sandy clay loam.

Water and air move at a moderate rate through the Ruston soils. Runoff is medium. Erosion is a problem when the soil is without a vegetative cover. Plants may suffer from lack of water during dry periods in the summer and fall of most years. Fertility is low.

The Urban land part of the unit is covered by concrete, asphalt, buildings, or other impervious surfaces that obscure or alter the soil so that identification is not feasible.

Included in mapping are areas of Bowie, Briley, Meth, and Smithdale soils. The Briley soils are at slightly higher elevations than the Ruston soils are, and the Bowie and Meth soils are at slightly lower elevations. Smithdale soils are on short side slopes that border drainageways.

Included soils make up to about 20 percent of the map unit.

Ruston soils in this complex are mainly used for lawns, gardens, parks, and open space. They have good potential for most uses, but the moderate slopes and hazard of erosion are problems when establishing lawns and vegetable gardens. An onsite investigation is needed to determine the potential and limitations of this complex for any proposed land use.

The Ruston soils are not assigned to interpretative groups.

Use and management of the soils

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

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

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

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

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

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

Crops and pasture

General management needed for crops and pasture is suggested in this section. The system of land capability classification used by the Soil Conservation Service is explained, and the estimated yields of the main crops 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 "Soil maps for detailed planning." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Specific recommendations for fertilizers, crop varieties, and seeding mixtures are not given, because these change from time to time as more complete information is obtained. For more detailed information, consult the local staff of the Soil Conservation Service, the Cooperative Extension Service, or the Louisiana Agricultural Experiment Station.

About 198,000 acres in Caddo Parish were used for crops and pasture in 1967 according to a Conservation Needs Inventory published in 1969. Of this total, about 97,739 acres were used for crops—mainly cotton and soybeans—and more than 100,000 acres were used for pasture. Acreage in crops and pasture has gradually been decreasing as more and more land is used for urban development. The acreage in urban use has been growing at the rate of about 1,200 acres per year in the last decade.

Differences in crop suitability and management needs result from differences in soil characteristics, such as fertility levels, erodibility, organic matter content, availability of water for plant growth, drainage, and flooding hazards. Cropping systems and soil tillage are also 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 to specific soils and certain crops. This section presents the general principles of management that can be applied widely to the soils of Caddo Parish.

Fertilization and liming. The amount of fertilizer needed depends upon the following: (1) the crop to be grown, (2) past cropping history, (3) level of yield desired, and (4) soil phase. Specific recommendations should be based on laboratory analysis of soil samples from each field.

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

In the upper 20 inches, the soils in Caddo Parish range in reaction from strongly acid to moderately alkaline. The more acid soils may require lime.

Organic matter content. Organic matter is important as a source of nitrogen for crop growth. It is also important in increasing the rate water is taken into the soil, in reducing surface crusting and soils losses by erosion, and in promoting good physical condition of the surface soil.

Most of the cultivated soils in Caddo Parish are moderately low in organic matter content. Organic matter can be built up to a limited extent and maintained by leaving plant residues on the soil, by promoting more plant growth and growing plants with extensive root systems, by adding barnyard manure, and by growing perennial grasses and legumes in rotation with other crops.

Soil tillage. The major purpose of soil tillage is seedbed preparation and weed control. Seedbed preparation, cultivating, and harvesting tend to damage soil structure. Excessive cultivating of the soils should be avoided. Some of the clayey soils in the parish become cloddy when cultivated.

A compacted layer develops in the loamy soils if they are plowed at the same depth for long periods or are plowed when wet. This compact layer is generally known as a traffic pan or plowpan, and it develops just below the plow layers. The development of this compacted layer can be avoided by not plowing when the soil is wet, by changing to another depth of plowing, or by subsoiling or chiseling.

Some tillage implements stir the surface and leave crop residues on the soil surface for protection from beating rains. This helps control erosion, reduce runoff, and increase infiltration.

Drainage. Many of the soils in the parish need surface drainage to make them more suitable for crops. Early drainage methods involved a complex pattern of main ditches, laterals, and field drains. The more recent approach to drainage in this parish is a combination of land leveling and grading with a minimum of open ditches. This creates larger and more uniformly shaped fields, which are more suited to the use of modern, multi-row farm machinery.

The Red River guide levee system protects most of the cropland and pasture from flooding; nevertheless, some of the soils at the lower elevations are subject to flooding by runoff from higher areas.

Water for plant growth. The available water-holding capacity of the soils in the parish is low to high, but in many years sufficient water is not available at the critical time for optimum plant growth unless irrigation is used. Large amounts of rain fall in winter and spring. Sufficient rain generally falls in summer and autumn of most years; however, plants lack water on most soils during dry periods in summer and autumn. 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 the content of organic matter. In a good cropping system, the sequence of crops should be such that the soil has a cover during 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 a higher percentage of pasture than the cropping systems of cash-crop farms. Additional information on cropping systems can be obtained from the Soil Conservation Service, the Cooperative Extension Service, or the Louisiana Agricultural Experiment Station.

Control of erosion. Soil erosion is a concern on soils that are bare of a vegetative cover in the uplands in Caddo Parish. Erosion is not a serious problem on soils of the alluvial plains, mainly because the topography is level and nearly level. Sheet erosion is moderately severe in all fallow-plowed fields and in newly constructed drainage ditches. Some gullies erode, mainly on more sloping soil and at overfalls into drainage ditches. Sheet and gully erosion can be reduced by maintaining a cover of vegetation or plant residues on the soil surface during as much of the year as possible, by farming on the contour or stripcropping where possible, by using minimum tillage, and by controlling weeds by methods other than fallow plowing. New drainage ditches should be seeded immediately after construction. Water control structures placed at overfalls into drainage ditches help control gully erosion.

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 parishes and results of field trials and demonstrations are also considered.

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

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

Crops other than those shown in table 5 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 Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

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

In the capability system, as used in Caddo Parish, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

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

Class I soils have slight 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 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, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* 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); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

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

The capability classification of each map unit is given in the section "Soil maps for detailed planning."

Woodland management and productivity

By H. Ford Fallin, state staff forester, Soil Conservation Service.

The total acreage of woodland in the parish is 305,000 acres, of which 98 percent is privately owned and 2 percent is publicly owned. Commercial forests cover 51 percent of Caddo Parish (*17*).

Forest types in the parish are: 29.5 percent loblolly-shortleaf pine, 29.5 percent oak-pine, 16 percent oak-hickory, 23 percent oak-gum-cypress, and 2 percent elm-ash-cottonwood.

Very little commercial hardwood is on the Red River alluvial plain. A few scattered stands of eastern cottonwood, American sycamore, and black willow are located between the Red River and the protection levee.

Most of the oak-gum-cypress forest types are located on alluvial plains of Boggy, Black, Cypress, and Cross Bayous. The best woodland wildlife habitat in the parish is also found along these alluvial flood plains.

Tree planting in the uplands of the parish has been an important woodland conservation practice. Many trees were planted in the late 1950's. By the end of the 1972-1973 planting season, 10,284 acres were planted in 177 pine plantations.

Prescriped burning is a desirable woodland conservation practice. This practice is not recommended in some parts of the parish because producing oil and gas wells make prescribed burning a safety hazard. Pipelines and other structures interfere with the placing of fire lanes.

Managed woodlands are also of value for wildlife habitat, recreation, soil and water conservation, and natural beauty.

There are adequate markets for timber products in Caddo Parish and adjacent areas.

Table 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the woodland suitability group for each soil. Soils assigned the same woodland suitability group require the same general management and have about the same potential productivity.

The first part of the *woodland suitability group*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the group, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 6, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

The *potential productivity* of merchantable or *important trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. Site index was calculated at age 30 years for eastern cottonwood, 35 years for American sycamore, and 50 years for all other species. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

The soils of the survey area are rated in table 7 according to 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 sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

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

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 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 mild slopes and are not wet or subject to flooding during the period of use. The surface absorbs rainfall readily but remains firm. Strong slopes 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 subject to flooding during the period of use, and do not have slopes 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 firm after rains.

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

Wildlife habitat

By E. Ray Smith, Jr., biologist, Soil Conservation Service.

The most important game animals in Caddo Parish include deer, dove, ducks, quail, rabbits, and squirrels. Deer are most abundant in areas of mixed pine-hardwood woodland.

Both fox and gray squirrels are present and are most common in drainageways in the uplands.

Cottontail and swamp rabbits are found wherever suitable cover exists. The cottontail is common in the uplands, and the swamp rabbit is confined to bottom land.

Caddo Parish has a fairly large number of furbearers within its boundaries. They include beaver, mink, raccoon, red and gray fox, skunk, nutria, opossum, bobcat, and otter.

Ducks are fairly common along the Red River and the larger lakes during the winter months. The wood duck is a year-round resident that breeds and lives around the lakes, bayous, and larger wooded streams.

The mourning dove is common throughout the parish, and large numbers are found in the croplands of the Red River during the fall and winter months. Woodcock and common snipe are common winter residents of this parish. Turkeys have been stocked, and their population is low, but growing.

Caddo Parish has a high number of nongame birds. The breeding population is highly diverse, but during the spring and fall migration season, the population grows tremendously. This is because of the parish's location on the Red River, which acts as a migratory highway.

Caddo Parish has several threatened and endangered plants and animals within its borders. The plants are *Coreopsis intermedia*, one of the tickseeds, and *Agalinis caddoensis*, one of the foxgloves. Animals on this list are the American alligator, red-cockaded woodpecker, and the bald eagle.

Four major lakes, several large cutoff lakes along the Red River, and about 485 farm ponds provide good, year-round fishing. The species are black and white crappie, white and largemouth bass, bluegill, redear sunfish, pickerel, and channel catfish. Also, a commercial fishery exists for buffalo, paddlefish, drum, gar, bowfin, and bullheads. The 485 farm ponds generally contain largemouth bass and bluegills. The quality and pounds of fish produced per acre of these ponds depends upon the management received.

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 established, 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 texture of the surface layer, available water capacity, wetness, slope, and flood hazard. Soil temperature and soil moisture are also considerations.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are texture of the surface layer, available water capacity, wetness, flood hazard, and slope. Soil temperature and soil moisture are also considerations.

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 texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and soil moisture are also considerations.

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 are the available water capacity and wetness.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are available water capacity and wetness.

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.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, and slope.

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

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.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. 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 need to be considered in planning, in site selection, and in design.

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

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) 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, and local roads and streets. 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 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 the depth to the water table.

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

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, 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.

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.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

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

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if slope is excessive or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

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

Table 10 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, a high water table, flooding, and content of organic matter.

Excessive seepage caused by rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. Slope can cause construction problems.

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

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

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, slope, and flooding affect both types of landfill. Texture, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. An onsite investigation is needed.

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

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

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over a water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. All layers or horizons of the soils of the Red River alluvial plain are suitable for growing plants. The surface layer of the soils in the uplands has the best workability, more organic matter, and the best potential for plants. In the uplands, 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, sand, gravel, and topsoil. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected 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, low shrink-swell potential, 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 moderate shrink-swell potential, slopes of 15 to 25 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, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 11 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 13.

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 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 have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, or soils that have 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 slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

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 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 for each soil the restrictive features that affect 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. 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 even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material. 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, susceptibility to flooding, and subsidence of organic layers. Excavating and grading and the stability of ditchbanks are affected by 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 salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

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

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope and wetness affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of 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. Wetness and slope affect the construction of grassed waterways. Low available water capacity, restricted rooting depth, 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 data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 16.

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

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

Engineering properties and classifications

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 "Soil series and 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 a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

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

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

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

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 16.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry 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.

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

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

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

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

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

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

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 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 without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

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

In table 14, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

Soil and water features

Table 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 not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

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

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 15 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 is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

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. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. 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.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

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

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

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

Engineering test data

The results of analyses of engineering properties of several typical soils of the survey area are in table 16.

The data presented are for soil samples that were collected from carefully selected sites. The soil profiles sampled are typical of the series discussed in the section "Soil series and morphology." The soil samples were analyzed by the Louisiana Department of Highways.

The methods used in obtaining the data are listed by code in the next paragraph. Most of the codes, in parentheses, refer to the methods assigned by the American Association of State Highway and Transportation Officials (*1*). The code for Unified classification is assigned by the American Society for Testing and Materials (*2*).

The methods and codes are AASHTO classification (M-145-66); Unified classification (D-2487-66T); mechanical analysis (T88-57), (*1*), liquid limit (T89-60); plasticity index (T90-56); and moisture-density, method A (T99-57).

Results obtained by the ASSHTO procedure (T88-57) (*1*) for mechanical analysis may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-sized fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-sized fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

Physical and chemical analyses of selected soils

The physical and chemical properties from representative soils of four series are shown in tables 17 and 18. Samples of Keithville, Metcalf, Meth, and Woodtell soils were analyzed by the Louisiana Agricultural Experiment Station of Louisiana State University. Table 19 gives data obtained by clay and silt mineral analysis. These estimates were made by A.G. Caldwell, Professor of Agronomy, Louisiana State University. Detailed descriptions of all soils analyzed are given in the section "Soil Series and Morphology."

Methods of sampling and analysis

Samples were taken from pits at carefully selected locations. For sampling methods used, see Soil Survey Investigations Report No. 1 (*16*). The results are reported in tables 17, 18, and 19.

Following are the methods of analysis used for data in table 17. The Louisiana Agricultural Experiment Station determined the textural data by the ovendry soil basis: sand was determined by the dry sieving method; silt and clay by the hydrometer method. The percent of water retained was determined on sieved samples using a pressure plant apparatus. The values of water content at 1/3 bar and 15 bar tension are percentages of the ovendry soil. Water retention difference was determined by subtracting the water content at 15 bar tension from the water content at 1/3 bar tension. These values were converted to percent of water and to inches of water per inch of soil. Bulk densities and Coeffiecient of Linear Extensibility (COLE) were based on undisturbed saran-coated clod samples.

In table 18, extractable bases were determined on original ammonium acetate extracts by atomic absorption flame photometry. Extractable acidity was determined by the triethanolamine method. Cation Exchange Capacity (CEC) is expressed in milliequivalents per 100 grams of soil as determined with ammonium acetate pH 7.0. Base saturation, as a percent, is based on the above mentioned cation exchange capacities. Organic carbon was determined by the Walkley-Black method of wet digestion with sulfuric acid and dichromate. Nitrogen content was determined by the macro-Kjeldahl method. The pH was determined in a 1:1 ratio with distilled water and in a 1:2 ratio with 0.01M calcium chloride. Iron was extracted overnight by sodium dithionite and determined by atomic absorption flame photometer. The extractable aluminum was determined by being treated with potassium fluoride and by titrating it with sodium hydroxide to a phenolphtholein end point. Phosphorus, (P2 method), given in pounds per acre, was extracted by the Bray strong acid extractant. In table 19, mineralogical data on the silt, coarse clay, and fine clay are estimates based on X-ray diffraction (*6*).

Interpretation of laboratory data

By A.G. Caldwell and B.A. Lindsay, professor and associate in Agronomy, Louisiana Agricultural Experiment Station, Louisiana State University.

The soils selected for characterization in tables 17, 18, and 19 are all acid. All pedons become increasingly acid as depth increases. Aluminum, extracted by normal potassium chloride (KCl), increases as depth increases. Maximum content is in the lower part of the B horizon in most pedons. Extractable aluminum exceeds 6 milliequivalents per 100 grams of soil in the B horizon of all pedons. These levels of aluminum are expected to be toxic to the roots of nonresistant crops, such as cotton and alfalfa; moderately resistant crops, such as soybeans; and even highly resistant crops, such as corn.

Meth (S74LA-17-10). This pedon meets the criteria of an Alfisol, and the clay mineralogy is mixed. The very strongly acid lower horizons would probably discourage the growth of roots of most agronomic crops. Although the clay fractions seem to be dominated by kaolinite, this pedon has enough montmorillonite and vermiculite to give fairly high exchange capacities in the B horizon. Extractable magnesium exceeds calcium in most of the B horizon. The soil is very low in available phosphorus. The surface horizons are very low in extractable potassium, but the subsoil is moderately well supplied. The upper 27 inches of this soil does not have large quantities of extractable aluminum.

Meth (S74LA-17-11). This pedon of Meth is an Ultisol, borderline to Alfisol. The clay mineralogy is mixed, but the soil has a relatively high exchange capacity in the B horizon. The extractable aluminum and the acidity of the subsoil would probably limit the growth of most agronomic crops but would present no problem to pine trees. The high extractable magnesium status of the B horizon may be indicative of clay breakdown. The soil is very low in available phosphorus. The subsoil has a moderate supply of extractable potassium. The upper 12 inches does not contain measurable quantities or extractable aluminum.

Woodtell (S75LA-17-1). This pedon is correctly classified as fine and montmorillonitic but is marginally vertic and has low base saturation in the B horizon. It exceeds 35 percent base saturation at 54 inches; therefore, it is an Alfisol. The very low pH level and high extractable aluminum and magnesium would seem to favor an Ultic subgroup. The fine sand of the C2 horizon is very high in mica. Micas were probably the source of the moderate amounts of extractable potassium throughout the profile. Available phosphorus is very low. The very different sand to silt ratio in the C2 horizon would indicate a different type of deposition than the horizons above. The aluminum in the subsoil would probably impede the growth of most agronomic crops.

Metcalf (S74LA-17-1). This pedon appears to be fine silty. The mineralogy of the clay fraction is mixed. The clay in the deepest horizon sampled is montmorillonitic. This increase in montmorillonite is also indicated by the higher COLE and cation exchange capacity of the lower two horizons. This soil is very strongly acid throughout. Of particular concern is the extractable aluminum, which increases to 60 percent of the KCl extractable cations. Such a level of aluminum would be expected to be toxic to the roots of most agronomic crops. Levels of magnesium are high; magnesium equals the level of calcium in the B horizon. This may indicate some breakdown of clay. There is an increase in extractable sodium in the two deepest horizons, which could contribute to low permeability in these layers.

Keithville (S74LA-17-12). This pedon seems to fit the classification of this series. Although the soil is very strongly acid, the base saturation exceeds the requirements for Alfisols. Extractable aluminum as a percent of the KCl extracted capacity would seem to be toxic for most crops. Extractable magnesium exceeds extractable calcium by over 2:1 in the lower five horizons. Although the soil does not have a natric horizon, the sodium increases in the lower horizons. This and the dominance of montmorillonitic clay in the lower horizons accounts for the poor permeability of this soil. Available phosphorus is very low and extractable potassium is low throughout. This soil would appear to need a strong program of fertilization that includes lime, phosphorus, potassium, and probably nitrogen for good agronomic production.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*18*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 20, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

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

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

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (*Hapl*, meaning minimal horizonation, plus *aquent*, the suborder of the Entisols that have 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 Haplaquents.

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

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. The texture of the surface layer or of the substratum can differ within a series.

Soil series and 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 (*15*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*18*). 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 "Soil maps for detailed planning."

Armistead series

The Armistead series consists of somewhat poorly drained soils that formed in clayey alluvium over loamy sediments. These soils are on the natural levees of the Red River and are in the eastern part of the parish. Permeability is slow in the clayey upper part of the soil and moderately slow in the loamy lower part. Slope is dominantly less than 1 percent.

Armistead soils are geographically closely associated with Caspiana, Gallion, and Moreland soils. Caspiana soils, at slightly higher elevations, are better drained and lack a clayey surface horizon. Gallion soils, also at slightly higher elevations, do not have a mollic epipedon. Moreland soils, at slightly lower elevations, have a fine control section.

Typical pedon of Armistead clay, 1 mile northeast of Forbing, 1,100 feet north of Louisiana Highway 526, 200 feet east of north-south fence in pecan grove; Spanish Land Grant 3, T. 16. N., R. 13 W.

Ap—0 to 7 inches; dark reddish brown (5YR 3/3) clay; moderate medium subangular blocky structure; firm; common fine and medium roots; very dark gray worm casts; moderately alkaline; abrupt smooth boundary.

A1—7 to 15 inches; dark reddish brown (5YR 3/3) clay; moderate coarse prismatic structure; firm; common fine roots; mildly alkaline; clear smooth boundary.

IIA1—15 to 25 inches; dark reddish brown (5YR 3/2) silty clay loam; common medium faint dark gray (5YR 4/1) and few fine faint gray mottles; moderate medium subangular blocky structure; firm; common fine and medium roots; reddish brown material in old root channels; some black stains along root channels; neutral; clear wavy boundary.

IIB21t—25 to 40 inches; yellowish red (5YR 5/6) silt loam; weak coarse prismatic structure; friable; common fine roots; common pores; dark reddish brown stains in pores and root channels; distinct continuous clay films; neutral; clear wavy boundary.

IIB22t—40 to 63 inches; yellowish red (5YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few roots; common fine pores; distinct discontinuous clay films on faces of peds; neutral.

The solum ranges from 40 to 70 inches in thickness. It ranges from moderately alkaline to slightly acid in reaction.

The A horizon has hue of 2.5YR, 5YR, or 7.5YR; value of 2 or 3; and chroma of 2 or 3.

The IIA horizon has hue of 2.5YR, 5YR, or 7.5YR; value of 3; and chroma of 1 to 3 and is mottled in shades of gray. It is silt loam or silty clay loam.

The IIBt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma or 4 to 8. It is silt loam or silty clay loam.

A IIC horizon is in some pedons. It has the same color range as the IIBt horizon. It is very fine sandy loam, silt loam, loam, or silty clay loam. The IIC horizon is calcareous in some pedons and has soft accumulations of carbonate that range from none to common.

Beauregard series

The Beauregard series consists of moderately well drained, slowly permeable soils. These soils formed in alluvial sediments of both Pleistocene age and Tertiary age. They are in the uplands, mostly in the southwestern part of the parish. Slope is dominantly less than 3 percent.

Beauregard soils are geographically closely associated with Bowie, Guyton, and Metcalf soils. Bowie soils are on higher lying, convex ridges and have a fine-loamy control section. Guyton soils are on flats, are poorly drained, and lack plinthite. Metcalf soils lack plinthite. They have a clayey IIB horizon that has base saturation of greater than 35 percent.

Typical pedon of Beauregard silt loam, 1 to 3 percent slopes, 5 1/2 miles southwest of Springridge, 600 feet west of Johns Gin Road and church; NE1/4SW1/4 sec. 29, T. 15 N., R. 16 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; medium acid; clear smooth boundary.

A2—5 to 9 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; common brown streaks from A1 in worm casts and old root channels; common fine roots; strongly acid; clear smooth boundary.

B21t—9 to 18 inches; yellowish brown (10YR 5/6) silt loam; common medium faint strong brown (7.5YR 5/6) and few fine pale brown mottles in lower part of horizon; weak fine subangular blocky structure; friable; few fine roots; few pores; thin discontinuous clay films on faces of peds; common soft brown nodules; strongly acid; clear smooth boundary.

B22t—18 to 32 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) and few fine yellowish red mottles; weak coarse subangular blocky structure; friable; few fine roots; few pores; about 15 percent plinthite; thin discontinuous clay films; few concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

B23t—32 to 43 inches; light brownish gray (10YR 6/2) silt loam; few vertical streaks of light gray (10YR 6/1) silt loam; many medium prominent yellowish brown (10YR 5/6) and red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; about 7 percent plinthite; thin discontinuous clay films; few fine brown concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

B24t—43 to 60 inches; mottled light gray (10YR 7/2) yellowish brown (10YR 5/6) and red (2.5YR 4/6) silt loam; moderate medium subangular blocky structure; friable; few fine roots; about 20 percent plinthite; distinct discontinuous clay films; few fine brown concretions (iron and manganese oxides); strongly acid.

The solum ranges from 60 to 90 inches in thickness. It ranges from slightly acid to strongly acid in the A horizons, from strongly acid to very strongly acid in the upper part of the B horizon, and from medium acid to very strongly acid in the lower part.

The A1 or Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 3.

The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. It is very fine sandy loam in some pedons.

The upper part of the Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. The lower part has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. The Bt horizon is mottled in shades of gray, brown, and red. It is silt loam or silty clay loam. Plinthite ranges from 5 to 30 percent.

In some pedons there is a C horizon. Where present, it is in shades of red, brown, and gray and is silt loam, silty clay loam, or silty clay.

Bernaldo series

The Bernaldo series consists of well drained, moderately permeable soils. These soils formed in loamy alluvial sediments of Pleistocene age. They are on low terraces adjacent to the major drainageways in the uplands, mostly in the central and southwestern part of the parish. Slope is dominantly less than 3 percent.

Bernaldo soils are geographically closely associated with the Guyton and Bonn soils. Guyton soils are on flats and drainageways, are poorly drained, and have a fine-silty control section. Bonn soils are at lower elevations, have chroma of 2 or less, and have a natric horizon.

Typical pedon of Bernaldo fine sandy loam, 1 to 3 percent slopes, 3.5 miles northwest of Keithville, south end of small pasture in woods; NE1/4SW1/4 sec. 14, T. 16 N., R. 15 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; many roots; slightly acid; clear smooth boundary.

A2—5 to 20 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine granular structure; friable; common roots; medium acid; clear wavy boundary.

B2t—20 to 39 inches; strong brown (7.5YR 5/6) loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few roots and pores; distinct discontinuous clay films; few fine black concretions; strongly acid; gradual wavy boundary.

B&A—39 to 52 inches; yellowish brown (10YR 5/6) loam (B); common medium faint strong brown (7.5YR 5/6) and few medium prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; about 10 percent light yellowish brown silt loam (A) material as films on faces of peds; pockets of very pale brown sandy loam; distinct discontinuous clay films; strongly acid; gradual wavy boundary.

B3t—52 to 80 inches; yellowish brown (10YR 5/6) sandy clay loam; few medium prominent red (2.5YR 4/8) mottles, common medium distinct light gray (10YR 6/1) mottles, and few fine distinct pale brown (10YR

6/3) mottles; moderate medium subangular blocky structure; friable; thin discontinuous clay films; strongly acid.

The solum ranges from 60 inches to more than 100 inches in thickness. It ranges from slightly acid to strongly acid in the A horizon and from slightly acid to very strongly acid in the Bt horizon.

The A1 or Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4.

The B2t horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 to 6; and chroma of 4 to 8. It is loam, sandy clay loam, or clay loam. Mottles in shades of brown, gray, and red are in most pedons.

The B&A horizon has the same range in color as the B2t horizon. Texture of the B part is fine sandy loam, loam, or sandy clay loam. The A part consists of streaks, tongues, and ped coatings and comprises 5 to 15 percent of the matrix. It is fine sandy loam or loamy fine sand.

Betis series

The Betis series consists of somewhat excessively drained, rapidly permeable soils that formed in sandy sediments of Tertiary age. These soils are in the uplands in the northern part of the parish. Slope ranges from 1 to 12 percent.

Betis soils are geographically closely associated with Briley soils. Briley soils are on higher lying, convex ridges. They have a sandy loam or sandy clay loam argillic horizon within a depth of 40 inches.

Typical pedon of Betis loamy fine sand, 5 to 12 percent slopes, 2.5 miles northwest of Hosston along Hosston-Rodessa Road, 200 feet north of gravel road; SW1/4SE1/4 sec. 3, T. 22 N., R. 15 W.

A11—0 to 5 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.

A12—5 to 11 inches; brown (10YR 4/3) loamy fine sand; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.

A13—11 to 23 inches; brown (10YR 5/3) loamy fine sand; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.

B1—23 to 35 inches; yellowish red (5YR 5/6) loamy fine sand; spots of yellowish brown loamy fine sand; weak medium granular structure; friable; many fine and medium roots; many sand grains coated with oxides; strongly acid; gradual wavy boundary.

B2t—35 to 62 inches; yellowish red (5YR 5/6) loamy fine sand and a few streaks of yellowish brown (10YR 5/4); moderate medium granular structure; friable; many fine and medium roots; sand grains are coated with oxides and clay; clay bridges between sand grains; strongly acid.

The solum is 60 inches or more thick. It ranges from medium acid to very strongly acid throughout.

The A1 or Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. It is 17 to 30 inches thick.

The Bt horizon has hue of 5YR, 7.5YR, or 10YR; value of 4 or 5; and chroma of 6 to 8. It is fine sandy loam or loamy fine sand. Where present, mottles are in shades of yellow, brown, and red. An A&B horizon is in some pedons.

Bonn series

The Bonn series consists of poorly drained, very slowly permeable soils. These soils have a high sodium content throughout the subsoil. They formed in loamy alluvial sediments of Pleistocene age. They are adjacent to major drainageways in the uplands, mostly in the central and southwestern part of the parish. Slope is dominantly less than 1 percent. Bonn soils are saturated with water late in winter and early in spring.

Bonn soils are geographically closely associated with Guyton and Bernaldo soils. Guyton soils lack the natric horizon and are neutral to alkaline in the B2t horizon. Bernaldo soils are on higher lying, convex ridges and have a fine-loamy control section.

Typical pedon of Bonn silt loam, 5 miles south of Greenwood, 1.3 miles south of Buncombe Road on Woolworth Road, then 100 yards west of road in forest; NE1/4NE1/4 sec. 16, T. 16 N., R. 15 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; many medium faint dark gray (10YR 4/1) mottles; weak medium granular structure; friable; many medium and fine roots; medium acid; clear wavy boundary.

A21—2 to 4 inches; grayish brown (10YR 5/2) silt loam; weak medium granular structure; friable; many fine roots; many pores; strongly acid; clear wavy boundary.

A22—4 to 12 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/8) mottles; massive; friable; many fine roots; many fine pores; strongly acid; clear irregular boundary.

A&B—12 to 15 inches; light brownish gray (10YR 6/2) silt loam (A); common medium distinct yellowish brown (10YR 5/4) mottles; weak coarse columnar structure; friable; about 30 percent of horizon is grayish brown (10YR 5/2) silty clay loam and a few dark grayish brown clay lenses (B); neutral; gradual wavy boundary.

B&A—15 to 28 inches; grayish brown (10YR 5/2) silty clay loam (B); common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium prisms that part into moderate medium subangular blocky structure; firm; tongues of light brownish gray silt loam (A) that are 1 to 3 inches wide; few dark grayish brown clay lenses; strongly alkaline; gradual wavy boundary.

B2tg—28 to 58 inches; grayish brown (10YR 5/2) silty clay loam; few fine faint olive yellow (2.5Y 6/6) mottles; weak coarse prismatic structure; firm; few fine roots; few pores; pockets of white crystals; discontinuous clay films; tongues of light brownish gray (10YR 6/2) silt loam extend into this horizon; strongly alkaline; gradual wavy boundary.

B3g—58 to 64 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct light yellowish brown (2.5Y 6/4) mottles; weak coarse subangular blocky structure; firm; gleyed areas around root channels; strongly alkaline.

The solum ranges from 30 to 60 inches or more in thickness. It ranges from neutral to very strongly acid in the A horizon and from strongly alkaline to medium acid in the B horizon. Exchangeable sodium saturation ranges from 15 to 50 percent in all horizons below a depth of 16 inches.

The A1 horizon has hue of 10YR, value of 2 to 5, and chroma of 1 to 3.

The A2 horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 to 7; and chroma of 1 or 2. It is silt loam or very fine sandy loam. Tongues of soil material from the A2 horizon extend into the lower B horizon.

The Bt horizon has hue of 10YR, 2.5YR, or 5Y; value of 5 or 6; and chroma of 1 or 2. The lower part has chroma of 4 to 6 in some pedons. The Bt horizon is silt loam or silty clay loam. Mottles are in shades of yellow, brown, and gray. Soft accumulations of carbonates range from none to common.

Where present, the C horizon has the same color and texture range as the Bt horizon.

Bowie series

The Bowie series consists of moderately well drained, moderately slowly permeable soils that formed in loamy sediments of both Pleistocene age and Tertiary age. These soils are throughout most of the upland area of the parish. Slope ranges from 2 to 5 percent.

Bowie soils are geographically closely associated with the Meth, Metcalf, Ruston, and Sacul soils. Meth soils are on higher lying convex ridges and upper side slopes and have a fine control section. Metcalf soils are at lower elevations and are fine-silty. Ruston soils are on higher lying, convex ridges; are well drained; and have redder hues in the Bt horizon. Sacul soils are on slightly higher lying ridges and have a fine control section.

Typical pedon of Bowie fine sandy loam, 1 to 5 percent slopes, 5.3 miles southwest of Springridge, 1,400 feet northeast of church, 1,100 feet north of Johns Gin Road; SW1/4NE1/4 sec. 29, T. 15 N., R. 16 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam; weak medium granular structure; friable; many roots; medium acid; clear smooth boundary.

A2—8 to 14 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak medium subangular blocky structure; friable; common roots; medium acid; clear smooth boundary.

B21t—14 to 26 inches; yellowish brown (10YR 5/8) sandy clay loam; weak medium subangular blocky structure; friable; common roots; thin discontinuous clay films; strongly acid; clear wavy boundary.

B22t—26 to 35 inches; strong brown (7.5YR 5/8) sandy clay loam; common medium prominent red (2.5YR 4/8) and yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; few roots; common medium pores; red (2.5YR 4/8) bodies are firm and brittle; 7 percent plinthite nodules; continuous thick clay films on faces of peds; few ironstone fragments; strongly acid; clear wavy boundary.

B23t—35 to 60 inches; yellowish brown (10YR 5/6) sandy clay loam; many medium red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; friable; about 15 percent nodular plinthite; vertical streaks on surfaces of peds of gray (10YR 6/1); thick continuous clay films on faces of peds; few clean sand grains; strongly acid.

The solum is more than 60 inches thick. Depth to a horizon with 5 percent or more plinthite nodules ranges from 25 to 48 inches. The solum ranges from slightly acid to strongly acid in the A horizon and strongly acid or very strongly acid in the B horizon.

The A1 or Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Where present, the A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4.

The B2t horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 8. Texture of B2t horizon is sandy clay loam, clay loam, or fine sandy loam. Content of plinthite nodules in the lower part of the B2t horizon ranges from 5 to 25 percent. Mottles with chroma of 2 are common at depths below 30 inches.

Briley series

The Briley series consists of well drained, moderately permeable soils that formed in sandy and loamy sediments of Tertiary age. These soils are on broad, convex ridgetops. They are in the uplands in the northern part of the parish. Slope ranges from 1 to 5 percent.

Briley soils are geographically closely associated with Betis and Ruston soils. Betis soils are on slightly higher, convex ridgetops and lower side slopes and have a sandy control section. Ruston soils are on lower side slopes and on convex ridgetops but do not have as thick a sandy surface horizon as the Briley soils.

Typical pedon of Briley loamy fine sand, 1 to 5 percent slopes, 2.5 miles northwest of Hosston, on oilfield road, 60 feet south of road; SW1/4SE1/4 sec. 3, T. 22 N., R. 15 W.

A1—0 to 10 inches; brown (10YR 5/3) loamy fine sand; weak fine granular structure; very friable; many fine and medium roots; few worm casts; few charcoal fragments; strongly acid; clear wavy boundary.

A2—10 to 28 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.

B21t—28 to 37 inches; red (2.5YR 4/6) fine sandy loam; few pockets of yellowish brown (10YR 5/4) material; weak medium subangular blocky structure; friable; many fine roots; many fine pores; sand grains coated and bridged with clay; thin patchy clay films; very strongly acid; clear smooth boundary.

B22t—37 to 52 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; common fine roots and pores; continuous thin clay films on faces of peds; very strongly acid; clear smooth boundary.

B23t—52 to 80 inches; red (2.5YR 4/6) fine sandy loam; moderate medium subangular blocky structure; friable; thin discontinuous clay films on faces of peds; very strongly acid.

The solum is greater than 60 inches in thickness. It ranges from slightly acid to strongly acid in the A horizon and from medium acid to very strongly acid in the B horizon.

The A1 or Ap horizon is 6 to 12 inches thick. It has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon is 14 to 28 inches thick. It has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4.

The B2t horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 to 8.

Buxin series

The Buxin series consists of poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are nearly level or in depressional areas of the Red River alluvial plain in the eastern part of the parish. Slope is less than 1 percent.

The Buxin soils are geographically closely associated with the Armistead, Moreland, and Norwood soils. All three associated soils are at higher elevations than the Buxin soils. Armistead soils have a fine-silty control section. Moreland soils are calcareous within 10 inches of the surface and do not have dark gray buried horizons. Norwood soils do not have a mollic epipedon and have a fine-silty control section.

Typical pedon of Buxin clay, occasionally flooded, 1.5 miles northwest of Gilliam, 0.7 mile west of junction of U.S. Highway 71 and Huckaby Road, 0.4 mile south on field road, 20 feet east of field road; NE1/4SW1/4 sec. 1, T. 21 N., R. 15 W.

Ap—0 to 10 inches; dark reddish brown (5YR 3/3) clay; moderate medium subangular blocky structure; firm, very plastic; many fine roots; neutral; clear smooth boundary.

B2—10 to 20 inches; dark reddish brown (5YR 3/4) clay; moderate medium subangular blocky structure; firm, very plastic; common fine roots; common tubular pores; neutral; abrupt smooth boundary.

Ab—20 to 26 inches; dark gray (10YR 4/1) clay; many fine prominent dark reddish brown mottles; moderate medium subangular blocky structure; firm, very plastic; neutral; clear smooth boundary.

Bb—26 to 41 inches; mottled dark grayish brown (10YR 4/2), dark brown (7.5YR 4/2), and reddish brown (5YR 4/4) clay; moderate fine angular blocky structure; firm, very plastic; few fine roots; pressure faces; neutral; clear wavy boundary.

C1—41 to 63 inches; reddish brown (5YR 4/4) clay; common coarse distinct dark grayish brown mottles; weak fine angular blocky structure; firm, plastic; mildly alkaline; clear wavy boundary.

The solum ranges from 30 to 60 inches in thickness. Depth to the buried A horizon ranges from 20 to 36 inches. Reaction ranges from mildly alkaline to slightly acid in the Ap, B2, Ab, and Bb horizons and from moderately alkaline to neutral in the C horizon. Some pedons are calcareous between depths of 40 to 60 inches.

This soil has cracks at some time in most years. These cracks are 1 centimeter or more wide and are at a depth of 50 centimeters. The cracks are at least 30 centimeters long in some parts. They extend upward to the surface or the base of the Ap horizon. The COLE (Coefficient of Linear Extensibility) is 0.09 or more. The potential linear extensibility is 6 centimeters or more in the upper 1 meter.

The A horizon has hue of 5YR or 2.5YR, value of 2 or 3, and chroma of 2 or 3.

The B horizon, to a depth of 10 inches, has the same color range as the A horizon. Below 10 inches it has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 2 to 4. Texture is clay or silty clay.

The Ab and Bb horizons have hue of 10YR, value of 3 or 4, and chroma of 1 or 2. They are mottled in shades of red and brown. Texture is clay or silty clay.

The C horizon has colors in shades of red, brown, and gray. It is clay, silty clay, or silty clay loam. It is neutral to moderately alkaline.

Caspiana series

The Caspiana series consists of well drained, moderately permeable soils that formed in loamy alluvium. These soils are on natural levees of the Red River alluvial plain in the eastern part of the parish. Slope is less than 1 percent.

Caspiana soils are geographically closely associated with the Armistead, Gallion, Moreland, and Norwood soils. Armistead soils are at slightly lower elevations than the Caspiana soils are. They have clayey horizons in the

10- to 20-inch section. Gallion and Caspiana soils are at about the same elevation. Gallion soils do not have a mollic epipedon. Moreland soils are at lower elevations than Caspiana soils, have a fine control section, and have vertic properties. Norwood soils are at higher elevations and lack a mollic epipedon.

Typical pedon on Caspiana silt loam, 1 mile northwest of Caspiana, 1,000 feet north of Louisiana Highway 523 on farm road, 25 feet west of farm road; SW1/4SW1/4 sec. 11, T. 15 N., R. 12 W.

Ap—0 to 5 inches; dark brown (7.5YR 3/2) silt loam; weak subangular blocky structure; friable; many fine roots; many fine and medium pores; slightly acid; abrupt smooth boundary.

A12—5 to 11 inches; very dark brown (10YR 2/2) silt loam; weak medium subangular blocky structure; friable; many fine roots; many fine pores; neutral; clear wavy boundary.

B1—11 to 15 inches; very dark brown (10YR 2/2) and reddish brown (5YR 4/4) silt loam crushing to dark brown (7.5YR 3/2); weak medium subangular blocky structure; friable; common fine roots; common fine and medium pores; worm casts filled with dark brown silt loam; neutral; gradual wavy boundary.

B21t—15 to 21 inches; reddish brown (5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few fine and medium pores; thick continuous clay films; very dark brown and dark brown staining on vertical ped surfaces; worm casts; mildly alkaline; gradual wavy boundary.

B22t—21 to 44 inches; yellowish red (5YR 4/6) silt loam; moderate medium subangular blocky structure; friable; few fine roots; common fine and medium pores; thick continuous clay films; very dark brown and dark brown staining in pores and root channels; mildly alkaline; clear wavy boundary.

B3—44 to 59 inches; yellowish red (5YR 4/6) silt loam; weak medium subangular blocky structure; friable; common fine and medium pores; many very fine soft black accumulations; mildly alkaline; abrupt wavy boundary.

C1—59 to 84 inches; yellowish red (5YR 4/6) silt loam; massive; firm; few fine accumulations of carbonates; calcareous; moderately alkaline.

The solum is 30 to 60 inches thick. It ranges from moderately alkaline to medium acid in the A and B horizons. The C horizon is moderately alkaline to slightly acid.

The A horizon has hue of 10YR, 7.5YR, or 5YR; value of 2 or 3; and chroma of 1 to 3. It is silt loam or silty clay loam.

The upper part of the B horizon, to a depth of 10 to 20 inches below the surface, has the same color range as the A horizon. The lower part of the B horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 3 to 6. The B horizon is silt loam or silty clay loam.

The C horizon has the same color range as the lower part of the B horizon. It is very fine sandy loam, silt loam, loam, or silty clay loam. It is calcareous in some pedons.

Darden series

The Darden series consists of well drained to somewhat excessively drained, rapidly permeable soils. These soils formed in sandy alluvial sediments of Pleistocene age. They are in the uplands in the northwestern part of the parish. Slope is dominantly less than 3 percent but ranges to as much as 5 percent.

Darden soils are geographically closely associated with Guyton soils. Guyton soils, at about the same elevations, are in drainageways, have a fine-silty control section, and are gray throughout.

Typical pedon of Darden loamy fine sand, 1 to 5 percent slopes, 1.5 miles west of Rodessa, 600 feet southwest of Louisiana Highway 168, 10 feet east of oilfield road; sec. 21, T. 23 N., R. 16 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy fine sand; single grained; loose; many fine roots; medium acid; clear smooth boundary.

C1—8 to 13 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; loose; many fine roots; medium acid; gradual wavy boundary.

C2—13 to 23 inches; yellowish brown (10YR 5/6) loamy fine sand; single grained; very friable; common fine roots; strongly acid; gradual wavy boundary.

C3—23 to 54 inches; strong brown (7.5YR 5/6) loamy fine sand; single grained; very friable; few fine roots; very strongly acid; gradual wavy boundary.

C4—54 to 66 inches; yellowish brown (10YR 5/8) loamy fine sand; common medium distinct very pale brown (10YR 7/4) mottles; single grained; very friable; very strongly acid; gradual smooth boundary.

Sandy horizons are more than 80 inches thick. The silt and clay content in the 10- to 40-inch control section ranges from 10 to 25 percent. Reaction ranges from medium acid to very strongly acid in the A horizon and upper part of the C horizon and from very strongly acid to neutral in the lower part of the C horizon.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2.

The C horizon has hue of 7.5YR, 10YR, or 2.5Y; value of 5 to 8; and chroma of 3 to 8. The lower part of the C horizon has brown mottles. The C horizon is loamy fine sand or loamy sand; however, in some pedons there are thin strata of sand or fine sand.

Forbing series

The Forbing series consists of moderately well drained, very slowly permeable soils that formed in clayey alluvium of Pleistocene age. These soils are in the uplands, mostly adjacent to the major lakes in the parish. Slope ranges from 1 to 8 percent.

Forbing soils are geographically closely associated with the Gore, Keithville, and Wrightsville soils. Gore soils are on higher, broad ridgetops and are more gray in the lower part of the subsoil. Keithville soils are on higher lying, convex ridges and have a fine-silty control section. Wrightsville soils are on flats and are gray throughout.

Typical pedon of Forbing silt loam, 1 to 3 percent slopes, 1 mile west of Summer Grove, 1,200 feet north of Kingston Road, 240 feet west of powerline; SW1/4SW1/4 sec. 15, T. 16 N., R. 14 W.

A1—0 to 4 inches; brown (10YR 4/3) silt loam; weak medium granular structure; friable; many fine and medium roots; common fine pores; strongly acid; clear wavy boundary.

B21t—4 to 12 inches; yellowish red (5YR 4/6) clay; common medium distinct pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) mottles; weak medium subangular blocky structure; firm, plastic and sticky; common roots; common fine pores; thin patchy clay films on surfaces of peds; medium acid; clear wavy boundary.

B22t—12 to 18 inches; yellowish red (5YR 4/6) clay; weak medium subangular blocky structure; firm, plastic and sticky; common roots; common fine pores; thin patchy clay films on surfaces of peds; medium acid; clear wavy boundary.

B23t—18 to 24 inches; red (2.5YR 4/6) clay; weak medium subangular blocky structure; firm, sticky and plastic; common fine roots; common black stains in channels and on surfaces of peds; neutral; clear wavy boundary.

B24t—24 to 36 inches; red (2.5YR 4/6) clay; weak medium subangular blocky structure; sticky and plastic, very firm; common slickensides that do not intersect; common fine and coarse calcium carbonate nodules; few black stains; strong effervescence; moderately alkaline; gradual wavy boundary.

B25t—36 to 61 inches; dark red (2.5YR 3/6) clay; weak medium subangular blocky structure; very firm; few fine roots; common slickensides that do not intersect; common fine and coarse calcium carbonate masses; few black stains; strong effervescence; moderately alkaline; gradual wavy boundary.

B3—61 to 75 inches; dark red (2.5YR 3/6) clay; common medium light olive gray (5Y 6/2) mottles; massive; very firm; common slickensides that do not intersect; common black stains; strong effervescence; moderately alkaline.

The solum ranges from 60 to 80 inches in thickness. It ranges from slightly acid to strongly acid in the A horizon, neutral to medium acid in the upper part of the Bt horizon, moderately alkaline to slightly acid in the lower part of the Bt horizon, and mildly alkaline or moderately alkaline in the B3 horizon.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. In undisturbed areas some pedons have a thin A2 horizon.

The Bt horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 4 to 6. In some pedons it contains few or common, brownish mottles. Calcium carbonate nodules that are 2 to 20 millimeters in diameter make up 1 to 5 percent of the lower part of the Bt horizon in some pedons.

The B3 horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 4 to 6 and contains grayish mottles. It is clay or silty clay.

Gallion series

The Gallion series consists of well drained, moderately permeable soils that formed in loamy alluvium. These soils are on natural levees of the Red River alluvial plain in the eastern part of the parish. Slope is 1 percent.

Gallion soils are geographically closely associated with the Armistead, Caspiana, and Moreland soils. Armistead soils are at slightly lower elevations than Gallion soils. They are clayey in the upper 10- to 20-inch section and have a mollic epipedon. Caspiana and Gallion soils are at about the same elevations. Caspiana soils have a mollic epipedon. Moreland soils are at lower elevations, are clayey throughout, and have vertic properties.

Typical pedon of Gallion silt loam, 2.1 miles west of Belcher on Self Road, 733 yards north of road in pasture; NE1/4SW1/4 sec. 1, T. 20 N., R. 15 W.

Ap—0 to 9 inches; brown (7.5YR 4/2) silt loam; weak fine and medium granular structure; friable; many fine roots; many fine pores; few worm casts; slightly acid; abrupt smooth boundary.

B21t—9 to 18 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable; many fine pores; thin continuous clay films; common fine roots; slightly acid; clear smooth boundary.

B22t—18 to 34 inches; yellowish red (5YR 4/6) silt loam; weak medium subangular blocky structure; friable; few fine roots; many fine pores; thin discontinuous clay films on vertical faces of peds; few fine black concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

B3—34 to 46 inches; yellowish red (5YR 4/6) silt loam; weak medium subangular blocky structure; friable; thin patchy clay films; few soft black nodules (iron and manganese oxides); slightly acid; clear smooth boundary.

C1—46 to 63 inches; yellowish red (5YR 4/6) stratified silt loam and very fine sandy loam; weak medium and coarse subangular blocky structure; friable; few fine pores; few dark soft nodules (iron and manganese oxides); neutral; clear smooth boundary.

The solum is 40 to 60 inches thick. It ranges from neutral to medium acid in the A horizon, from medium acid to mildly alkaline in the B2t horizon, and from slightly acid to moderately alkaline in the B3 and C horizons.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or silty clay loam.

The B2t horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is silt loam, silty clay loam, or clay loam.

The B3 horizon has the same color range as the B2t horizon. It is silt loam, clay loam, or silty clay loam. Soft calcium carbonate accumulations range from none to common.

The C horizon has the same color and texture range as the B3 horizon. Soft calcium carbonate accumulations range from none to common.

Gore series

The Gore series consists of moderately well drained, very slowly permeable soils that formed in clayey alluvium of Pleistocene age. These soils are in the uplands and are adjacent to the major lakes in the parish. Slope ranges from 1 to 5 percent.

Gore soils are geographically closely associated with the Forbing, Keithville, and Wrightsville soils. Forbing soils are on adjacent side slopes and have a very fine control section. Keithville soils are on higher lying, convex ridges and have a fine-silty control section. Wrightsville soils are on lower lying flats and are gray throughout.

Typical pedon of Gore silt loam, 1 to 5 percent slopes, 3 miles southeast of Forbing, 0.1 mile east on Leonard Road, 150 feet north of road; Spanish Land Grant 22, T. 16 N., R. 13 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable; many roots; strongly acid; clear wavy boundary.

A2—4 to 8 inches; pale brown (10YR 6/3) silt loam; few fine faint yellowish brown mottles; weak medium subangular blocky structure; friable; many roots; strongly acid; clear wavy boundary.

B21t—8 to 17 inches; red (2.5YR 4/6) silty clay; common fine distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; few roots; thin discontinuous clay films; very strongly acid; gradual wavy boundary.

B22t—17 to 46 inches; light brownish gray (10YR 6/2) silty clay; many medium prominent red (2.5YR 4/6) and few fine prominent red (10R 4/6) mottles; moderate medium subangular blocky structure; firm; few roots; thin discontinuous clay films; very strongly acid; gradual wavy boundary.

B3—46 to 56 inches; yellowish red (5YR 5/6) clay; many medium prominent light brownish gray (2.5Y 6/2) mottles; moderate fine subangular blocky structure; firm; medium acid; gradual smooth boundary.

C—56 to 65 inches; dark red (2.5YR 3/6) clay; massive; firm; few black stains; medium acid.

The solum ranges from 40 to 60 inches in thickness. It ranges from medium acid to strongly acid in the A horizon, from neutral to very strongly acid in the Bt horizon, and from medium acid to mildly alkaline in the lower part of the B3 and C horizons.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3.

The upper part of the B2t horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. The lower part has hue of 10YR, value of 6, and chroma of 1 or 2. The B2t horizon is clay or silty clay. Mottles are in shades of brown and gray in the upper part and red and brown in the lower part.

The lower part of the B3 horizon and the C horizon has hue of 2.5YR or 5YR. Few to common nodules of calcium carbonate that range up to 20 millimeters in size are present in some pedons.

Guyton series

The Guyton series consists of poorly drained, slowly permeable soils that formed in silty alluvium of Pleistocene age. These soils are on broad flats and on alluvial plains throughout the uplands in the parish. Slope is mainly less than 1 percent. Guyton soils are saturated with water late in winter and early in the spring.

Guyton soils are geographically closely associated with the Bonn, Metcalf, and Wrightsville soils. Bonn soils have a natric horizon and are neutral to alkaline in the B2t horizon. Metcalf soils are at higher elevations, are better drained, and have a clayey IIB horizon below 30 inches. Wrightsville soils are at slightly lower elevations and have a fine control section.

Typical pedon of Guyton silt loam, in an area of Guyton soils, frequently flooded, 1.7 miles northwest of Greenwood, on oilfield road, 70 feet south of road; SW1/4NE1/4 sec. 14, T. 17 N., R. 16 W.

A1—0 to 3 inches; brown (10YR 5/3) silt loam; common fine grayish brown (10YR 5/2) mottles; weak fine granular structure; friable; many fine and medium roots; common pores; few fine brown concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

A2g—3 to 21 inches; light brownish gray (2.5Y 6/2) silt loam with common medium distinct brown (10YR 4/3) mottles; weak medium subangular blocky structure; friable; many fine roots; common fine pores; common medium concretions; strongly acid; clear irregular boundary.

B&A—21 to 34 inches; grayish brown (10YR 5/2) silty clay loam (B); many medium distinct light yellowish brown (2.5Y 6/4) and few fine distinct brown (10YR 4/3) mottles; moderate medium subangular blocky structure; firm, plastic; common roots; common fine pores; common hard concretions up to 10 millimeters wide (iron and manganese oxides); thin discontinuous clay films; tongues of light brownish gray silt loam (A2) as much as 1 inch wide make up about 20 percent of the horizon; strongly acid; clear wavy boundary.

B21tg—34 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/8) and brown (10YR 4/3) mottles; moderate medium subangular blocky structure; firm; common roots; common fine pores; thin discontinuous clay films; few medium brown concretions (iron and manganese oxides); gray (10YR 6/1) around dead roots; strongly acid.

The solum ranges from 52 to 80 inches in thickness. It ranges from medium acid to strongly acid in the A horizon. The upper part of the B2 horizon ranges from strongly acid to very strongly acid, and the lower part ranges from moderately alkaline to strongly acid.

The A1 or Ap horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. The A2g horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. Mottles are in shades of brown. Tongues of soil material from the A2 horizon extend into the Bt horizon.

The Btg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is silt loam, silty clay loam, or clay loam. Mottles are strong brown or yellowish brown.

Guyton Variant

The Guyton Variant consists of poorly drained, slowly permeable soils that formed in silty sediments of late Pleistocene age. These soils are on low terraces east of Oil City. Slope is less than 1 percent. These soils are saturated with water in late winter and early spring.

Guyton Variant differs from the Guyton soils by having a thinner solum and by being over a platy, weakly cemented loam material, which is at a depth of about 45 inches.

Guyton Variant is geographically closely associated with the Messer Variant. The Messer Variant is on convex ridges, are moderately well drained, and have a coarse-silty control section.

Typical pedon of Guyton Variant, in an area of Messer Variant-Guyton Variant complex, gently undulating, 1.8 miles east of Oil City on oilfield road, 200 feet south of road along ditch, 50 feet east of ditch; NW1/4NE1/4 sec. 8, T. 20 N., R. 15 W.

O1—1 inch to 0; decomposed hardwood leaves and matted roots.

A1—0 to 6 inches; dark gray (5YR 4/1) silty clay; weak medium fine subangular blocky structure; many fine faint reddish brown mottles; very firm; many roots; many fine pores; slightly acid; abrupt wavy boundary.

IIA—6 to 14 inches; light brownish gray (2.5Y 6/2) silt loam; few fine distinct reddish brown (5YR 4/4) mottles; weak coarse subangular blocky structure; friable; common fine roots; many fine pores; thick dark grayish brown clay flows on vertical faces of peds; medium acid; clear irregular boundary.

IIB&A—14 to 21 inches; light brownish gray (2.5Y 6/2) silty clay loam (B); few fine distinct yellowish brown mottles; weak coarse prismatic structure; hard when dry, friable when moist; few fine roots; many fine pores; thick discontinuous dark clay films on faces of peds; tongues of gray silt loam (A) make up about 15 percent of the horizon; medium acid; clear irregular boundary.

IIB22tg—21 to 45 inches; light brownish gray (2.5Y 6/2) loam; many coarse distinct yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure; friable; few fine roots; common fine pores; thick patchy clay films on faces of peds and in channels; few tongues of gray silt loam in upper part; medium acid; clear wavy boundary.

IICg—45 to 60 inches; stratified light brownish gray (10YR 6/2) weakly cemented loam; few medium distinct yellowish brown (10YR 5/4) mottles; massive; horizontal plates about 1 to 3 centimeters thick; firm; few fine roots between plates; thin patchy dark gray stains on surfaces of plates; few thin patches of white crystals between plates; slightly acid.

The solum ranges to 60 inches or more in thickness. It ranges from neutral to slightly acid in the A1 horizon and from medium acid to slightly acid in the IIA and IIB horizons.

The A1 horizon has hue of 5YR or 10YR, value of 3 or 4, and chroma of 1 or 2.

The IIA horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 2.

The Bt horizon has hue of 2.5Y, value of 5 or 6, and chroma of 2. It is silt loam, loam, or silty clay loam. Mottles are in shades of yellow and brown and range from few to many.

Keithville series

The Keithville series consists of moderately well drained, very slowly permeable soils that formed in loamy and clayey sediments of Tertiary age. These soils are in the uplands, mostly in the southwestern part of the parish. Slope ranges from 2 to 5 percent.

Keithville soils are geographically closely associated with the Metcalf and Woodtell series. Metcalf soils are at lower elevations and have tongues of albic material in the Bt horizon. Woodtell soils are on adjacent side slopes and have a fine control section.

Typical pedon of Keithville very fine sandy loam, 2 to 5 percent slopes, 4.5 miles south of Keithville, 60 yards south of intersection of Keithville-Keatchie and Stonewall Roads, 25 yards west of Keithville-Keatchie Road; SE1/4NW1/4 sec. 24, T. 15 N., R. 15 W.

A1—0 to 3 inches; brown (10YR 4/3) very fine sandy loam; weak fine granular structure; very friable;

many fine and medium roots; many fine pores; few fine dark brown concretions (iron and manganese oxides); medium acid; clear smooth boundary.

A2—3 to 9 inches; yellowish brown (10YR 5/4) very fine sandy loam; weak fine granular structure; very friable; common fine roots; many fine pores; few fine brown concretions (iron and manganese oxides); medium acid; clear smooth boundary.

B21t—9 to 16 inches; yellowish red (5YR 5/8) loam; moderate medium subangular blocky structure; friable; common fine roots; common fine pores; thin discontinuous clay films on surfaces of peds and in pores; common fine dark brown concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

B22t—16 to 22 inches; yellowish red (5YR 4/6) loam; moderate medium subangular blocky structure; friable; common fine roots; common fine pores; thin discontinuous clay films on surfaces of peds and in pores; common fine dark brown concretions (iron and manganese oxides); strongly acid; clear wavy boundary.

B23t—22 to 30 inches; strong brown (7.5YR 5/6) loam; few fine distinct light grayish brown mottles; moderate medium subangular blocky structure; friable; few fine roots; common fine pores; thin discontinuous clay films on surfaces of peds and in pores; thin light yellowish brown silt coats on vertical faces of some peds; strongly acid; clear wavy boundary.

B&A—30 to 35 inches; strong brown (7.5YR 5/6) loam (B2t); many coarse distinct light yellowish brown (10YR 6/4) and red (2.5YR 4/6) mottles and few fine distinct light grayish brown mottles; moderate medium subangular blocky structure; friable; few fine roots; many fine pores; thin discontinuous clay films in pores and channels; light brownish gray silt coats that are 2 to 5 millimeters thick make up 15 percent of horizon (A2); many fine and medium brown concretions (iron and manganese oxides); strongly acid; abrupt wavy boundary.

IIB24t—35 to 43 inches; gray (10YR 6/1) silty clay; many medium prominent red (2.5YR 4/6) and few medium distinct brownish yellow (10YR 6/6) mottles; weak very coarse prismatic structure parting to weak medium subangular blocky; firm; common fine roots; distinct discontinuous clay films on surface of peds; few fine black concretions (iron and manganese oxides); very strongly acid; gradual wavy boundary.

IIB3t—43 to 70 inches; light brownish gray (2.5Y 6/2) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; black stains in root channels; very strongly acid.

The solum ranges from 60 to 100 inches in thickness. The clayey IIB horizon ranges in depth from 30 to 40 inches. The solum ranges from medium acid to very strongly acid.

The A1 or Ap horizon has hue of 10YR, value of 3 to 6, and chroma of 2 to 4. Where present, the A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is very fine sandy loam or loam.

The B2t horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 6 to 8, or it has hue of 10YR, value of 5 or 6, and chroma of 6 to 8. It is loam, silt loam, or silty clay loam. Total content of sand, which is dominantly very fine sand, ranges from 25 to 40 percent.

The B part of the B&A horizon is mottled in hue of 2.5YR through 10YR, value of 3 through 6, and chroma of 3 through 6. It is silt loam, clay loam, loam, or silty clay loam. The A part of the B&A horizon is grayish silt or very fine sand.

The IIBt horizon is mottled in shades of gray, red, and brown. It is silty clay or clay.

Messer series

The Messer series consists of moderately well drained, slowly permeable soils that formed in silty alluvium of both Pleistocene and Tertiary age. These soils are on small, convex mounds throughout most of the uplands in the parish. The mounds are from 2 to 4 feet high and 50 to 150 feet in diameter. Slope is dominantly less than 3 percent but ranges to 10 percent on the side slopes.

Messer soils are geographically closely associated with the Guyton, Metcalf, and Wrightsville soils. The associated soils are in areas between mounds. Guyton soils are gray throughout. Metcalf soils have a clayey IIB horizon below 30 inches. Wrightsville soils are gray throughout and have a fine clayey control section.

Typical pedon of Messer very fine sandy loam, in an area of Wrightsville-Messer complex, 2.5 miles west of Mooringsport, 300 feet south of Hereford Road; SE1/4SW1/4 sec. 33, T. 20 N., R. 16 W.

A1—0 to 3 inches; brown (10YR 5/3) very fine sandy loam; weak fine granular structure; very friable; many fine roots; few fine pores; medium acid; abrupt smooth boundary.

A2—3 to 6 inches; yellowish brown (10YR 5/4) very fine sandy loam; weak fine granular structure; very friable; many fine and medium roots; many fine pores; medium acid; clear wavy boundary.

B1—6 to 28 inches; yellowish brown (10YR 5/6) very fine sandy loam; weak coarse subangular blocky structure; friable; many fine and medium roots; many fine pores; strongly acid; clear wavy boundary.

B&A—28 to 34 inches; yellowish brown (10YR 5/6) very fine sandy loam (B2); common fine faint strong brown mottles; moderate medium subangular blocky structure; friable; many fine and medium roots; many fine pores; thin patchy clay films on faces of peds; few tongues of pale brown silt loam (A2); strongly acid; gradual wavy boundary.

B22t—34 to 54 inches; yellowish brown (10YR 5/4) loam; common fine faint strong brown mottles; moderate medium subangular blocky structure; friable; common fine roots; thick continuous clay films on faces of peds; few tongues of pale brown silt loam; strongly acid; abrupt wavy boundary.

B3g—54 to 62 inches; gray (10YR 6/1) clay loam; many medium prominent strong brown and yellowish red mottles; moderate medium subangular blocky structure; firm; thick continuous clay films on faces of peds; few thin silt coats on vertical faces of some peds; strongly acid.

The solum ranges from 60 to 100 inches in thickness. It ranges from medium acid to very strongly acid in the A horizon and the upper part of the B horizon and from neutral to very strongly acid in the lower part.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4.

The B1 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. It is very fine sandy loam or silt loam.

The Bt horizon has hue of 10YR, value of 5 to 6, and chroma of 4 to 6. It is loam, clay loam, or silty clay loam. Tongues of pale brown silt loam are present in most pedons. Mottles are strong brown, yellowish red, or red.

Messer Variant

The Messer Variant consists of moderately well drained, moderately rapidly permeable soils that formed in loamy sediments of late Pleistocene age. These soils are on low ridges in the uplands, immediately east of Oil City. Slope is dominantly less than 3 percent.

The Messer Variant differs from the Messer soils by having more fine sand in the B horizon and by being slightly more alkaline throughout the solum.

Messer Variant is geographically closely associated with the Guyton Variant. The Guyton Variant is in swales and is poorly drained.

Typical pedon of Messer Variant, in an area of Messer Variant-Guyton Variant complex, gently undulating, 1.4 miles east of Oil City, 100 feet south of oilfield road; NW1/4NW1/4 sec. 8, T. 20 N., R. 15 W.

A1—0 to 6 inches; dark reddish brown (5YR 3/4) silty clay; moderate medium subangular blocky structure; very firm; many fine and medium roots; slightly acid; abrupt wavy boundary.

IIA12—6 to 14 inches; brown (10YR 5/3) fine sandy loam; massive; very friable; common fine and medium roots; few fine soft brown accumulations (iron and manganese oxides); slightly acid; clear wavy boundary.

IIB2t—14 to 21 inches; brown (7.5YR 5/4) fine sandy loam; many fine strong brown mottles; weak medium subangular blocky structure; common fine roots; thin patchy clay films on surfaces of peds; few thin lamellae; many soft brown and black accumulations (iron and manganese oxides); few streaks and pockets of pale brown loamy fine sand in lower part of horizon; slightly acid; clear wavy boundary.

IIB&A—21 to 34 inches; brown (7.5YR 5/4) fine sandy loam (B); many fine strong brown mottles; weak coarse subangular blocky structure; common fine roots; pale brown streaks up to 10 centimeters wide and ped coatings (A) make up about 20 percent of horizon; thin patchy, clay films on surfaces of peds; common soft brown and black accumulations (iron and manganese oxides); slightly acid; clear wavy boundary.

IIB'2t—34 to 60 inches; brown (7.5YR 5/4) sandy loam; many strong brown mottles; moderate medium subangular blocky structure; friable; slightly brittle; few fine roots; streaks of pale brown loamy fine sand make up about 10 percent of horizon; thin patchy clay films; common soft black accumulations (iron and manganese oxides); slightly acid.

The solum ranges from 60 to 100 inches in thickness. It ranges from neutral to slightly acid in the A1 horizon and from slightly acid to medium acid in the IIA and IIB horizons.

The A1 horizon has hue of 5YR, value of 3, and chroma of 2 or 3.

The IIA horizon has hue of 7.5YR, value of 4, and chroma of 2 to 4. It is fine sandy loam or sandy loam.

The Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is fine sandy loam or sandy loam. Mottles are in shades of brown.

Metcalf series

The Metcalf series consists of somewhat poorly drained, very slowly permeable soils that formed in loamy and clayey sediments of Tertiary age. These soils are in the uplands, mostly in the southwestern part of the parish. Slope is dominantly less than 1 percent but ranges up to 2 percent.

Metcalf soils are geographically closely associated with the Guyton, Keithville, Bowie, and Woodtell soils. Guyton soils are adjacent to drainageways, have color chroma of less than 2 throughout, and do not have a clayey IIB horizon. Keithville soils are on higher lying, convex ridges; have redder hues; and do not have tongues of albic material in the Bt horizon. Bowie soils are also on higher lying, convex ridges; have a fine-loamy control section; and lack a clayey IIB horizon. Woodtell soils are on adjacent side slopes and have a fine control section and vertic properties.

Typical pedon of Metcalf silt loam, in an area of Metcalf-Messer complex, 1.6 miles west of Keithville, 400 feet west of Keith Road; NW1/4NW1/4 sec. 36, T. 16 N., R. 15 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many medium and fine roots; few fine pores; few worm casts; very strongly acid; clear smooth boundary.

A2—3 to 8 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct strong brown (7.5YR

5/8) mottles; weak medium subangular blocky structure; friable; many fine roots; common fine pores; few worm casts; dark grayish brown material in worm casts; common fine black concretions (iron and manganese oxides); very strongly acid; clear smooth boundary.

B21t—8 to 16 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; common fine roots; many fine pores; thin patchy clay films on surfaces of peds and in pores; few worm casts; light yellowish brown material in worm casts; few fine black concretions (iron and manganese oxides); very strongly acid; clear wavy boundary.

B22t—16 to 23 inches; yellowish brown (10YR 5/4) loam, many medium prominent red (2.5YR 4/8) and few medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; common fine roots; common fine pores; thin patchy clay films on surfaces of peds and in pores; few black concretions (iron and manganese oxides); very strongly acid; clear wavy boundary.

B23t—23 to 30 inches; yellowish brown (10YR 5/4) loam; common continuous red bands 1/2 centimeter to 2 centimeters wide, vertically oriented; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; many common fine roots; common fine pores; thin discontinuous clay films on surface of peds and in pores; light brownish gray coats on some peds; few fine black concretions (iron and manganese oxides); very strongly acid; clear wavy boundary.

B&A'—30 to 38 inches; light brownish gray (10YR 6/2) loam (B); many coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse prisms that part to moderate medium subangular blocky structure; friable; few fine roots; common fine pores; thin patchy clay films in pores; few medium black concretions (iron and manganese oxides); common continuous red bands 1/2 centimeter to 2 centimeters wide, vertically oriented; gray silt tongues (A') 1 centimeter to 1 1/2 centimeters wide make up to 20 percent of the horizon; very strongly acid; clear wavy boundary.

IIB24t—38 to 55 inches; gray (10YR 6/1) clay; common medium prominent red (10R 4/8) and few medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prisms that part to angular blocky structure; firm; few fine roots; few fine pores; pressure faces on some vertical and horizontal faces of peds; thin patchy silt coats between prisms; very strongly acid; gradual wavy boundary.

IIB25t—55 to 65 inches; light brownish gray (2.5Y 6/2) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; many shiny faces on peds; very strongly acid.

The solum ranges from 60 to about 100 inches in thickness. The clayey IIB horizon ranges in depth from 27 to 40 inches. The solum ranges from very strongly acid to medium acid throughout.

The A1 or Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. Where present, the A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4.

The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 8. The lower part of the B2t horizon has few or common mottles of 1 or 2 chroma. Texture of the B2t horizon is loam, silt loam, or clay loam.

The B part of the B&A' horizon is in hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is silt loam, loam, or clay loam. The A' part of the B&A' horizon is a grayish, uncoated silt or very fine sand.

The IIBt horizon is mottled with shades of gray, red, and brown. It is silty clay or clay.

Meth series

The Meth series consists of well drained, moderately slowly permeable soils that formed in clayey and loamy sediments of Tertiary age. These soils are in the uplands in the west central and southwestern parts of the parish. Slope is dominantly less than 5 percent but ranges to as much as 8 percent.

Meth soils are geographically closely associated with the Bowie, Ruston, and Woodtell soils. Bowie soils have a fine-loamy control section, have plinthite, and have less than 35 percent base saturation. Ruston soils are on higher lying, convex ridges and have a fine-loamy control section. Woodtell soils are adjacent to Meth soils on lower side slopes, have a fine control section, and have vertic properties.

Typical pedon of Meth fine sandy loam, 1 to 3 percent slopes, 3 miles southeast of Bethany, 0.2 mile northeast on pipeline, 0.3 mile north on access road, 100 yards south of old house site; NW1/4SE1/4 sec. 27, T. 16 N., R. 16 W.

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine and medium granular structure; very friable; many fine and medium roots; many fine pores; many fine ironstone fragments; strongly acid; clear smooth boundary.

A2—7 to 12 inches; brown (7.5YR 5/4) fine sandy loam; weak fine and medium granular structure; very friable; common fine roots; few fine pores; many fine ironstone fragments up to 5 millimeters; strongly acid; clear smooth boundary.

B21t—12 to 24 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; few fine and medium roots; few fine pores; friable; continuous clay films on faces of peds; very strongly acid; clear smooth boundary.

B22t—24 to 32 inches; red (2.5YR 4/6) clay; common medium to coarse yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; friable; few fine roots; many fine pores; few discontinuous pale brown coatings on vertical faces of peds; continuous clay films on faces of peds; very strongly acid; clear wavy boundary.

B23t—32 to 46 inches; red (10R 4/8) sandy clay loam; weak coarse prismatic structure parting to strong medium and coarse subangular blocky; firm and slightly brittle; pale brown coatings on vertical faces of peds; few fine and medium roots; common fine pores; distinct continuous clay films; pockets of yellowish brown sandy loam; few shiny mica flakes; many sand grains are black; very strongly acid; gradual wavy boundary.

B3—46 to 62 inches; yellowish red (5YR 5/8) sandy clay; weak coarse subangular blocky structure; firm; pockets and streaks on light brownish gray fine sand; few pockets of red sandy loam; many sand grains are black; very strongly acid.

The solum ranges from 60 to 80 inches in thickness. It ranges from medium acid to strongly acid in the A horizon and from medium acid to very strongly acid in the B horizon.

The A1 or Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The A2 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6.

The B2t horizon has hue of 2.5YR, 5YR, or 10R; value of 3 to 5; and chroma of 4 to 8. It is clay loam, clay, or sandy clay in the upper part and is sandy clay loam, fine sandy loam, or sandy loam in the lower part. Mottles are in shades of brown, red, or yellow.

The B3 horizon is in shades of red, yellow, and gray. It is sandy clay, sandy clay loam, fine sandy loam, or sandy loam. Pockets and streaks of uncoated sand grains are common.

Moreland series

The Moreland series consists of somewhat poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are on the lower part of the natural levees of the Red River alluvial plain in the eastern part of the parish. Slope is dominantly less than 1 percent but ranges to as much as 3 percent.

Moreland soils are geographically closely associated with the Armistead, Buxin, Norwood, and Severn soils. Armistead soils are at slightly higher elevations than the Moreland soils, and they have a fine-silty control section. Buxin soils are in depressions and have dark gray buried horizons within 20 to 40 inches of the surface. Norwood soils are at slightly higher elevations, lack a mollic epipedon, and have a fine-silty control section. Severn soils are also at higher elevations, lack a mollic epipedon, and have a coarse-silty control section.

Typical pedon of Moreland clay, within the city limits of Shreveport, on North Way Road about 0.2 mile south of its intersection with North Hearne Ave., 120 feet east of North Way Road; NW1/4SE1/4 sec. 23, T. 18 N., R. 14 W.

Ap—0 to 5 inches; dark reddish brown (5YR 3/2) clay; moderate fine granular structure; firm; many fine and medium roots; mildly alkaline; clear smooth boundary.

A1—5 to 13 inches; dark reddish brown (5YR 3/3) silty clay; moderate fine subangular blocky structure; firm; common fine and medium roots; weak effervescence; mildly alkaline; clear wavy boundary.

B21—13 to 29 inches; dark reddish brown (5YR 3/4) silty clay; few fine distinct dark gray mottles in lower part of the horizon; moderate fine subangular blocky structure; firm; few fine roots; common slickensides; strong effervescence; few charcoal fragments; moderately alkaline; gradual wavy boundary.

B22—29 to 52 inches; dark reddish brown (5YR 3/3) silty clay; many fine distinct dark gray (10YR 4/1) mottles; strong fine subangular blocky structure; firm; common slickensides; few fine black concretions (iron and manganese oxides); few fine soft calcium carbonate accumulations; strong effervescence; moderately alkaline; gradual wavy boundary.

B3—52 to 65 inches; dark reddish brown (5YR 3/4) clay; few fine faint gray mottles; weak medium subangular blocky structure; firm; few slickensides; few fine soft calcium carbonate accumulations; strong effervescence; moderately alkaline.

The solum ranges from 40 to 80 inches in thickness. It ranges from mildly alkaline to slightly acid in the A horizon and from moderately alkaline to neutral in the B horizon. Calcareous layers range in depth from 10 to 40 inches.

This soil has cracks at some time in most years. These cracks are 1 centimeter or more wide at a depth of 50 centimeters. The cracks are at least 30 centimeters long in some parts; they extend upward to the surface or the base of the Ap horizon. The COLE (Coefficient of Linear Extensibility) is 0.09 or more, and the potential linear extensibility is 6 centimeters or more in the upper 1 meter of soil.

The A horizon has hue of 7.5YR or 5YR, value of 2 or 3, and chroma of 2 or 3. It is clay, silty clay loam, or silt loam.

The B horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 3 or 4. It is clay, silty clay, or silty clay loam. Thin strata of lighter textured material are common at depths of greater than 30 inches. Grayish mottles are present within 30 inches of the surface. Few to common, soft calcium carbonate accumulations are present in some pedons.

The Moreland silt loam is a taxadjunct to the Moreland series because it has a reddish brown (5YR 4/4) Ap horizon, which is 1 hue and 1 value too high for both a mollic epipedon and for the range of the series. This difference, however, does not affect use and management of these soils.

Norwood series

The Norwood series consists of well drained, moderately permeable soils that formed in calcareous, loamy alluvium. These soils are on natural levees of the Red River alluvial plain. Slope is dominantly less than 1 percent.

Norwood soils are geographically closely associated with the Armistead, Moreland, and Severn soils. Armistead soils are at a slightly lower elevation than Norwood soils. They have a mollic epipedon and an argillic horizon. Moreland soils are also at lower elevations, have a mollic epipedon, and are clayey throughout. Severn soils are at slightly higher elevations than the Norwood soils, and they have a coarse-silty control section.

Typical pedon of Norwood silt loam, 1.1 miles south of Caspiana on Louisiana 1, 0.2 mile north from Louisiana 1 on Roberson Road; 179 feet east of road in cotton field; NW1/4NW1/4 sec. 19, T. 15 N., R. 11 W.

Ap—0 to 10 inches; reddish brown (5YR 4/3) silt loam; weak fine granular structure; friable; many fine and medium roots; many fine pores; common worm casts; calcareous; moderately alkaline; clear smooth boundary.

C1—10 to 23 inches; reddish brown (5YR 4/4) silt loam; bedding planes evident; massive but parts along bedding planes to platy fragments; friable; strata of (5YR 5/6) yellowish red very fine sandy loam; calcareous; moderately alkaline; gradual smooth boundary.

C2—23 to 38 inches; reddish brown (5YR 4/4) silt loam; massive but parts along bedding planes to platy fragments; friable; few black stains; thin strata of reddish brown silty clay loam; calcareous; moderately alkaline; clear smooth boundary.

C3—38 to 46 inches; reddish brown (5YR 4/3) silt loam; massive but parts along bedding planes to platy fragments; friable; few black stains; thin strata of silty clay loam; calcareous; moderately alkaline; clear smooth boundary.

C4—46 to 65 inches; reddish brown (5YR 4/3) silty clay loam; massive; firm; many black stains; calcareous; moderately alkaline.

The solum ranges from 3 to 44 inches in thickness. Bedding planes are evident throughout the soil. Reaction ranges from moderately alkaline or mildly alkaline in the A horizon and moderately alkaline in the C horizon.

The A horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 3 or 4. It is silt loam or silty clay loam.

Where present, the B2 horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 3 to 6. It is silt loam, silty clay loam, or loam.

The C horizon has hue of 5YR or 7.5YR, value of 4 to 7, and chroma of 3 to 6. It is silt loam, silty clay loam, or very fine sandy loam. Thin strata of coarser and finer materials are common. Horizons of buried soils are in some pedons below a depth of 40 inches.

Ruston series

The Ruston series consists of well drained, moderately permeable soils that formed in loamy sediments of both Pleistocene age and Tertiary age. These soils are on ridgetops in the uplands throughout most of the parish. Slope is dominantly less than 5 percent but ranges to as much as 8 percent along local drainageways.

Ruston soils are geographically closely associated with the Briley, Bowie, Sacul, and Smithdale soils. Briley soils are on higher lying, convex ridgetops and have a thick sandy surface layer. Bowie soils are on lower lying parts of the landscape and have more than 5 percent plinthite in the argillic horizon. Sacul soils are on adjacent side slopes and have a clayey control section. Smithdale soils are also on adjacent side slopes and are not bisequal.

Typical pedon of Ruston fine sandy loam, 1 to 5 percent slopes, about 3.8 miles west of Gilliam, 400 feet east of road, 50 feet north of pipeline; NE1/4NW1/4 sec. 10, T. 21 N., R. 15 W.

Ap—0 to 5 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium granular structure; friable; many fine roots and pores; medium acid; clear smooth boundary.

A2—5 to 12 inches; yellowish brown (10YR 5/4) fine sandy loam; few spots of yellowish red (5YR 5/6) fine sandy loam; weak medium subangular blocky structure; very friable; many fine roots and pores; few fine streaks of uncoated sand grains; medium acid; clear smooth boundary.

B21t—12 to 32 inches; red (2.5YR 4/6) sandy clay loam; moderate fine subangular blocky structure; friable; common fine and medium roots; thick continuous dark red clay films on faces of peds; strongly acid; gradual wavy boundary.

B22t—32 to 58 inches; red (2.5YR 4/8) sandy clay loam; moderate medium subangular blocky structure; friable; thin continuous dark red clay films on faces of peds; few fine brown concretions (iron and manganese oxides); strongly acid; gradual wavy boundary.

B&A'2—58 to 67 inches; red (2.5YR 4/8) sandy loam (B); about 10 percent light yellowish brown (10YR 6/4) fine sandy loam (A'2); thin patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

B'24t—67 to 85 inches; red (10R 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; somewhat brittle; thin patchy clay films on faces of peds in upper part of the horizon and thin continuous clay films on faces of peds in lower part of the horizon; few pockets of light yellowish brown fine sandy loam; strongly acid.

The solum is greater than 60 inches thick. It ranges from slightly acid to strongly acid in the A horizon and from medium acid to very strongly acid in the B horizon.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4.

The Bt horizon has hue of 2.5YR, 5YR, or 10R; value of 4 to 6; and chroma of 4 to 8. It is sandy clay loam, loam, or clay loam. Ironstone fragments are present in some pedons.

The B't horizon is similar in color to the Bt horizon but most pedons are mottled in shades of gray and brown. It is sandy clay loam or fine sandy loam.

The A'2 horizon has hue of 10YR, value of 5 to 6, and chroma of 3 or 4. It is fine sandy loam or sandy loam and is in streaks and pockets that make up to 50 percent of the B&A'2 horizon.

Sacul series

The Sacul series consists of moderately well drained, moderately slowly permeable soils that formed in loamy and clayey sediments of Tertiary age. These soils are in the uplands in the northern part of the parish. Slope is dominantly less than 15 percent but ranges to as much as 20 percent along local drainageways.

Sacul soils are geographically closely associated with the Bowie and Ruston soils. Bowie soils are at slightly lower elevations, have a fine-loamy control section, and have plinthite in the lower part of the subsoil. Ruston soils are on high, convex ridges and have a fine-loamy control section.

Typical pedon of Sacul fine sandy loam, 1 to 5 percent slopes, 3.8 miles northwest of Ida from intersection of U.S. Highway 171, 2 miles north on hard surface road, 0.4 mile west on access road; SW1/4NE1/4 sec. 6, T. 23 N., R. 15 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; friable; many fine and medium roots; about 10 percent by volume of ironstone fragments; strongly acid; clear smooth boundary.

A2—4 to 13 inches; pale brown (10YR 6/3) fine sandy loam; massive; friable; many fine roots; about 10 percent by volume of ironstone fragments; strongly acid; clear smooth boundary.

B21t—13 to 24 inches; red (2.5YR 4/6) clay; moderate fine and medium subangular blocky structure; firm; common fine roots; common fine pores; distinct continuous clay films; less than 10 percent by volume of ironstone fragments; strongly acid; clear smooth boundary.

B22t—24 to 38 inches; red (2.5YR 4/8) sandy clay; common medium strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; common fine roots; common fine pores; thin continuous clay films; very strongly acid; clear wavy boundary.

B3t—38 to 42 inches; red (2.5YR 4/6) clay loam; common medium prominent light gray (10YR 7/1) mottles; weak thick platy structure; firm; few roots; common pores; discontinuous clay films; very strongly acid; clear wavy boundary.

C—42 to 60 inches; variegated red (2.5YR 4/6), gray (10YR 6/1) and strong brown (7.5YR 5/8) sandy clay loam and sandy loam; massive; firm; common voids and pores; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Gray mottles begin 7 to 24 inches from the top of the B2t horizon. The solum ranges from strongly acid to very strongly acid throughout. Ironstone fragments in varying amounts are throughout the upper part of the solum. In some pedons they are in the lower part of the solum.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. The A2 horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 to 6; and chroma of 3 to 8.

The Bt horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 6 to 8. The upper 20 inches of the Bt horizon is clay, clay loam, or sandy clay but averages about 45 percent clay. The lower part of the Bt horizon is sandy clay loam, clay loam, or sandy loam.

The C horizon has colors of brown, red, and gray. It ranges from sandy loam to clay loam.

Severn series

The Severn series consists of well drained, moderately rapidly permeable soils that formed in loamy and sandy, calcareous alluvium on natural levees of the Red River alluvial plain. These soils are near the present or recently abandoned courses of the Red River in the eastern part of the parish. Slope is dominantly less than 1 percent but ranges to 3 percent.

Severn soils are geographically closely associated with the Moreland and Norwood soils. Moreland soils are mostly at lower elevations, have a mollic epipedon, and have a fine control section. Norwood soils are mostly at slightly lower elevations and have a fine-silty control section.

Typical pedon of Severn very fine sandy loam, occasionally flooded, 3 miles southeast of Caspiana, 150 feet west of river bank; SE1/4SE1/4 sec. 21, T. 15 N., R. 11 W.

A11—0 to 2 inches; dark brown (7.5YR 3/2) very fine sandy loam; weak fine granular structure; friable; many fine roots; calcareous; moderately alkaline; abrupt smooth boundary.

A12—2 to 6 inches; reddish brown (5YR 4/3) very fine sandy loam; weak fine granular structure; friable; many fine roots; calcareous; moderately alkaline; gradual smooth boundary.

C1—6 to 31 inches; reddish brown (5YR 4/4) very fine sandy loam; massive; very friable; many fine roots; few thin strata of loam and silt loam; calcareous; moderately alkaline; clear smooth boundary.

C2—31 to 43 inches; reddish brown (5YR 4/4) very fine sandy loam; massive; very friable; strata of loam and silt loam; calcareous; moderately alkaline; clear smooth boundary.

C3—43 to 60 inches; reddish brown (5YR 4/4) loamy very fine sand; massive; very friable; thin strata of very fine sandy loam; calcareous; moderately alkaline.

The solum ranges from 6 to 16 inches in thickness. Reaction is mildly alkaline or moderately alkaline in the A horizon and moderately alkaline in the C horizon. The soils are calcareous in all horizons below 10 inches and are calcareous throughout in most pedons.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 3 or 4.

The C horizon has hue of 2.5YR or 5 YR, value of 4 to 6, and chroma of 4 to 6. Bedding planes are evident throughout the C horizon.

Smithdale series

The Smithdale series consists of well drained, moderately permeable soils that formed in loamy sediments of Tertiary age. These soils are on side slopes in the uplands, mostly in the northern part of the parish. Slope is dominantly 12 to 20 percent.

Smithdale soils are geographically closely associated with the Briley, Sacul, and Ruston soils. Briley soils are on higher lying, convex ridgetops and have a thick, sandy surface layer. Ruston soils are also on higher lying, convex ridgetops and are bisequal. Sacul soils are adjacent to Smithdale soils on side slopes, and they have a clayey control section.

Typical pedon of Smithdale fine sandy loam, 12 to 20 percent slopes, 3.8 miles west of Gilliam, 600 feet east of Mt. Gilead-Mailbox Road; SE1/4NW1/4 sec. 10, T. 21 N., R. 15 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear smooth boundary.

A2—4 to 11 inches; dark brown (7.5YR 4/4) fine sandy loam; weak medium granular structure; very friable; many fine and medium roots; strongly acid; clear smooth boundary.

B1—11 to 16 inches; strong brown (7.5YR 5/6) fine sandy loam; weak fine subangular blocky structure; friable; many fine and medium roots; thin patchy clay films on faces of peds; strongly acid; clear wavy boundary.

B21t—16 to 39 inches; red (10R 4/6) sandy clay loam; moderate coarse subangular blocky structure; friable; common fine roots; many fine pores; continuous thick clay films on faces of peds; strongly acid; clear smooth boundary.

B22t—39 to 49 inches; red (2.5YR 4/8) sandy loam; weak coarse subangular blocky structure; common fine roots; discontinuous thick clay films on faces of peds; few fine pockets of uncoated sand; strongly acid; clear wavy boundary.

B23t—49 to 63 inches; red (2.5YR 4/8) sandy loam; weak coarse subangular blocky structure; few fine roots; discontinuous thick clay films on surfaces of peds; many streaks and pockets of yellowish red; strongly acid.

The solum ranges from 60 inches to more than 100 inches in thickness. It ranges from strongly acid to very strongly acid throughout.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4.

The B1 horizon has hue of 7.5YR or 5YR, value of 5, and chroma of 6 to 8.

The B21t horizon has hue of 10R, 5YR, or 2.5YR; value of 4 or 5; and chroma of 6 to 8. It is sandy clay loam, clay loam, or loam.

The B22t and B23t horizons have the same color range as that of the B21t horizon. These two horizons are sandy loam or loam.

Woodtell series

The Woodtell series consists of moderately well drained, very slowly permeable soils that formed in stratified loamy and clayey sediments of Tertiary age. These soils are in the uplands in the west-central and southwestern part of the parish. Slope is dominantly less than 12 percent but ranges to 20 percent along drainageways.

Woodtell soils are geographically closely associated with the Bowie, Keithville, and Meth soils. The three associated soils are on higher lying, convex ridges. The Bowie soils have a fine-loamy control section and have plinthite in the lower part of the subsoil. Keithville soils have a fine-silty control section. Meth soils lack vertic properties.

Typical pedon of Woodtell fine sandy loam, 1 to 3 percent slopes, 5 miles southeast of Greenwood, 40 yards south of Buncombe Road; NW1/4SE1/4 sec. 8, T. 16 N., R. 15 W.

A11—0 to 1 inch; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine granular structure; friable; many fine roots; many fine black concretions (iron and manganese oxides); few fine ironstone fragments; medium acid; abrupt smooth boundary.

A12—1 to 9 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; many fine and medium roots; many fine black concretions (iron and manganese oxides); common fine ironstone fragments; strongly acid; clear smooth boundary.

B21t—9 to 15 inches; red (2.5YR 4/8) clay; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; firm; common fine and medium roots; common fine pores; thin discontinuous clay films on surfaces of peds; few fine black concretions (iron and manganese oxides); very strongly acid; clear smooth boundary.

B22t—15 to 24 inches; red (2.5YR 4/6) clay; many medium prominent light brownish gray (2.5Y 6/2) and few fine distinct yellowish brown mottles; weak fine and medium subangular blocky structure; firm; common fine and medium roots; common fine pores; thin discontinuous clay films on surface of peds; very strongly acid; gradual smooth boundary.

B23t—24 to 44 inches; mottled gray (10YR 6/1), red (2.5YR 4/6), and yellowish brown (10YR 5/6) clay; weak fine and medium subangular blocky structure; firm; common fine and medium roots; common fine pores; thin discontinuous clay films on surfaces of peds; very strongly acid; gradual smooth boundary.

C1—44 to 54 inches; light brownish gray (2.5Y 6/2) clay; common medium prominent red (2.5YR 4/6) and yellowish red (5YR 5/6) mottles; weak medium subangular blocky structure; few fine and medium roots; common fine pores; very strongly acid; gradual smooth boundary.

C2—54 to 65 inches; light olive gray (5Y 6/2) and yellowish brown (10YR 5/6) shaly silty clay; weak medium platy structure; firm; few flattened roots between plates; few small spots of white crystals; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Reaction ranges from slightly acid to very strongly acid in the A and C horizons and is strongly acid to extremely acid in the Bt horizon.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. A thin A2 horizon is present in some pedons.

The upper part of the Bt horizon has hue of 2.5YR, 5YR, or 10R; value of 4 or 5; and chroma of 6 to 8. The lower part of the Bt horizon has hue of 2.5Y or 10YR, value of 6, and chroma of 1 or 2. Texture is clay or silty clay.

The C horizon is stratified shale, shaly clay, shaly silty clay, sandy loam, loam, or clay loam.

Wrightsville series

The Wrightsville series consists of poorly drained, very slowly permeable soils that formed in clayey alluvial sediments of Pleistocene age. These soils are in the uplands and are on the broad flats adjacent to the major lakes in the parish. Slope is less than 1 percent.

Wrightsville soils are geographically closely associated with the Forbing, Gore, and Metcalf soils. Forbing soils are on side slopes that are adjacent to Wrightsville soils. They have a very fine control section and have vertic properties. Gore soils are on higher lying, broad ridges; have chroma of more than 2; and lack tongues of albic material in the argillic horizon. Metcalf soils are on slightly higher areas, have chroma of more than 2 in the upper part of the solum, and have a fine-silty control section.

Typical pedon of Wrightsville silt loam, in an area of Wrightsville-Messer complex, 2.0 miles west of Hosston on Louisiana Highway 2, 100 feet west of gravel road; NW1/4NW1/4 sec. 27, T. 22 N., R. 15 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam; few fine faint grayish brown mottles; weak fine granular structure; friable; many fine roots; common medium black concretions (iron and manganese oxides); strongly acid; abrupt smooth boundary.

A2g—4 to 15 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown mottles; weak medium subangular blocky structure; friable; many fine and medium roots; few large roots; common fine pores; common medium black concretions (iron and manganese oxides); strongly acid; abrupt irregular boundary.

B&A—15 to 24 inches; light brownish gray (2.5Y 6/2) silty clay loam (B); few medium distinct yellowish brown mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common medium and large roots; distinct continuous clay films on faces of peds; common medium black concretions (iron and manganese oxides); tongues of light gray silt loam that are 1 to 2 inches wide (A) and extend through the horizon; very strongly acid; gradual wavy boundary.

B22tg—24 to 38 inches; light brownish gray (2.5Y 6/2) silty clay; few medium distinct yellowish brown mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few large roots; distinct continuous clay films on faces of peds; few streaks of light gray silt loam; common medium black concretions (iron and manganese oxides); very strongly acid; gradual wavy boundary.

B23tg—38 to 53 inches; light brownish gray (2.5Y 6/2) silty clay; few medium and coarse distinct yellowish brown mottles; weak medium prismatic structure; firm; distinct continuous clay films on faces of peds; few streaks and pockets of light gray silt loam; common medium black concretions (iron and manganese oxides); very strongly acid; gradual wavy boundary.

B3g—53 to 64 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; firm; common medium black concretions (iron and manganese oxides); very strongly acid.

The solum ranges from 40 to 70 inches in thickness. It ranges from strongly acid to extremely acid in the A horizon and B2t horizon and from moderately alkaline to extremely acid in the B3 horizon.

The A1 or Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. The A2 horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2.

The B horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. The upper part of the horizon is silty clay loam, silty clay, or clay, and the lower part is silty clay loam or silty clay.

Where present, the C horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 to 7; and chroma of 1 or 2. It ranges from silty clay to silty clay loam and is stratified in some pedons. Some pedons have a IIC horizon of reddish clay or silty clay between depths of 40 and 60 inches.

Formation of the soils

By Dr. Bobby J. Miller, Department of Agronomy, Agricultural Experiment Station, Louisiana State University.

In this section, the processes of soil formation are discussed and related to the soils in the survey area.

Processes of soil formation

The processes of soil formation are those processes or events in soils that influence the kind and degree of development of soil horizons. The rate and relative effectiveness of different processes are determined by the factors of soil formation: climate, living organisms, relief, parent material, and time.

Important soil forming processes include those that result in (1) additions of organic, mineral, and gaseous materials to the soil; (2) losses of these same materials from the soil; (3) translocation of materials from one point to another within the soil; and (4) physical and chemical transformation of mineral and organic materials within the soil (*14*).

Typically, many processes occur simultaneously in soils. Examples in the survey area include accumulation of organic matter, development of soil structure, and leaching of bases from some soil horizons. The contribution of a particular process may change over a period of time. For example, installation of drainage and water control systems can change the length of time some soils are flooded or saturated with water. Some important processes that have contributed to the formation of the soils in Caddo Parish are discussed in the following paragraphs.

Organic matter has accumulated, undergone partial decomposition, and been incorporated in all the soil. Organic matter production in soils is greatest in and above the surface layer. This results in the formation of soils that have a surface layer that is higher in organic matter content than the deeper horizons. The decomposition, incorporation, and mixing of organic residues into the soil is accomplished largely by the activity of living organisms. Many of the more stable products of decomposition remain as finely divided materials that contribute to darker colors, increased water holding, and cation exchange capacities and granulation in the soil.

The deposition of alluvial sediments on the surface has been important in the formation of several of the soils. Added sediments provide new parent material in which processes of soil formation must then begin; consequently, soils that have formed under these conditions may lack prominant horizons. The Severn and Norwood soils formed in recent, loamy deposits on natural levees of the Red River, and the Armistead, Buxin, and Moreland soils formed in areas characterized by accumulations of clayey backswamp deposits.

Processes that develop soil structure have occurred in all the soils. Plant roots and other organisms contribute to the rearrangement of soil materials into secondary aggregates. Decomposition products of organic residues and secretions of organisms serve as cementing agents that help stabilize structural aggregates. Alternate wetting and drying as well as shrinking and swelling contribute to the development of structural aggregates and are particularly effective in soils that have appreciable amounts of clay. Examples are the Armistead, Buxin, and Moreland soils.

About one-half of the soils in the parish have horizons in which reduction and segregation of iron and manganese compounds are important processes. Conditions that reduce these compounds prevail for long periods in poorly aerated horizons; consequently, the relatively soluble, reduced forms of iron and manganese are predominant over the less soluable, oxidized forms. Reduced compounds of these elements result in the gray colors in the Bg and Cg horizons that are characteristic of many of the soils in the parish. In the more soluable, reduced form, appreciable amounts of iron and manganese can be removed from the soils or translocated from one position to another within the soil by water. The presence of browner mottles in predominantly gray horizons is indicative of segregation and local concentration of oxidized iron compounds as a result of alternating oxidizing and reducing conditions in the soil. The well drained and somewhat excessively drained soils do not have the gray colors associated with wetness and poor aeration and apparently are not dominated by a reducing environment for significant periods of time.

Loss of components from the soils has been an important process in their formation. Water moving through the soil has leached many soluble components, including free carbonates that may have been present initially, from some horizons of most of the soils in the parish. The soils that formed in the recent Red River alluvium are less severely leached than other soils in the parish. In places the Moreland, Norwood, and Severn soils may have free calcium carbonate throughout the profile, which indicates these young soils have had little leaching. The upland soils that formed in deposits of Tertiary age are generally acid throughout and are the most highly leached soils in the parish. Although the soils that formed in sediments of Pleistocene age may be highly leached, particularly in the upper horizons, they are generally less severely leached than soils that formed in the older deposits of Tertiary age.

The formation, translocation, and accumulation of clay in the profile have been important processes during the formation of most of the soils in Caddo Parish. Silicon and aluminum released as a result of weathering of such minerals as hornblende, amphibole, and feldspars can recombine with the components of water to form secondary clay minerals, such as kaolinite. Layered silicate minerals, such as biotite, glauconite, and montmorillonite, can also weather to form other clay minerals, such as vermiculite or kaolinite. Clay accumulates in horizons largely from translocation from upper to lower horizons. As water moves downward, it can carry small amounts of clay in suspension. This clay is deposited and accumulates at the depths penetrated by water or in horizons where it becomes flocculated or filtered out by fine pores in the soil. Over long periods, such processes can result in distinct horizons of clay accumulation. All the soils in Caddo Parish, except Buxin, Moreland, Norwood, Severn, and Darden soils, have a subsoil characterized by an accumulation of clay.

Secondary accumulation of calcium carbonate in the lower soil horizons has been an important process in some of the soils in the parish. Free carbonates were present initially in the soils that formed in the recent Red River alluvial deposits. They are still present throughout most of the horizons of the Severn, Norwood, and Moreland soils. The Armistead, Buxin, Caspiana, and Gallion soils that formed in recent Red River alluvium and the Forbing and Gore soils that formed in the older sediments of Pleistocene age may, in places, have secondary accumulations of carbonates at a depth of less than 60 inches. Carbonates dissolved from overlying horizons may have been translocated to these depths by water and redeposited. Other sources and processes that can contribute in varying degrees to these carbonate accumulations are segregation of material within the horizon; upward translocation of materials in solution from deeper horizons during fluctuations of water table levels; and contributions of materials from readily weatherable minerals, such as plagioclase.

Factors of soil formation

Soils are natural, three-dimensional bodies that formed on the earth's surface and that have properties resulting from the integrated effect of climate and living matter acting on parent material, as conditioned by relief over periods of time.

The interaction of five main factors influences the processes of soil formation and results in differences among the soils. These factors are the physical and chemical composition of the parent material; the kind of plants and other organisms living in and on the soil; the relief of the land and its effect on runoff and soil temperature and moisture conditions; and the length of time it took the soil to form.

The effect of any one factor can differ from place to place, but the interaction of all the factors determines the kind of soil that forms. Because of these interactions, many of the differences in soils cannot be attributed to differences in only one factor. For example, organic matter content in the soils of Caddo Parish is influenced by several factors including relief, parent material, and living organisms. Such interactions do not preclude recognition of the manner in which a given factor can influence a specific soil property. In the following paragraphs the factors of soil formation are discussed as they relate to soils in the survey area.

Climate

Caddo Parish is in a region characterized by a humid, subtropical climate. A detailed discussion of the present climate in the parish is given in the section "General nature of the parish."

The climate is relatively uniform throughout the parish. As a result, local differences in the soils are not caused by large differences in atmospheric climate. The warm average temperatures and large amounts of precipitation favor a rapid rate of weathering of readily weatherable minerals in the soils. Ancient climates (Paleoclimates) in the area may have differed considerably from the present-day climate. Some of the differences between soils formed on old landscapes may be caused partly by climatic differences over periods of thousands of years.

In landscapes of comparable age, differences in weathering, leaching, and translocation of clay is caused chiefly by variations in factors other than atmospheric climate. Weathering processes involving the release and reduction of iron are indicated by the gray colors in Ag, Bg, or Cg horizons in some of the soils. Oxidation and segregation of iron as a result of alternating conditions of oxidation with reduction is indicated by mottled horizons and iron and manganese concretions in many of the soils.

Another important facet of climate is expressed in the clayey soils that have appreciable amounts of expanding-lattice minerals in which large changes in volume occur upon wetting and drying. Wetting and drying cycles, and the volume changes associated with them, are important factors in the formation and stabilization of structural aggregates in these soils.

When the wet soils dry, cracks of variable width and depth can form as a result of the decrease in volume. When the cracks form, the depth and extent of cracking are influenced by climate. Repeated large changes in volume frequently result in structural problems for buildings, roads, and other structures. Formation of deep, wide cracks may shear roots of some plants growing in the soil. When cracks are present, much of the water from initial rainfall or irrigation is filtered through the cracks. Once the soil has become wet, however, infiltration rates become slow or very slow. Cracks form extensively in Armistead, Buxin, and Moreland soils during late summer and early fall when the soils are driest. During this time, cracks of an inch or more in width and extending to a depth of more than 20 inches can form in most years. In places cracks that are less extensive and less deep sometimes form in some of the less clayey soils, such as the Norwood soils.

Living organisms

Living organisms affect the processes of soil formation in a number of ways, thereby they exert a major influence on the kind and extent of horizons that develop. Growth of plants and activity of other organisms physically disturb the soil; this in turn modifies porosity and influences the formation of structure and incorporation of organic matter. Photosynthesis of plants utilizes energy from the sun to synthesize compounds necessary for growth, in this way producing additional organic matter. Growth of plants and their eventual death and decomposition provides a recycling of nutrients from the soil into the plant and back into the soil. This serves as a major source of organic residues. Decomposition and incorporation of organic matter into the soil by micro-organisms enhance the development of structure and generally increase the infiltration rate and available water holding capacity in soils.

Relatively stable organic compounds in soils generally have very high cation exchange capacities, thus they increase the capacity of the soil to absorb and store nutrients, such as calcium, magnesium, and potassium. The extent of these and other processes and the kind of organic matter produced can vary widely, depending on the kinds of organisms living in and on the soil. For example, the organic matter content of soils formed under prairie vegetation is typically higher than in soils formed under forests (*8, 18*).

The natural vegetation throughout nearly all of Caddo Parish was forest. The uplands were covered with a mixed hardwood-pine forest. Generally, pine was prevalent on most of the soils formed in the parent materials of Tertiary age; whereas, hardwoods were more prevalent on soils formed in parent materials of the Pleistocene age. The bottom-land soils that formed in recent alluvial sediments were covered by a hardwood forest. Some relatively small areas of such soils as Buxin and Caspiana may have had a natural vegetation comprised mostly of grasses.

Differences in the amount of organic matter that has accumulated in and on the soils is influenced by the kinds and populations of micro-organisms. Aerobic organisms use oxygen from the air and are chiefly responsible for organic matter decomposition through rapid oxidation of organic residues. These organisms are most abundant and prevail for longer periods in the better drained and aerated soils.

In more poorly drained soils, anaerobic organisms are predominant for longer periods during the year. Anaerobic organisms do not require oxygen from the air, and they decompose organic residues very slowly. Differences in decomposition by micro-organisms can result in larger accumulations of organic matter in soils that have restricted drainage than in better drained soils. In general, the organic matter content is higher where the soil is more poorly drained and not well aerated.

Relief

Relief and other physiographic features influence soil formation processes by affecting internal soil drainage, runoff, erosion and deposition, and exposure to the sun and wind.

The influence of relief on soils in Caddo Parish is especially evident in the rates at which water runs off the surface, in the internal soil drainage, and in depths and duration of a seasonal high water table in some of the soils. The Red River alluvial plain has generally less relief than the Pleistocene terrace or uplands. The Severn, Gallion, Caspiana, Norwood, Armistead, Moreland, and Buxin soils, which formed in Red River alluvium, have progressively less relief and progressively lower elevations, in the order in which the soils are listed. For example, Gallion soils typically are nearly level and on narrow ridges, while Buxin soils are level or in depressional areas. Rates of surface runoff are slow on the Severn soils and become progressively slower in the order in which the soils are listed. Depth and duration of a seasonal high water table show similar variations. For example, a seasonal high water table is not present for significant periods in the Severn, Gallion, and Norwood soils. In most years one may be present for significant periods from December through April at a depth of 4 to 6 feet in the Caspiana soil and at progressively shallower depths in the Armistead, Buxin, and Moreland soils.

Similar relationships also exist in the soils formed in other parent materials. Table 21 shows the relationship among topography, runoff, soil drainage, and depth and duration of a seasonal high water table for all of the soil series mapped in the parish.

Parent material and time

The parent material of mineral soils is the material from which the soils first formed. In the survey area the effects of parent material are particularly expressed in certain differences in soil color, texture, permeability, and depth and degree of leaching. Parent material has also had a major influence on mineralogy of the soils and is a significant factor in determining their susceptibility to erosion. The characteristics, distributions, and depositional sequence of the parent materials are more thoroughly discussed in the section "Landforms and surface geology."

Parent material and time are independent factors of soil formation. For example, a particular kind of parent material may have been exposed to the processes of soil formation for periods ranging from a few years or less to more than a million years in some cases. The kinds of horizons and their degree of development within a soil are influenced by the length of time of soil formation. Long periods of time are generally required for prominent horizons to form. In the survey area possible differences in the time of soil formation amount to thousands of years for some of the soils.

The soils in the parish have formed in parent materials deposited during three or more different geologic time periods. Recent Red River alluvial deposits are the parent materials of the youngest soils. As shown in table 21, these Holocene (recent) deposits are the parent materials of the Armistead, Buxin, Caspiana, Gallion, Moreland, Norwood, and Severn soils. The characteristic red colors and the presence of free carbonates are prominant features of these sediments at the time of depositions. The Severn, Norwood, and Moreland soils formed in the youngest deposits and have undergone only slight leaching in the short period of time since deposition. They have soil reactions that, in places, are neutral or alkaline throughout and free carbonates are present throughout most or all of the solum. The natural fertility level of the surface horizon in these soils is higher than that of other soils in the parish. The Severn soils formed in deposits near the river and are more sandy than other soils in the flood plain. Norwood soils formed in loamy deposits on natural levees, and Moreland soils formed in clayey backswamp areas. Armistead soils formed in areas where thin layers of more recent clayey sediments were deposited on soils that formed in older loamy deposits. Buxin soils formed where recent clayey deposits overlie a buried soil that also formed in clayey deposits.

The Caspiana and Gallion soils formed in the oldest Holocene deposits in the area. The Caspiana and Gallion soils formed in loamy-textured, old deposits on natural levees. The loamy Caspiana and Gallion soils have developed a B horizon that is more clayey than the surface horizon. These soils are somewhat leached as indicated by soil reactions that typically are acid in the surface horizon and become more alkaline as depth increases. Typically, they are more acid and have lower natural fertility levels than soils that formed in the more recent Holocene deposits.

The areas of Guyton Variant and Messer Variant formed in old alluvial deposits of late Pleistocene or early Holocene age along the Red River. They are mapped only in the Pine Island area, east of Oil City. The Messer Variant soils formed in loamy deposits on low, convex ridges. The Guyton Variant formed in silty deposits that are in low areas between the ridges. Throughout most of the area these soils have a thin surface layer of more recent clayey alluvium that ranges up to about 10 inches in thickness. In most places the soil reaction is less acid in the thin, clayey surface layer than in the underlying horizons.

Areas of Darden, Bernaldo, Guyton, and Bonn soils are on terraces adjacent and generally parallel to the present streams that drain the uplands. These soils formed in old alluvium of late Pleistocene or early Holocene age. This alluvium derived from erosion of the surrounding uplands. The Darden soils formed in the sandiest sediments eroded from the upland soils, in the northwest part of the parish. They are at the highest elevations on the stream terraces and are loamy sand or sand throughout. The Bernaldo, Guyton, and Bonn soils formed in parent materials containing less sand and have a well developed B horizon that is more clayey than the surface horizon. The well drained Bernaldo soils formed in loamy deposits and are at higher elevations than the associated Guyton and Bonn soils. Guyton soils formed in silty deposits and are at intermediate elevations. Bonn soils formed in loamy deposits and are at lower elevations than the associated Guyton and Bernaldo soils. The Bernaldo soils have a soil reaction that is acid throughout the profile. Guyton soils have an acid reaction in the upper horizons and are neutral or alkaline in the lower part of the B horizon. Bonn soils have high exchangeable sodium saturation of 15 to 50 percent throughout the B horizon.

Deposits on Pleistocene terraces are equivalent in age to those on the Prairie Formation found along the Red River. These terrace deposits are the parent material of the Forbing, Gore, and Wrightsville soils and associated areas of Messer soils. These soils are level or gently sloping and are in areas that adjoin the major lakes or flank the present Red River alluvial plain. They formed in clayey sediments that have been exposed to weathering and soil formation processes since their deposition. The soils have a well developed B horizon that is more clayey than the surface horizon. They are acid and highly leached in upper horizons but typically become less acid below the B horizon. Forbing and Gore soils may have free calcium carbonate at a depth of less than 60 inches in some places.

Some areas of Ruston, Bowie, and Beauregard soils may have formed in loamy deposits of the Pleistocene terrace.

Sediments deposited during the Tertiary Period are parent materials of most of the upland soils in the parish. These sediments were deposited 40 to 60 million years ago and are the oldest soil parent materials in the parish. They have not been continuously exposed to weathering and soil formation processes since the time of deposition. In some places they may have been continuously exposed for periods of more than a million years. The soils formed in the Tertiary deposits are highly weathered and leached, and characteristically have an acid soil reaction and low base status throughout. The soils all have a developed B horizon that is more clayey than the A horizon. The natural fertility level of these soils is low throughout the profile.

Major differences in the soils that formed in the Tertiary deposits are associated with differences in the texture and composition of the parent material. The Woodtell, Meth, Metcalf, Sacul, and Keithville soils that formed in clayey deposits are stratified clayey and loamy deposits. The Woodtell, Meth, Metcalf, and Keithville soils are the major soils in the uplands, generally south of Vivian. The Woodtell and Meth soils have a B horizon that is more than 35 percent clay in the upper part. The Metcalf and Keithville soils are less clayey in the upper part of the B horizon; the lower part of the B horizon formed in more clayey sediments. These soils are less leached and have slightly higher base status in the lower part of the solum than other soils that formed in the Tertiary deposits. Areas where these soils dominate are less dissected by streams and have more gently sloping topography than areas of soils formed in the more erodible coarse-textured deposits. Messer soils are on small, convex mounds in areas of Metcalf soils. They are more silty and have a less clayey lower part of the B horizon than the Metcalf soils.

Sacul soils are mostly in the northern part of the parish and are associated with soils that formed in the more sandy deposits of Tertiary age. The Sacul soils are more highly leached than other soils that formed in the clayey Tertiary deposits. They contain ironstone fragments in the upper part of the solum and formed in areas where the parent material contained appreciable quantities of glauconite or other weatherable iron-bearing minerals.

Soils that formed in sandy deposits of Tertiary age make up a large part of the uplands, generally north of Vivian. The major soils in this area are Ruston, Smithdale, Briley, Bowie, and Beauregard. They have a B horizon that is less than 35 percent clay throughout and are more severely leached than the Woodtell, Meth, Metcalf, and Keithville soils. Areas of these soils are more dissected and have steeper slopes than areas of soils formed in the more clayey deposits. In some areas Beauregard, Bowie, Messer, and Ruston soils formed in deposits that may be of Pleistocene age.

Landforms and surface geology

By Dr. Bobby J. Miller, Department of Agronomy, Agricultural Experiment Station, Louisiana State University.

Caddo Parish has three general physiographic regions. Each region is characterized by soils formed in a different kind or age of parent materials. The Red River alluvial plain forms a north-south band along the eastern edge of the parish. The Pleistocene terraces of the Red River adjoin the major lakes and flank the lower-lying Red River alluvial plain. These terraces are large, gently sloping to level, and about 160 to 220 feet in elevation. The gently sloping to hilly uplands, of the Tertiary Period, make up the remainder of the parish. The major surface features of these areas and their geology and age are discussed in the following paragraphs. A listing of the soil series of Caddo Parish by kind or age of the parent material can be seen in table 21.

Detailed geological maps of Caddo Parish have not been published. During the course of the survey, several field investigations were conducted to establish soil-parent material relationships in the parish and to compare these relationships with those of adjoining areas: Panola, Harrison, Marion, and Cass Counties, in Texas; Miller County, in Arkansas; and DeSoto, Red River, Bienville, and Webster Parishes, in Louisiana. The information in the following section is based largely on work done during the course of the survey and on comparisons with adjoining areas where more detailed geological information was available. The findings are generally consistent with soil-parent material-geomorphology relationships in areas where recent and more detailed information is available for comparison.

Red River alluvial plain

Recent Red River alluvial deposits (*11*) cover about 28 percent of the parish and correspond to the Moreland-Armistead, Buxin, Severn-Norwood, and Caspiana-Gallion map units shown on the General Soil Map. Pine Island, east of Oil City, is an area of approximately 4 square miles and is included in the Moreland-Armistead map unit on the General Soil Map. This discussion of the recent Red River alluvial plain does not include that area. Pine Island is discussed in a later section dealing with Pleistocene terraces.

The Red River alluvial plain forms a continuous north-south band along the eastern edge of the parish. It is bounded on the east by the Red River and on the west by a low bluff line separating it from the Pleistocene terraces and the uplands. Elevations in the area range from approximately 200 feet at the northern edge of the parish to about 140 feet at the southern edge. The overall north to south slope is about 1 1/2 feet per mile. Except for small areas of ridges and swales, level or nearly level topography is characteristic of the entire area.

The sediments are almost entirely of Red River alluvial origin. Sediments derived from erosion of local soil materials are minor in the area. Most of the sediments transported by the Red River originated in more arid areas to the north and west of Caddo Parish. These sediments are dominantly materials derived from erosion of the older Permean red beds, which gives them their characteristic red colors. At the time of deposition, they are relatively unweathered and typically contain free calcium carbonate. Only after considerable time and leaching do acid soil horizons develop.

Sorting of the sediments at the time of deposition and a diverse mineralogy result in considerable variation in the sediments and the soils formed in them. The material is partially sorted when the stream overflows and the initial decrease in velocity and transporting capacity of the water results in deposition of sediments. As the velocity of the water decreases, the initial deposits near the stream are higher in heavier sand than the lighter, siltier, and more clayey materials that are deposited at increasing distances from the stream. The clayey backswamp sediments are deposited from still or slowly moving water in low areas that are behind the coarser textured natural levees. Characteristically, this depositional pattern results in long, nearly level slopes that extend from natural levees formed near the streams to clayey, backswamp deposits. The differences caused by deposition, together with differences in the time of deposition, account for most of the major differences in soils within the area.

Sediments in the area are recent in age (*5, 11*) and most are considerably younger than the approximately 10,000 years that marks the beginning of Holocene (recent) time. Soils that formed in parent materials of at least two different ages are mapped in the area. The Gallion and Caspiana soils formed in the oldest deposits on natural levees in an area that is not covered by more recent sediments. The Buxin soils formed in areas where a 20- to 36-inch layer of more recent clayey deposits overlie a buried soil that also formed in clayey deposits. The Armistead soils are associated with the Buxin soils and are at slightly higher elevations in areas where a 10- to 20-inch layer of more recent clayey deposits overlie a buried soil that formed in loamy deposits.

The Severn, Norwood, and Moreland soils have formed entirely in more recent deposits. The Severn soils are on the highest parts of the natural levee near the river and contain more sand than Norwood or Moreland soils. The Norwood soils formed in loamy deposits on the natural levee, farther from the river, and contain less sand and more silt and clay than the Severn soils. Moreland soils formed in the clayey backswamp deposits and are associated with the Severn and Norwood soils. In places buried soils that formed in older Holocene deposits may underlie the Moreland, Norwood, or Severn soils at depths below about 40 inches.

Pleistocene terraces

Pine Island, east of Oil City, is made up of soils of the Guyton Variant and Messer Variant series. The area is surrounded by soils that formed in more recent alluvial sediments of the Red River. On the east side, Pine Island is about 15 feet higher than the recent Red River alluvial plain and is separated from it by an abrupt escarpment. Everywhere else, the area is bordered by a narrow band of Buxin clay formed in recent Red River sediments along either side of the old channel of Black Bayou. This band of sediments buries soils on the edges of Pine Island. It separates Pine Island from the Prairie Terrace at higher elevations. Ridges and intervening low areas on the island approximately parallel the old channel of Black Bayou. Surface deposits over the entire island are loamy or silty covered with a thin layer of recent, clayey Red River alluvium approximately 6 to 10 inches thick. The island is younger than the underlying edge of the Prairie Terrace and older than the overlying Holocene deposits of the Red River in which the Buxin soils formed. The thin mantle of clays over the area are recent and relatively unleached. Geologic investigations are needed to determine the age of Pine Island more precisely. A late Pleistocene-Deweyville terrace that is younger than the Prairie Terrace has been identified in other areas of Louisiana (*13*).

The present streams that drain the uplands are flanked by paired stream terraces generally paralleling the stream. The terraces are mostly stream deposits of sediments from the late Pleistocene or possibly early Holocene Epoch. They are the result of erosion from the surrounding uplands. Most of these terraces are included in the Guyton map unit shown on the General Soil Map. Small terraces, however, may also be near drainages in other map units, except in the Moreland-Armistead, Buxin, Severn-Norwood, and Caspiana-Gallion map units.

At the highest elevation of these terraces are the Darden soils, which formed in the loamy sand or sand deposits. These sandy deposits are restricted to areas along streams in the northern part of the parish. Many of the surrounding upland soils formed in sandy Tertiary deposits. The Bernaldo, Guyton, and Bonn soils formed in sediments containing less sand and are along streams that drain the uplands throughout the parish. The Bernaldo, Guyton, and Bonn soils typically are at successively lower elevations in the order named. These soils have a distinct B horizon marked by an accumulation of clay. The Bernaldo soils are acid throughout. Guyton soils are acid in the surface horizon and neutral or alkaline in the lower part of the B horizon. Typically, they have large quantities of exchangeable sodium in the neutral or alkaline lower part of the B horizon.

At the lowest elevations of the terraces, Bonn soils have 15 to 50 percent exchangeable sodium throughout the B horizon. The source of these large quantities of exchangeable sodium has not been determined. These lower terraces are younger than the Prairie Terrace of the Red River and are along streams that truncate the Prairie Terrace surfaces. They are older than the recent Red River alluvial deposits, which overlap the lower stream terraces in places. The degree of profile development in the soils on the terraces, especially the extent of eluviation and illuviation of clays, indicates that the soils are quite old and may be approximately equivalent in age to Deweyville terraces, which have been identified in some areas of Louisiana (*13*).

Areas of Prairie Terrace (*11*) cover about 10 percent of the parish and correspond to the Forbing-Gore-Wrightsville map unit shown on the General Soil Map. The Prairie Terrace is discontinuous, gently sloping to level, and adjoins the major lakes or flanks the Red River alluvial plain. It is between elevations of about 160 and 180 feet in the southern part of the parish and 200 and 220 feet in the northern part. Low bluff lines or escarpments separate the terrace from the lower Red River alluvial plain and the higher uplands.

The Prairie Terrace is relatively undissected and slopes are dominantly less than 3 percent. Slopes that are more than 5 percent are restricted almost entirely to the valley walls of drainage systems and to escarpments separating the Prairie Terrace from other areas.

Investigations during the survey indicated that these terraces are remnants of Red River alluvial deposits laid down at a time when the River followed a course that was mostly west of its present position in Caddo Parish (*11*). The deposits and the soils formed in them are similar to Prairie age materials identified in other areas (*11, 13*). Saucier (*13*) indicates that Prairie age sediments were deposited approximately 80,000 to 100,000 years ago.

The soils in Prairie Terrace are acid and low in bases in the upper horizons. In the lower horizons, soil reaction and base saturation increase as depth increases in many areas. Borings to depths of several feet indicate that, in many areas, the materials in or below the developed soil grade into material similar in appearance to recent deposits of the Red River. This is illustrated by the profile description and discussion of the range in characteristics of the Gore, Forbing, and Wrightsville soils in the section "Soil series and morphology" of this report.

Tertiary uplands

An area of gently sloping uplands, 1 mile south of Vivian, corresponds to the Keithville-Woodtell-Metcalf, Bowie-Metcalf-Keithville, and Woodtell-Meth map units shown in this area on the General Soil Map. The parent materials of the soils in the area are dominantly clays, shales, and lignitic shales and lesser amounts of mostly quartz sands and some glauconitic sands. Geological maps of adjoining areas in Texas identify these sediments along the western edge of the parish as members of the Wilcox Group (*4*). Woodtell and Meth soils, formed in the clayey deposits, are the major soils in these uplands and together comprise about 45 percent of the area. Metcalf and Keithville soils make up about 30 percent of the area. They formed in loamy material overlying clayey sediments that are at depths of 30 to 40 inches. The Bowie soils, formed in loamy deposits, make up less than 10 percent of these uplands. Soils in drainageways, such as Guyton soils, and several other minor upland soils, such as Ruston soils, make up the remaining 25 percent of the area.

The topography of these uplands appears to have developed as a result of differential erosion of the different, nearly horizontally bedded formations in the Wilcox Group. Large areas of gently sloping soils, such as Keithville, Metcalf, and other soils formed in loamy deposits, are separated from other large areas of similar soils at higher or lower elevations by narrow bands of more steeply sloping soils, such as Woodtell soils, which formed in clayey deposits. The nearly horizontal bedding of the sediments and the proximity of the Red River and other large streams results in more or less parallel major drainages in the parish. Deposition of alluvium and/or accumulation of pedisediment during the Pleistocence Epoch may also have contributed to this pattern.

The uplands that are generally north of Vivian are more dissected by erosion and have generally steeper and shorter slopes than the gently sloping uplands farther south. The topography appears to result mostly from erosion. Sandy sediments are more erodible than clayey deposits and the result is more dissection. The area corresponds approximately to the Sacul-Ruston, Betis-Briley-Darden, and Bowie-Metcalf-Keithville map units shown on the General Soil Map.

The Darden soils in these uplands formed in Pleistocene terrace deposits that are along the present streams draining the uplands. The remainder of the soils formed in Tertiary age deposits of the Upper Wilcox and Claiborne Group. These deposits are mostly siliceous sands and lesser amounts of clays and glauconite sands. The Bowie, Betis, Briley, Ruston, and Smithdale soils formed in the loamy and sandy deposits. The Metcalf and Keithville soils formed in areas where loamy deposits are underlain, at 30- to 40-inch depths, by clayey deposits. Sacul soils formed in deposits containing appreciable quantities of glauconite sands. The dominance of soils formed entirely in sandy or loamy deposits results in this being an area of more highly leached soils than the area where soils formed in mostly clayey deposits.

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Glossary

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

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

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

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-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.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coefficient of Linear Extensibility (COLE). A quantitative method of determining shrink-swell behavior of soil. It is an estimate of the vertical component of swelling of a natural soil clod. COLE is expressed as: low (00.03); moderate (0.03-0.06); and, high (00.06).

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures 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.

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.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

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

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

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

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

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

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for 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.

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

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

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

Evapotranspiration. The combined loss of water from a given area and during a specific period of time by evaporation from the soil surface and by transpiration from plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

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

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

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

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

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

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

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the

A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

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

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

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.

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

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).

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.

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 affecting the specified use.

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

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

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

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

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

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

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

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

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

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

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

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 groundwater runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

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.

Slow intake (in tables). The slow movement of water into 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.

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

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

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. 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, silt loam, 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."

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the low lands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

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

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

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

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1941-70 at Shreveport, LA]

Month	Temperature					Precipitation		
				2 years in 10 will have			2 years in 10 will have	
	Average daily maximum	Average daily minimum	Extreme maximum and minimum	Maximum temperature higher than--	Minimum temperature lower than--	Average	Less than--	More than--
	°F	°F	°F	°F	°F	In	In	In
January	57	38	85/3	80	15	4.0	2.6	5.1
February	60	41	84/2	82	21	3.7	2.4	4.7
March	67	46	91/15	87	25	4.1	2.8	5.9
April	77	56	92/34	89	37	5.2	2.6	6.6
May	84	63	99/42	94	48	5.0	2.2	8.0
June	90	70	101/54	98	58	3.3	1.2	4.7
July	94	73	106/60	101	64	2.9	1.0	4.4
August	94	72	107/57	105	62	2.7	1.1	4.1
September	88	67	104/42	99	52	3.1	1.2	4.2
October	79	56	97/31	93	36	2.9	1.3	3.5
November	67	45	88/21	85	25	3.6	1.6	5.2
December	59	39	84/9	80	18	4.2	2.6	5.8
Year						44.7		

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1941-1966 at Shreveport, Louisiana]

Probability	Minimum temperature		
	24° F or lower	28° F or lower	32° F or lower
SPRING:			
1 year in 10 later than------------	February 24	March 13	March 19
2 years in 10 later than------------	February 15	March 4	March 13
5 years in 10 later than------------	January 29	February 14	March 2
FALL:			
1 year in 10 earlier than----------	November 28	November 13	October 29
2 years in 10 earlier than----------	December 4	November 20	November 4
5 years in 10 earlier than----------	December 15	December 4	November 16

TABLE 3.--WATER-BUDGET DEFICITS AND SURPLUSES

[Data calculated for the period 1941-1970 at Shreveport, Louisiana]

Month	Deficit								Surplus							
	Mean	Probability of deficit equal to or greater than---							Mean	Probability of surplus equal to or greater than--						
		0.1 in	1 in	2 in	3 in	4 in	5 in	6 in		0.1 in	2 in	4 in	6 in	8 in	10 in	12 in
	In	Pct	Pct	Pct	Pct	Pct	Pct	Pct	In	Pct	Pct	Pct	Pct	Pct	Pct	Pct
January-----	---	---	---	---	---	---	---	---	3.0	90	67	20	10	3	3	---
February----	---	3	---	---	---	---	---	---	3.0	93	73	23	---	---	---	---
March-------	---	10	---	---	---	---	---	---	2.8	87	60	23	7	3	---	---
April-------	---	27	---	---	---	---	---	---	2.6	67	50	27	13	3	---	---
May---------	0.2	50	3	---	---	---	---	---	1.5	47	30	17	---	---	---	---
June--------	1.2	87	53	27	3	---	---	---	0.2	7	3	3	---	---	---	---
July--------	2.6	100	70	53	43	88	7	---	---	---	---	---	---	---	---	---
August------	3.2	93	90	73	57	37	13	7	---	---	---	---	---	---	---	---
September---	1.8	80	63	47	23	7	---	---	---	3	---	---	---	---	---	---
October-----	0.7	70	30	7	3	---	---	---	0.2	7	3	3	---	---	---	---
November----	0.1	20	---	---	---	---	---	---	0.7	33	13	7	3	3	---	---
December----	---	---	---	---	---	---	---	---	2.1	73	50	10	7	---	---	---
Year-----	9.8								16.1							

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Buxin clay, occasionally flooded	14,927	2.6
2	Armistead clay	15,148	2.6
3	Beauregard silt loam, 1 to 3 percent slopes	4,562	0.8
4	Bernaldo fine sandy loam, 1 to 3 percent slopes	4,527	0.8
5	Bonn silt loam	396	0.1
6	Woodtell fine sandy loam, 1 to 3 percent slopes	27,964	4.9
7	Woodtell fine sandy loam, 3 to 8 percent slopes	63,103	10.8
8	Woodtell fine sandy loam, 8 to 20 percent slopes	9,465	1.7
9	Betis loamy fine sand, 1 to 5 percent slopes	5,144	0.9
10	Betis loamy fine sand, 5 to 12 percent slopes	2,874	0.5
11	Caspiana silty clay loam	4,342	0.8
12	Caspiana silt loam	7,988	1.4
13	Keithville very fine sandy loam, 2 to 5 percent slopes	38,566	6.7
14	Gallion silt loam	4,997	0.9
15	Gallion silty clay loam	1,137	0.2
16	Gore silt loam, 1 to 5 percent slopes	9,867	1.7
17	Messer Variant-Guyton Variant complex, gently undulating	2,014	0.4
18	Guyton soils, frequently flooded	46,250	8.0
19	Briley loamy fine sand, 1 to 5 percent slopes	4,600	0.8
20	Moreland clay, gently undulating	3,777	0.7
21	Forbing silt loam, 1 to 3 percent slopes	7,239	1.3
22	Moreland silt loam	2,780	0.5
23	Moreland silty clay loam	4,252	0.7
24	Moreland clay	37,023	6.4
25	Forbing silt loam, 3 to 8 percent slopes	12,104	2.1
26	Darden loamy fine sand, 1 to 5 percent slopes	3,093	0.5
27	Norwood silt loam	19,519	3.4
28	Sacul fine sandy loam, 1 to 5 percent slopes	7,611	1.3
29	Norwood silty clay loam	5,025	0.9
30	Sacul fine sandy loam, 5 to 15 percent slopes	15,128	2.6
31	Ruston fine sandy loam, 1 to 5 percent slopes	12,198	2.1
32	Smithdale fine sandy loam, 12 to 20 percent slopes	6,676	1.2
33	Severn very fine sandy loam	9,147	1.6
34	Severn very fine sandy loam, gently undulating	11,337	2.0
35	Severn very fine sandy loam, occasionally flooded	8,681	1.5
36	Severn very fine sandy loam, frequently flooded	3,703	0.6
37	Metcalf-Messer complex	46,510	8.0
38	Guyton-Messer complex	6,079	1.1
39	Wrightsville-Messer complex	12,679	2.2
40	Bowie fine sandy loam, 1 to 5 percent slopes	25,906	4.5
41	Meth fine sandy loam, 1 to 3 percent slopes	14,668	2.6
42	Meth fine sandy loam, 3 to 8 percent slopes	4,663	0.8
43	Moreland-Urban land complex	916	0.2
44	Norwood-Urban land complex	3,683	0.6
45	Woodtell-Urban land complex, 3 to 8 percent slopes	4,812	0.8
46	Woodtell-Urban land complex, 8 to 20 percent slopes	3,542	0.6
47	Urban land	3,153	0.6
48	Keithville-Urban land complex, 2 to 5 percent slopes	7,965	1.4
49	Forbing-Urban land complex, 2 to 8 percent slopes	1,137	0.2
50	Guyton-Urban land complex	598	0.1
51	Ruston-Urban land complex, 2 to 8 percent slopes	962	0.2
	Small water areas	853	0.1
	Total land area	575,296	---
	Large water areas	28,224	---
	Total area	603,520	100.00

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Soybeans	Cotton lint	Corn	Common bermudagrass	Improved bermudagrass	Bahiagrass
	Bu	Lb	Bu	AUM*	AUM*	AUM*
1----------------------- Buxin	30	---	---	5.5	---	---
2----------------------- Armistead	35	675	---	6.5	13.0	---
3----------------------- Beauregard	25	450	60	6.0	---	7.0
4----------------------- Bernaldo	---	400	65	---	8.0	---
5----------------------- Bonn	15	---	---	4.0	---	4.5
6----------------------- Woodtell	40	250	45	6.5	7.5	---
7----------------------- Woodtell	30	200	35	6.0	7.0	---
8----------------------- Woodtell	---	---	---	5.5	6.0	---
9----------------------- Betis	30	---	40	---	8.0	---
10---------------------- Betis	---	---	---	---	7.0	---
11**-------------------- Caspiana	40	825	85	7.5	15.0	---
12**-------------------- Caspiana	40	875	90	8.0	15.0	---
13---------------------- Keithville	24	550	---	5.5	12.0	7.5
14---------------------- Gallion	40	875	90	7.0	15.0	9.5
15---------------------- Gallion	40	825	85	7.0	13.0	9.5
16---------------------- Gore	23	---	---	4.5	---	6.5
17---------------------- Messer Variant- Guyton Variant	---	---	---	---	---	---
18---------------------- Guyton	---	---	---	4.5	---	---
19---------------------- Briley	---	275	40	---	6.5	---
20---------------------- Moreland	35	575	---	6.0	12.0	---
21---------------------- Forbing	---	---	50	5.0	---	5.5

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Soybeans	Cotton lint	Corn	Common bermudagrass	Improved bermudagrass	Bahiagrass
	Bu	Lb	Bu	AUM*	AUM*	AUM*
22, 23, 24 Moreland	37	625	---	6.0	12.0	---
25 Forbing	---	---	35	5.0	---	5.5
26 Darden	20	---	---	4.0	7.5	6.5
27** Norwood	40	875	90	---	13.0	---
28 Sacul	---	---	---	6.5	---	7.5
29** Norwood	40	875	90	---	13.0	---
30 Sacul	---	---	---	5.5	---	6.5
31 Ruston	25	600	65	5.5	12.0	9.5
32 Smithdale	---	---	---	4.5	9.0	---
33** Severn	40	800	---	4.5	12.0	---
34** Severn	40	750	---	8.0	12.0	---
35 Severn	35	---	---	8.0	10.0	---
36 Severn	---	---	---	6.5	7.5	---
37 Metcalf-Messer	25	---	---	5.2	---	6.0
38 Guyton-Messer	24	---	---	6.1	---	8.3
39 Wrightsville-Messer	25	---	---	6.5	---	7.0
40 Bowie	---	450	50	---	10.0	10.0
41 Meth	32	550	60	5.0	12.0	7.0
42 Meth	25	450	50	5.0	12.0	7.0
43 Moreland-Urban land	---	---	---	---	---	---
44** Norwood-Urban land	---	---	---	---	---	---
45 Woodtell-Urban land	---	---	---	---	---	---
46 Woodtell-Urban land	---	---	---	---	---	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Soybeans	Cotton lint	Corn	Common bermudagrass	Improved bermudagrass	Bahiagrass
	Bu	Lb	Bu	AUM*	AUM*	AUM*
48 Keithville-Urban land	---	---	---	---	---	---
49 Forbing-Urban land	---	---	---	---	---	---
50 Guyton-Urban land	---	---	---	---	---	---
51 Ruston-Urban land	---	---	---	---	---	---

* 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.
** Yields are for areas protected from flooding.

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. Site index was determined at age 30 for eastern cottonwood, at age 35 for American sycamore, and at age 50 for all other species]

Map symbol and soil name	Woodland suitability group	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Potential productivity: Important trees	Potential productivity: Site index	Trees to plant
1. Buxin	3w6	Slight	Severe	Moderate	Green ash	78	Eastern cottonwood, American sycamore, sweetgum.
					Eastern cottonwood	90	
					Sweetgum	88	
					Cherrybark oak	87	
					Nuttall oak	75	
					Water oak	86	
					Willow oak	89	
2. Armistead	2w5	Slight	Moderate	Moderate	Green ash	80	Eastern cottonwood, American sycamore.
					Cherrybark oak	90	
					Water oak	90	
					Pecan	---	
					Sweetgum	90	
					American sycamore	---	
					Eastern cottonwood	110	
3. Beauregard	2w8	Slight	Moderate	Slight	Loblolly pine	90	Loblolly pine.
					Shortleaf pine	---	
					Sweetgum	---	
4. Bernaldo	2o1	Slight	Slight	Slight	Loblolly pine	90	Loblolly pine, sweetgum.
					Shortleaf pine	80	
					Sweetgum	---	
					Southern red oak	---	
5. Bonn	5t0	Slight	Severe	Severe	Eastern redcedar	---	Eastern redcedar.
6, 7, 8. Woodtell	4c2	Slight	Moderate	Moderate	Loblolly pine	70	Loblolly pine.
					Shortleaf pine	60	
9, 10. Betis	4s3	Slight	Moderate	Severe	Shortleaf pine	63	Loblolly pine, slash pine.
					Loblolly pine	70	
11, 12. Caspiana	2o4	Slight	Slight	Slight	Green ash	75	Eastern cottonwood, sweetgum, American sycamore.
					Eastern cottonwood	105	
					Cherrybark oak	100	
					Pecan	---	
					Sweetgum	100	
					American sycamore	---	
13. Keithville	3w8	Slight	Moderate	Slight	Loblolly pine	83	Loblolly pine.
					Shortleaf pine	---	
					Sweetgum	---	
14, 15. Gallion	2o4	Slight	Slight	Slight	Green ash	80	Eastern cottonwood, American sycamore.
					Cherrybark oak	95	
					Sweetgum	83	
					Water oak	---	
					Pecan	---	
					American sycamore	---	
					Eastern cottonwood	100	
16. Gore	3c2	Slight	Moderate	Moderate	Loblolly pine	76	Loblolly pine.
					Shortleaf pine	---	
17*:							
Messer Variant	2w8	Slight	Moderate	Slight	Loblolly pine	90	Loblolly pine, sweetgum.
					Sweetgum	90	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Wood-land suita-bility group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Important trees	Site index	
17*:							
Guyton Variant----	2w9	Slight	Severe	Moderate	Loblolly pine----------	90	Loblolly pine, sweetgum.
					Sweetgum---------------	---	
					Green ash--------------	---	
					Southern red oak-------	---	
					Water oak--------------	---	
18*----------------- Guyton	2w9	Slight	Severe	Moderate	Loblolly pine----------	90	Loblolly pine, sweetgum.
					Slash pine-------------	90	
					Sweetgum---------------	---	
					Green ash--------------	---	
					Southern red oak-------	---	
					Water oak--------------	---	
19----------------- Briley	3s3	Slight	Slight	Severe	Loblolly pine----------	80	Loblolly pine.
					Shortleaf pine---------	70	
					Slash pine-------------	---	
20----------------- Moreland	2w6	Slight	Severe	Moderate	Green ash--------------	75	Eastern cottonwood, American sycamore.
					Eastern cottonwood-----	100	
					Sweetgum---------------	90	
					American sycamore------	---	
					Water oak--------------	90	
					Cherrybark oak---------	90	
21----------------- Forbing	3c2	Slight	Moderate	Moderate	Loblolly pine----------	80	Loblolly pine.
					Shortleaf pine---------	70	
22, 23, 24--------- Moreland	2w6	Slight	Severe	Moderate	Green ash--------------	75	Eastern cottonwood, American sycamore.
					Eastern cottonwood-----	100	
					Sweetgum---------------	90	
					American sycamore------	---	
					Water oak--------------	90	
					Cherrybark oak---------	90	
25----------------- Forbing	3c2	Slight	Moderate	Moderate	Loblolly pine----------	80	Loblolly pine.
					Shortleaf pine---------	70	
26----------------- Darden	3s3	Slight	Moderate	Severe	Loblolly pine----------	80	Loblolly pine.
					Shortleaf pine---------	70	
27----------------- Norwood	2o4	Slight	Slight	Slight	Eastern cottonwood-----	100	Eastern cottonwood.
28----------------- Sacul	3c2	Moderate	Slight	Slight	Loblolly pine----------	80	Loblolly pine, shortleaf pine.
					Shortleaf pine---------	70	
29----------------- Norwood	2o4	Slight	Slight	Slight	Eastern cottonwood-----	100	Eastern cottonwood.
30----------------- Sacul	3c2	Moderate	Slight	Slight	Loblolly pine----------	80	Loblolly pine, shortleaf pine.
					Shortleaf pine---------	70	
31----------------- Ruston	3o1	Slight	Slight	Slight	Loblolly pine----------	84	Loblolly pine.
					Shortleaf pine---------	75	
32----------------- Smithdale	3o1	Slight	Slight	Slight	Loblolly pine----------	80	Loblolly pine.
					Shortleaf pine---------	69	
33, 34, 35, 36----- Severn	2o4	Slight	Slight	Slight	Eastern cottonwood-----	100	Eastern cottonwood, American sycamore, pecan, black walnut, sweetgum.
					Pecan------------------	76	
					Common hackberry-------	76	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Potential productivity: Important trees	Potential productivity: Site index	Trees to plant
37*:							
Metcalf	2w8	Slight	Moderate	Slight	Loblolly pine	87	Loblolly pine.
					Shortleaf pine	---	
					Sweetgum	---	
Messer	2w8	Slight	Moderate	Slight	Loblolly pine	90	Loblolly pine.
					Slash pine	90	
					Longleaf pine	75	
					Sweetgum	90	
38*:							
Guyton	2w9	Slight	Severe	Moderate	Loblolly pine	90	Loblolly pine, sweetgum.
					Slash pine	90	
					Sweetgum	---	
					Green ash	---	
					Southern red oak	---	
					Water oak	---	
Messer	2w8	Slight	Moderate	Slight	Loblolly pine	90	Loblolly pine.
					Slash pine	90	
					Longleaf pine	75	
					Sweetgum	90	
39*:							
Wrightsville	4w9	Slight	Severe	Moderate	Loblolly pine	70	Loblolly pine, sweetgum, water oak, willow oak.
					Sweetgum	70	
					Water oak	70	
Messer	2w8	Slight	Moderate	Slight	Loblolly pine	90	Loblolly pine.
					Slash pine	90	
					Longleaf pine	75	
					Sweetgum	90	
40 Bowie	3o1	Slight	Slight	Slight	Loblolly pine	83	Loblolly pine, shortleaf pine.
					Shortleaf pine	74	
41, 42 Meth	3o1	Slight	Slight	Slight	Loblolly pine	80	Loblolly pine.
					Shortleaf pine	74	

* 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]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
1 Buxin	Severe: floods, wetness, too clayey.	Severe: floods, wetness, too clayey.	Severe: floods, wetness, too clayey.	Severe: floods, wetness, too clayey.
2 Armistead	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
3 Beauregard	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, slope, percs slowly.	Slight.
4 Bernaldo	Slight	Slight	Moderate: slope.	Slight.
5 Bonn	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.
6, 7 Woodtell	Severe: slope, percs slowly.	Moderate: wetness.	Severe: percs slowly.	Slight.
8 Woodtell	Severe: slope, percs slowly.	Moderate: slope.	Severe: slope, percs slowly.	Slight.
9 Betis	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.
10 Betis	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.
11 Caspiana	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
12 Caspiana	Slight	Slight	Slight	Slight.
13 Keithville	Slight	Slight	Moderate: slope.	Slight.
14 Gallion	Slight	Slight	Slight	Slight.
15 Gallion	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
16 Gore	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope.	Slight.
17*:				
Messer Variant	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Guyton Variant	Severe: wetness, too clayey.	Severe: wetness, too clayey.	Severe: wetness, too clayey.	Severe: wetness, too clayey.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
18* Guyton	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
19 Briley	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
20 Moreland	Severe: too clayey, percs slowly, wetness.	Severe: too clayey, wetness.	Severe: too clayey, percs slowly, wetness.	Severe: too clayey, wetness.
21 Forbing	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
22, 23 Moreland	Severe: percs slowly, wetness.	Severe: wetness.	Severe: percs slowly, wetness.	Severe: wetness.
24 Moreland	Severe: too clayey, percs slowly, wetness.	Severe: too clayey, wetness.	Severe: too clayey, percs slowly, wetness.	Severe: too clayey, wetness.
25 Forbing	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
26 Darden	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.
27 Norwood	Slight	Slight	Slight	Slight.
28 Sacul	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight.
29 Norwood	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
30 Sacul	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
31 Ruston	Slight	Slight	Moderate: slope.	Slight.
32 Smithdale	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
33, 34 Severn	Slight	Slight	Slight	Slight.
35 Severn	Severe: floods.	Slight	Moderate: floods.	Slight.
36 Severn	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
37*: Metcalf	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, percs slowly.	Slight.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
37*:				
Messer	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
38*:				
Guyton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Messer	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
39*:				
Wrightsville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.
Messer	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
40 Bowie	Slight	Slight	Moderate: slope.	Slight.
41, 42 Meth	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight.
43*:				
Moreland	Severe: too clayey, percs slowly, wetness.	Severe: too clayey, wetness.	Severe: too clayey, percs slowly, wetness.	Severe: too clayey, wetness.
Urban land.				
44*:				
Norwood	Slight	Slight	Slight	Slight.
Urban land.				
45*:				
Woodtell	Severe: slope, percs slowly.	Moderate: wetness.	Severe: percs slowly.	Slight.
Urban land.				
46*:				
Woodtell	Severe: slope, percs slowly.	Moderate: slope.	Severe: slope, percs slowly.	Slight.
Urban land.				
48*:				
Keithville	Slight	Slight	Moderate: slope.	Slight.
Urban land.				
49*:				
Forbing	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Urban land.				

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
50*:				
Guyton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.				
51*:				
Ruston	Slight	Slight	Moderate: slope.	Slight.
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1 Buxin	Fair	Fair	Fair	Good	---	---	Good	Good	Fair	Good	Good.
2 Armistead	Fair	Fair	Fair	Good	---	---	Good	Fair	Fair	Good	Fair.
3 Beauregard	Good	Good	Good	---	Good	---	Poor	Poor	Good	Good	Poor.
4 Bernaldo	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
5 Bonn	Poor	Poor	Poor	Poor	---	---	Poor	Good	Poor	Poor	Fair.
6 Woodtell	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor.
7, 8 Woodtell	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
9, 10 Betis	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
11, 12 Caspiana	Good	Good	Good	Good	---	---	Poor	Poor	Good	Good	Poor.
13 Keithville	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
14, 15 Gallion	Good	Good	Good	Good	---	---	Poor	Very poor.	Good	Good	Very poor.
16 Gore	Poor	Good	Good	---	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
17*:											
Messer Variant	Good	Good	Good	---	Good	---	Poor	Very poor.	Good	Good	Very poor.
Guyton Variant	Very poor.	Very poor.	Very poor.	Fair	---	---	Good	Good	Poor	Fair	Good.
18* Guyton	Poor	Fair	Fair	Fair	---	---	Good	Good	Poor	Fair	Good.
19 Briley	Poor	Fair	Good	Good	Good	---	Poor	Very poor.	Fair	Good	Very poor.
20 Moreland	Fair	Fair	Fair	Good	---	---	Good	Good	Fair	Good	Good.
21 Forbing	Fair	Good	Good	---	Fair	---	Poor	Poor	Fair	Fair	Poor.
22, 23, 24 Moreland	Fair	Fair	Fair	Good	---	---	Good	Good	Fair	Good	Good.
25 Forbing	Fair	Good	Good	---	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
26 Darden	Poor	Fair	Fair	Poor	Poor	---	Very poor.	Very poor.	Fair	Poor	Very poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
27 Norwood	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.
28 Sacul	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
29 Norwood	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.
30 Sacul	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
31 Ruston	Good	Good	Good	---	Good	---	Poor	Very poor.	Good	Good	Very poor.
32 Smithdale	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
33, 34 Severn	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
35 Severn	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
36 Severn	Poor	Fair	Fair	Good	---	---	Poor	Very poor.	Fair	Good	Very poor.
37*:											
Metcalf	Fair	Good	Good	Good	Good	---	Fair	Fair	Fair	Good	Fair.
Messer	Good	Good	Good	---	Good	---	Poor	Poor	Good	Good	Poor.
38*:											
Guyton	Fair	Fair	Fair	Fair	---	---	Good	Good	Fair	Fair	Good.
Messer	Good	Good	Good	---	Good	---	Poor	Poor	Good	Good	Poor.
39*:											
Wrightsville	Fair	Fair	Fair	Fair	Fair	---	Good	Good	Fair	Fair	Good.
Messer	Good	Good	Good	---	Good	---	Poor	Poor	Good	Good	Poor.
40 Bowie	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
41 Meth	Good	Good	Good	---	Good	---	Poor	Very poor.	Good	Good	Very poor.
42 Meth	Fair	Good	Good	---	Good	---	Poor	Very poor.	Good	Good	Very poor.
43*:											
Moreland	Fair	Fair	Fair	Good	---	---	Good	Good	Fair	Good	Good.
Urban land.											
44*:											
Norwood	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.
Urban land.											
45*, 46*:											
Woodtell	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.											

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
48*:											
Keithville	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
Urban land.											
49*:											
Forbing	Fair	Good	Good	---	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
Urban land.											
50*:											
Guyton	Fair	Fair	Fair	Fair	---	---	Good	Good	Fair	Fair	Good.
Urban land.											
51*:											
Ruston	Fair	Good	Good	---	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.											

* 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]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
1 Buxin	Severe: floods, too clayey, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.
2 Armistead	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, low strength.
3 Beauregard	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: low strength, wetness.
4 Bernaldo	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: low strength.
5 Bonn	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.
6, 7 Woodtell	Severe: wetness, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
8 Woodtell	Severe: wetness, too clayey.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.
9 Betis	Severe: cutbanks cave.	Slight	Slight	Slight.
10 Betis	Severe: cutbanks cave.	Moderate: slope.	Severe: slope.	Moderate: slope.
11, 12 Caspiana	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
13 Keithville	Severe: too clayey, wetness.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell, low strength.
14, 15 Gallion	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
16 Gore	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
17*:				
Messer Variant	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Guyton Variant	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.
18* Guyton	Severe: floods, wetness, cutbanks cave.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
19-Briley	Slight	Slight	Slight	Moderate: low strength.
20-Moreland	Severe: wetness, too clayey.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.
21-Forbing	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
22, 23, 24-Moreland	Severe: wetness, too clayey.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.
25-Forbing	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
26-Darden	Severe: cutbanks cave.	Slight	Slight	Slight.
27-Norwood	Slight	Slight	Slight	Severe: low strength.
28-Sacul	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
29-Norwood	Slight	Slight	Slight	Severe: low strength.
30-Sacul	Severe: too clayey.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.
31-Ruston	Slight	Slight	Slight	Moderate: low strength.
32-Smithdale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
33, 34-Severn	Slight	Slight	Slight	Moderate: low strength.
35, 36-Severn	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
37*:				
Metcalf	Severe: too clayey, wetness.	Moderate: wetness.	Moderate: wetness.	Severe: shrink-swell, low strength.
Messer	Moderate: wetness.	Slight	Slight	Moderate: low strength.
38*:				
Guyton	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Messer	Moderate: wetness.	Slight	Slight	Moderate: low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
39*:				
Wrightsville	Severe: wetness, too clayey.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, low strength, shrink-swell.
Messer	Moderate: wetness.	Slight	Slight	Moderate: low strength.
40 Bowie	Slight	Slight	Slight	Moderate: low strength.
41 Meth	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
42 Meth	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
43*:				
Moreland	Severe: wetness, too clayey.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.
Urban land.				
44*:				
Norwood	Slight	Slight	Slight	Severe: low strength.
Urban land.				
45*:				
Woodtell	Severe: wetness, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Urban land.				
46*:				
Woodtell	Severe: wetness, too clayey.	Severe: shrink-swell.	Severe: shrink-swell. slope.	Severe: shrink-swell, low strength.
Urban land.				
48*:				
Keithville	Severe: too clayey, wetness.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell, low strength.
Urban land.				
49*:				
Forbing	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Urban land.				
50*:				
Guyton	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
50*:				
Urban land.				
51*:				
Ruston	Slight	Slight	Moderate: slope.	Moderate: low strength.
Urban land.				

* 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," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1 Buxin	Severe: floods, percs slowly, wetness.	Severe: floods.	Severe: floods, too clayey, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness.
2 Armistead	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
3 Beauregard	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
4 Bernaldo	Moderate: wetness.	Moderate: seepage.	Severe: wetness.	Moderate: wetness.	Good.
5 Bonn	Severe: percs slowly, wetness.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
6, 7 Woodtell	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: thin layer.
8 Woodtell	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: thin layer.
9 Betis	Slight	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Fair: too sandy.
10 Betis	Moderate: slope.	Severe: seepage, slope.	Severe: too sandy, seepage.	Severe: seepage.	Fair: too sandy, slope.
11, 12 Caspiana	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
13 Keithville	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Fair: thin layer.
14, 15 Gallion	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
16 Gore	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
17*:					
Messer Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage.	Severe: seepage.	Good.
Guyton Variant	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
18* Guyton	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
19-----------------Briley	Slight-----------	Moderate: seepage.	Slight-----------	Slight-----------	Fair: too sandy.
20-----------------Moreland	Severe: percs slowly, wetness.	Slight-----------	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
21-----------------Forbing	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey.
22, 23, 24---------Moreland	Severe: percs slowly, wetness.	Slight-----------	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
25-----------------Forbing	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey.
26-----------------Darden	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
27-----------------Norwood	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Good.
28-----------------Sacul	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey.
29-----------------Norwood	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
30-----------------Sacul	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
31-----------------Ruston	Slight-----------	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
32-----------------Smithdale	Severe: slope.	Severe: seepage, slope.	Moderate: slope.	Severe: slope.	Poor: slope.
33, 34-------------Severn	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
35, 36-------------Severn	Severe: floods.	Severe: seepage, floods.	Severe: seepage, floods.	Severe: seepage, floods.	Good.
37*:					
Metcalf------------	Severe: percs slowly, wetness.	Slight-----------	Severe: too clayey, wetness.	Moderate: wetness.	Fair: thin layer.
Messer-------------	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: too clayey, wetness.	Slight-----------	Fair: too clayey.
38*:					
Guyton-------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Messer-------------	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: too clayey, wetness.	Slight-----------	Fair: too clayey.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
39*:					
Wrightsville	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.
Messer	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: too clayey, wetness.	Slight	Fair: too clayey.
40 Bowie	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
41, 42 Meth	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
43*:					
Moreland	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
Urban land.					
44*:					
Norwood	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Good.
Urban land.					
45*:					
Woodtell	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: thin layer.
Urban land.					
46*:					
Woodtell	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: thin layer.
Urban land.					
48*:					
Keithville	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Fair: thin layer.
Urban land.					
49*:					
Forbing	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Urban land.					
50*:					
Guyton	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
51*:					
Ruston	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Urban land.					

* 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 "poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1---------------------- Buxin	Poor: low strength, wetness, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
2---------------------- Armistead	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
3---------------------- Beauregard	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
4---------------------- Bernaldo	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
5---------------------- Bonn	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, excess sodium.
6, 7, 8---------------- Woodtell	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
9---------------------- Betis	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
10--------------------- Betis	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy, slope.
11--------------------- Caspiana	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
12--------------------- Caspiana	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
13--------------------- Keithville	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
14--------------------- Gallion	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
15--------------------- Gallion	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
16--------------------- Gore	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
17*:				
Messer Variant--------	Fair: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, too clayey.
Guyton Variant--------	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
18*-------------------- Guyton	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
19: Briley	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
20: Moreland	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
21: Forbing	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
22, 23: Moreland	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
24: Moreland	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
25: Forbing	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
26: Darden	Good	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy.
27: Norwood	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
28: Sacul	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, too clayey.
29: Norwood	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
30: Sacul	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, too clayey.
31: Ruston	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
32: Smithdale	Fair: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
33, 34, 35, 36: Severn	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
37*:				
Metcalf	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Messer	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
38*:				
Guyton	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Messer	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
39*:				
Wrightsville	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.

See footnote at end of table.

TALBE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
39*:				
Messer----------------	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
40-------------------- Bowie	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
41, 42---------------- Meth	Poor: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
43*:				
Moreland--------------	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Urban land.				
44*:				
Norwood---------------	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Urban land.				
45*, 46*:				
Woodtell--------------	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Urban land.				
48*:				
Keithville------------	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Urban land.				
49*:				
Forbing---------------	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Urban land.				
50*:				
Guyton----------------	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Urban land.				
51*:				
Ruston----------------	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Urban land.				

* 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]

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1 Buxin	Slight	Moderate: compressible, shrink-swell.	Floods, percs slowly.	Floods, slow intake, wetness.	Not needed	Wetness.
2 Armistead	Moderate: seepage.	Moderate: compressible.	Percs slowly	Slow intake, percs slowly.	Not needed	Favorable.
3 Beauregard	Slight	Moderate: wetness.	Not needed	Percs slowly, slope, erodes easily.	Percs slowly, erodes easily, wetness.	Percs slowly, erodes easily.
4 Bernaldo	Moderate: seepage.	Moderate: piping.	Not needed	Complex slope	Complex slope	Favorable.
5 Bonn	Slight	Severe: piping, wetness.	Percs slowly, excess sodium.	Excess sodium, wetness, erodes easily.	Not needed	Erodes easily, excess sodium, wetness.
6, 7, 8 Woodtell	Slight	Moderate: compressible, hard to pack.	Percs slowly, slope.	Slow intake, slope.	Slope, erodes easily, wetness.	Percs slowly, slope, erodes easily.
9 Betis	Severe: seepage.	Severe: seepage, piping.	Not needed	Fast intake, droughty.	Slope, too sandy.	Droughty.
10 Betis	Severe: seepage.	Severe: seepage, piping.	Not needed	Slope, fast intake, droughty.	Slope, too sandy.	Droughty, slope.
11 Caspiana	Moderate: seepage.	Slight	Favorable	Slow intake	Not needed	Favorable.
12 Caspiana	Moderate: seepage.	Slight	Favorable	Favorable	Not needed	Favorable.
13 Keithville	Slight	Moderate: shrink-swell, compressible.	Not needed	Erodes easily, slope, percs slowly.	Erodes easily, percs slowly.	Favorable.
14 Gallion	Moderate: seepage.	Slight	Favorable	Favorable	Not needed	Favorable.
15 Gallion	Moderate: seepage.	Slight	Favorable	Slow intake	Not needed	Favorable.
16 Gore	Slight	Moderate: hard to pack.	Not needed	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Percs slowly, erodes easily.
17*:						
Messer Variant	Severe: seepage.	Moderate: seepage.	Not needed	Slope	Wetness, percs slowly.	Favorable.
Guyton Variant	Slight	Moderate: erodes easily, compressible.	Cutbanks cave, percs slowly.	Percs slowly	Not needed	Wetness.
18* Guyton	Slight	Moderate: erodes easily, compressible.	Cutbanks cave, floods, percs slowly.	Percs slowly	Not needed	Wetness.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	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
19----------------- Briley	Moderate: seepage.	Moderate: piping.	Not needed-----	Fast intake, slope.	Too sandy, piping, slope.	Droughty, erodes easily, slope.
20----------------- Moreland	Slight---------	Moderate: compressible, shrink-swell.	Complex slope, percs slowly.	Complex slope, slow intake.	Not needed-----	Favorable.
21----------------- Forbing	Slight---------	Slight---------	Not needed-----	Erodes easily, slow intake, percs slowly.	Percs slowly, erodes easily.	Erodes easily, percs slowly.
22, 23, 24-------- Moreland	Slight---------	Moderate: compressible, shrink-swell.	Complex slope, percs slowly.	Complex slope, slow intake.	Not needed-----	Favorable.
25----------------- Forbing	Slight---------	Slight---------	Not needed-----	Erodes easily, slow intake, percs slowly.	Percs slowly, erodes easily.	Erodes easily, percs slowly.
26----------------- Darden	Severe: seepage.	Severe: seepage, piping.	Not needed-----	Fast intake, droughty, slope.	Too sandy, slope.	Droughty, slope.
27----------------- Norwood	Moderate: seepage.	Slight---------	Not needed-----	Slope, erodes easily.	Erodes easily	Erodes easily.
28----------------- Sacul	Slight---------	Moderate: compressible.	Not needed-----	Erodes easily, slow intake, slope.	Slope, erodes easily, percs slowly.	Erodes easily, percs slowly, slope.
29----------------- Norwood	Moderate: seepage.	Slight---------	Not needed-----	Slope, erodes easily.	Erodes easily	Erodes easily.
30----------------- Sacul	Slight---------	Moderate: compressible.	Not needed-----	Erodes easily, slow intake, slope.	Slope, erodes easily, percs slowly.	Erodes easily, percs slowly, slope.
31----------------- Ruston	Moderate: seepage.	Slight---------	Not needed-----	Slope----------	Favorable------	Favorable.
32----------------- Smithdale	Severe: seepage.	Moderate: piping.	Not needed, slope.	Fast intake, seepage, complex slope.	Slope, erodes easily.	Slope, erodes easily.
33, 34------------ Severn	Severe: seepage.	Severe: piping.	Not needed-----	Fast intake----	Not needed-----	Favorable.
35, 36------------ Severn	Severe: seepage.	Severe: piping.	Not needed-----	Floods, fast intake.	Not needed-----	Favorable.
37*:						
Metcalf----------	Slight---------	Moderate: wetness, thin layer.	Not needed-----	Erodes easily, percs slowly.	Not needed-----	Favorable.
Messer-----------	Slight---------	Moderate: piping, wetness.	Slope----------	Percs slowly, slope, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
38*:						
Guyton-----------	Slight---------	Moderate: erodes easily, compressible.	Cutbanks cave, percs slowly.	Percs slowly---	Not needed-----	Wetness.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
38*: Messer	Slight	Moderate: piping, wetness.	Slope	Percs slowly, slope, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
39*: Wrightsville	Slight	Severe: compressible.	Favorable, wetness, percs slowly.	Favorable, wetness, slow intake.	Not needed	Not needed.
Messer	Slight	Moderate: piping, wetness.	Slope	Percs slowly, slope, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
40 Bowie	Moderate: seepage.	Slight	Not needed	Fast intake, slope.	Favorable	Favorable.
41, 42 Meth	Moderate: seepage.	Slight	Not needed	Slope	Favorable	Favorable.
43*: Moreland	Slight	Moderate: compressible, shrink-swell.	Complex slope, percs slowly.	Complex slope, slow intake.	Not needed	Favorable.
Urban land.						
44*: Norwood	Moderate: seepage.	Slight	Not needed	Slope, erodes easily.	Erodes easily	Erodes easily.
Urban land.						
45*, 46*: Woodtell	Slight	Moderate: compressible, hard to pack.	Percs slowly, slope.	Slow intake, slope.	Slope, erodes easily, wetness.	Percs slowly, slope, erodes easily.
Urban land.						
48*: Keithville	Slight	Moderate: shrink-swell, compressible.	Not needed	Erodes easily, slope, percs slowly.	Erodes easily, percs slowly.	Favorable.
Urban land.						
49*: Forbing	Slight	Slight	Not needed	Erodes easily, slow intake, percs slowly.	Percs slowly, erodes easily.	Erodes easily, percs slowly.
Urban land.						
50*: Guyton	Slight	Moderate: erodes easily, compressible.	Cutbanks cave, percs slowly.	Percs slowly	Not needed	Wetness.
Urban land.						
51*: Ruston	Moderate: seepage.	Slight	Not needed	Slope	Favorable	Slope.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. NP means nonplastic]

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
1 Buxin	0-10	Clay	CH, CL	A-7-6, A-7-5	0	100	100	100	95-100	41-75	20-45
	10-41	Clay, silty clay	CH	A-7-6, A-7-5	0	100	100	100	95-100	51-75	30-45
	41-63	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-7-5	0	100	100	100	95-100	41-75	20-45
2 Armistead	0-15	Clay	CH	A-7-6, A-7-5	0	100	100	100	95-100	51-70	25-40
	15-63	Silt loam, silty clay loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	75-100	<40	NP-20
3 Beauregard	0-9	Silt loam	ML	A-4	0	100	100	90-100	70-95	<23	NP-3
	9-32	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	70-95	25-35	7-15
	32-43	Silty clay loam, silt loam.	CL	A-6	0	100	100	85-100	70-95	30-40	12-19
	43-60	Silty clay, silty clay loam, silt loam.	CH, CL	A-7-6, A-6	0	100	100	85-100	70-95	30-60	12-33
4 Bernaldo	0-20	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	100	95-100	90-100	45-65	<25	NP-5
	20-39	Loam, sandy clay loam, clay loam.	CL	A-6	0	100	100	90-100	51-75	28-40	12-22
	39-80	Fine sandy loam, loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	95-100	90-100	45-65	25-40	8-22
5 Bonn	0-12	Silt loam	ML, CL-ML	A-4	0	100	100	95-100	75-100	<28	NP-7
	12-28	Silt loam, silty clay loam.	CL	A-6, A-7-6	0	95-100	90-100	85-100	65-100	30-44	12-22
	28-64	Silt loam, silty clay loam.	CL	A-6, A-4	0	100	95-100	90-100	75-100	28-40	8-18
6 Woodtell	0-9	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-2-4, A-4	0	90-100	85-100	75-95	30-60	<25	NP-7
	9-44	Clay, silty clay	CH	A-7-6, A-7-5	0	100	90-100	80-100	60-98	51-75	28-50
	44-54	Clay loam, clay, sandy clay loam.	CL, SC, CH	A-6, A-7-6	0	100	80-100	75-90	36-98	35-65	15-45
	54-65	Variable	---	---	---	---	---	---	---	---	---
7 Woodtell	0-5	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-2-4, A-4	0	90-100	85-100	75-95	30-60	<25	NP-7
	5-36	Clay, silty clay	CH	A-7-6, A-7-5	0	100	90-100	80-100	60-98	51-75	28-50
	36-45	Clay loam, clay, sandy clay loam.	CL, SC, CH	A-6, A-7-6	0	100	80-100	75-90	36-98	35-65	15-45
	45-63	Variable	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
8------------------ Woodtell	0-4	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-2-4, A-4	0	90-100	85-100	75-95	30-60	<25	NP-7
	4-38	Clay, silty clay	CH	A-7-6, A-7-5	0	100	90-100	80-100	60-98	51-75	28-50
	38-51	Clay loam, clay, sandy clay loam.	CL, SC, CH	A-6, A-7-6	0	100	80-100	75-90	36-98	35-65	15-45
	51-65	Variable	---	---	---	---	---	---	---	---	---
9------------------ Betis	0-18	Loamy fine sand	SM, SP-SM	A-2-4	0	100	97-100	90-100	10-35	---	NP
	18-62	Loamy fine sand, fine sandy loam.	SM	A-2-4, A-4	0	100	97-100	90-100	25-49	---	NP
10------------------ Betis	0-23	Loamy fine sand	SM, SP-SM	A-2-4	0	100	97-100	90-100	10-35	---	NP
	23-62	Loamy fine sand, fine sandy loam.	SM	A-2-4, A-4	0	100	97-100	90-100	25-49	---	NP
11------------------ Caspiana	0-14	Silty clay loam	CL	A-6, A-7-6	0	100	100	100	85-100	32-50	11-25
	14-45	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7-6, A-4	0	100	100	100	85-100	23-43	4-20
	45-60	Silt loam, very fine sandy loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	100	80-100	23-37	4-15
12------------------ Caspiana	0-11	Silt loam--------	CL-ML, ML	A-4	0	100	100	100	85-100	<27	NP-7
	11-59	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7-6, A-4	0	100	100	100	85-100	23-43	4-20
	59-84	Silt loam, very fine sandy loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	100	80-100	23-37	4-15
13------------------ Keithville	0-9	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	85-100	50-90	<25	NP-6
	9-36	Silt loam, loam, silty clay loam.	CL	A-6, A-4	0	100	100	90-100	65-95	25-35	8-16
	36-70	Silty clay, clay	CH, CL	A-7-6	0	100	100	95-100	65-95	41-66	22-38
14------------------ Gallion	0-9	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	100	100	100	90-100	<28	NP-11
	9-46	Silt loam, silty clay loam, clay loam.	CL	A-6	0	100	100	100	90-100	28-40	11-17
	46-63	Stratified silty clay loam to very fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	23-34	4-12
15------------------ Gallion	0-5	Silty clay loam	CL	A-6	0	100	100	100	90-100	33-40	15-20
	5-47	Silt loam, silty clay loam, clay loam.	CL	A-6	0	100	100	100	90-100	28-40	11-17
	47-62	Stratified silty clay loam to very fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	23-34	4-12

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Map symbol and soil name	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
16----------------- Gore	0-8	Silt loam--------	ML, CL-ML	A-4	0	100	100	95-100	60-90	<27	NP-7
	8-46	Clay, silty clay	CH	A-7-6	0	100	100	95-100	85-100	53-65	28-40
	46-65	Clay-------------	CH	A-7-6, A-7-5	0	100	100	95-100	85-100	51-75	25-45
17*:											
Messer Variant----	0-6	Silty clay-------	CH	A-7-6, A-7-5	0	100	100	95-100	90-100	51-75	25-45
	6-14	Fine sandy loam, sandy loam.	SM, SM-SC, ML, CL-ML	A-2-4, A-4	0	100	100	60-85	30-49	<25	NP-6
	14-60	Fine sandy loam, sandy loam.	SM, SM-SC, ML, CL-ML	A-2-4, A-4	0	100	100	60-85	30-49	<25	NP-6
Guyton Variant----	0-6	Silty clay-------	CH	A-7-6, A-7-5	0	100	95-100	90-100	90-100	51-75	25-45
	6-14	Silt loam--------	ML, CL-ML	A-4	0	100	100	95-100	75-90	<27	NP-7
	14-60	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	75-95	26-40	7-18
18*---------------- Guyton	0-21	Silt loam--------	ML, CL-ML	A-4	0	100	100	95-100	65-90	<27	NP-7
	21-34	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
	34-60	Silt loam, silty clay loam, clay loam.	CL, CL-ML, ML	A-6, A-4	0	100	100	95-100	51-95	<40	NP-18
19----------------- Briley	0-28	Loamy fine sand	SM	A-2-4, A-4	0	97-100	95-100	80-98	17-45	<25	NP-4
	28-80	Fine sandy loam, sandy clay loam.	SC, CL	A-4, A-6	0	95-100	95-100	85-98	36-55	22-39	8-22
20----------------- Moreland	0-13	Clay-------------	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	13-40	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	40-60	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	15-45
21----------------- Forbing	0-4	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	100	70-90	<30	NP-10
	4-12	Clay-------------	CH	A-7-6	0	100	100	95-100	85-100	51-76	26-50
	12-61	Clay-------------	CH	A-7-6	0	95-100	95-100	95-100	85-100	51-76	26-49
	61-75	Clay, silty clay	CH, CL	A-7-6	0	95-100	95-100	95-100	85-100	45-76	22-49
22----------------- Moreland	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	22-31	3-13
	8-48	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	48-60	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	15-45
23----------------- Moreland	0-9	Silty clay loam	CL	A-6, A-7-6	0	100	100	100	90-100	30-50	12-25
	9-32	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	32-60	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	15-45

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
24----------------- Moreland	0-13	Clay------------	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	13-52	Clay, 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	15-45
25----------------- Forbing	0-4	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	100	70-90	<30	NP-10
	4-7	Clay------------	CH	A-7-6	0	100	100	95-100	85-100	51-76	26-49
	7-24	Clay------------	CH	A-7-6	0	95-100	95-100	95-100	85-100	51-76	26-50
	24-60	Clay, silty clay	CH, CL	A-7-6	0	95-100	95-100	95-100	85-100	45-76	22-49
26----------------- Darden	0-8	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	100	100	90-100	5-35	---	NP
	8-66	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	90-100	11-35	---	NP
27----------------- Norwood	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	70-90	20-35	4-15
	10-46	Silt loam, silty clay loam, loam.	CL	A-6, A-7-6	0	100	100	90-100	70-98	30-46	11-26
	46-65	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7-6	0	100	100	90-100	70-98	20-45	2-25
28----------------- Sacul	0-13	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	80-100	40-65	<20	NP-3
	13-24	Clay, silty clay	CH, CL	A-7-6, A-7-5	0	95-100	90-100	85-100	70-90	45-70	20-40
	24-60	Silty clay loam, silt loam, clay loam.	CL, CH, SC	A-6, A-7-6 A-4	0	95-100	90-100	85-100	40-90	25-61	8-32
29----------------- Norwood	0-10	Silty clay loam	CL, CH	A-6, A-7-6	0	100	100	95-100	85-98	30-55	15-35
	10-38	Silt loam, silty clay loam, loam.	CL	A-6, A-7-6	0	100	100	90-100	70-98	30-46	11-26
	38-60	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7-6	0	100	100	90-100	70-98	20-45	2-25
30----------------- Sacul	0-15	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	80-100	40-65	<20	NP-3
	15-27	Clay, silty clay	CH, CL	A-7-5, A-7-6	0	95-100	90-100	85-100	70-90	45-70	20-40
	27-60	Silty clay loam, silt loam, clay loam.	CL, CH, SC	A-6, A-7-6, A-4	0	95-100	90-100	85-100	40-90	25-61	8-32
31----------------- Ruston	0-12	Fine sandy loam	SM, ML	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<20	NP-3
	12-58	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-40	11-18
	58-67	Fine sandy loam, sandy loam.	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<27	NP-7
	67-85	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-40	11-18

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
32----------------- Smithdale	0-16	Fine sandy loam	SM, SM-SC	A-4	0	100	85-100	60-80	36-49	<20	NP-5
	16-39	Clay loam, sandy clay loam, loam.	SC-CL	A-6, A-4	0	100	85-100	80-95	45-75	23-38	8-15
	39-63	Loam, sandy loam	SM, ML, CL, SC	A-4	0	100	85-100	65-80	36-70	<30	NP-10
33----------------- Severn	0-10	Very fine sandy loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	94-100	65-97	22-31	3-12
	10-60	Stratified silt loam to loamy very fine sand.	ML, CL-ML	A-4	0	100	100	94-100	65-97	<28	NP-7
34, 35------------- Severn	0-6	Very fine sandy loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	94-100	65-97	22-31	3-12
	6-60	Stratified silt loam to loamy very fine sand.	ML, CL-ML	A-4	0	100	100	94-100	65-97	<28	NP-7
36----------------- Severn	0-5	Very fine sandy loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	94-100	65-97	22-31	3-12
	5-63	Stratified silt loam to loamy very fine sand.	ML, CL-ML	A-4	0	100	100	94-100	65-97	<28	NP-7
37*:											
Metcalf------------	0-8	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	65-90	<25	NP-6
	8-38	Silt loam, loam, clay loam.	CL	A-6	0	100	100	90-100	65-95	31-40	11-18
	38-65	Silty clay, clay	CH, CL	A-7-6	0	100	100	95-100	85-100	46-66	20-42
Messer-------------	0-28	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	95-100	80-95	<27	NP-7
	28-62	Silty clay loam, clay loam, loam.	CL	A-6, A-7-6	0	100	100	95-100	80-95	32-45	11-21
38*:											
Guyton-------------	0-26	Silt loam--------	ML, CL-ML	A-4	0	100	100	95-100	65-90	<27	NP-7
	26-42	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
	42-65	Silt loam, silty clay loam, clay loam.	CL, CL-ML, ML	A-6, A-4	0	100	100	95-100	51-95	<40	NP-18
Messer-------------	0-30	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	95-100	80-95	<27	NP-7
	30-65	Silty clay loam, clay loam, loam.	CL	A-6, A-7-6	0	100	100	95-100	80-95	32-45	11-21
39*:											
Wrightsville-------	0-24	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	75-100	<31	NP-10
	24-53	Silty clay, clay, silty clay loam.	CH, CL,	A-7-6	0	100	100	95-100	90-100	41-65	22-40
	53-64	Silty clay loam, silty clay, clay.	CL, CH,	A-7-6, A-6	0	100	95-100	95-100	90-100	35-65	16-40
Messer-------------	0-34	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	95-100	80-95	<27	NP-7
	34-62	Silty clay loam, clay loam, loam.	CL	A-6, A-7-6	0	100	100	95-100	80-95	32-45	11-21

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
40----------------- Bowie	0-14	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-2-4, A-4	0	98-100	98-100	95-100	35-55	<25	NP-6
	14-35	Sandy clay loam, clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	90-100	90-100	85-100	40-55	20-40	8-22
	35-60	Sandy clay loam, clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	80-100	70-100	65-100	36-65	20-40	8-20
41----------------- Meth	0-12	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2-4	0	80-100	80-100	65-100	30-75	<25	NP-5
	12-32	Clay, sandy clay, clay loam.	CL, SC, CH, MH	A-6, A-7-6, A-7-5	0	100	100	85-100	45-95	36-66	14-34
	32-62	Sandy clay loam, sandy loam, fine sandy loam.	CL, SC, SM-SC, CL-ML	A-6, A-4, A-7-6	0	100	100	75-100	40-60	25-45	5-21
42----------------- Meth	0-10	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2-4	0	80-100	80-100	65-100	30-75	<25	NP-5
	10-32	Clay, sandy clay, clay loam.	CL, SC, CH, MH	A-6, A-7-6, A-7-5	0	100	100	85-100	45-95	36-66	14-34
	32-70	Sandy clay loam, sandy loam, fine sandy loam.	CL, SC, SM-SC, CL-ML	A-6, A-4, A-7-6	0	100	100	75-100	40-60	25-45	5-21
43*:											
Moreland----------	0-14	Clay------------	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	14-43	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	90-100	51-74	25-45
	43-60	Clay, silty clay loam, silty clay.	CH, CL	A-7-6, A-6	0	100	100	100	90-100	35-74	15-45
Urban land.											
44*:											
Norwood-----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	70-90	20-35	4-15
	8-33	Silt loam, silty clay loam, loam.	CL	A-6, A-7-6	0	100	100	90-100	70-98	30-46	11-26
	33-60	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7-6	0	100	100	90-100	70-98	20-45	2-25
Urban land.											
45*:											
Woodtell----------	0-8	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-2-4, A-4	0	90-100	85-100	75-95	30-60	<25	NP-7
	8-31	Clay, silty clay	CH	A-7-6	0	100	90-100	80-100	60-98	51-75	28-50
	31-47	Clay loam, clay, sandy clay loam.	CL, SC, CH	A-6, A-7-6	0	100	80-100	75-90	36-98	35-65	15-45
	47-60	Variable	---	---	---	---	---	---	---	---	---
Urban land.											

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
46*:											
Woodtell----------	0-5	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-2-4, A-4	0	90-100	85-100	75-95	30-60	<25	NP-7
	5-34	Clay, silty clay	CH	A-7-6, A-7-5	0	100	90-100	80-100	60-98	51-75	28-50
	34-49	Clay loam, clay, sandy clay loam.	CL, SC, CH	A-6, A-7-6	0	100	80-100	75-90	36-98	35-65	15-45
	49-60	Variable	---	---	---	---	---	---	---	---	---
Urban land.											
48*:											
Keithville--------	0-9	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	85-100	50-90	<25	NP-6
	9-30	Silt loam, loam, silty clay loam.	CL	A-6, A-4	0	100	100	90-100	65-95	25-35	8-16
	30-70	Silty clay, clay	CH, CL	A-7-6	0	100	100	95-100	65-95	41-66	22-38
Urban land.											
49*:											
Forbing-----------	0-3	Silt loam-------	ML, CL-ML, CL	A-4	0	100	100	100	70-90	<30	NP-10
	3-11	Clay------------	CH	A-7-6	0	100	100	95-100	85-100	51-76	26-49
	11-34	Clay------------	CH	A-7-6	0	95-100	95-100	95-100	85-100	51-76	26-49
	34-60	Clay, silty clay	CH, CL	A-7-6	0	95-100	95-100	95-100	85-100	45-76	22-49
Urban land.											
50*:											
Guyton------------	0-16	Silt loam-------	ML, CL-ML	A-4	0	100	100	95-100	65-90	<27	NP-7
	16-47	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
	47-66	Silt loam, silty clay loam, clay loam.	CL, CL-ML, ML	A-6, A-4	0	100	100	95-100	51-95	<40	NP-18
Urban land.											
51*:											
Ruston------------	0-10	Fine sandy loam	SM, ML	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<20	NP-3
	10-27	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-40	11-18
	27-42	Fine sandy loam, sandy loam.	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<27	NP-7
	42-60	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-40	11-18
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
						K	T	
	In	In/hr	In/in	pH				Pct
1----------------	0-10	<0.06	0.17-0.20	6.1-7.8	High-----------	0.28	5	2.4
Buxin	10-41	<0.06	0.17-0.20	6.1-7.8	High-----------	0.32		
	41-63	<0.2	0.17-0.22	6.6-8.4	High-----------	0.32		
2----------------	0-15	0.06-0.2	0.18-0.20	6.1-8.4	High-----------	0.32	5	2.4
Armistead	15-63	0.2-0.6	0.18-0.22	6.1-8.4	Low------------	0.37		
3----------------	0-9	0.6-2.0	0.20-0.22	5.1-6.5	Low------------	0.43	4	.5-2
Beauregard	9-32	0.2-0.6	0.20-0.22	4.5-5.5	Low------------	0.37		
	32-43	0.06-0.2	0.20-0.22	4.5-6.0	Low------------	0.37		
	43-60	0.06-0.2	0.18-0.22	5.1-6.0	Low------------	0.37		
4----------------	0-20	2.0-6.0	0.11-0.15	5.1-6.5	Low------------	0.32	5	<1
Bernaldo	20-39	0.6-2.0	0.15-0.20	4.5-6.5	Moderate-------	0.32		
	39-80	0.6-2.0	0.15-0.20	4.5-6.5	Low------------	0.32		
5----------------	0-12	0.2-0.6	0.15-0.23	4.5-7.3	Low------------	0.55	3	---
Bonn	12-28	<0.06	0.08-0.14	5.6-9.0	Low------------	0.55		
	28-64	<0.2	0.08-0.14	6.6-9.0	Low------------	0.55		
6----------------	0-9	0.6-2.0	0.10-0.15	4.5-6.5	Low------------	0.43	4	.5-1
Woodtell	9-44	<0.06	0.12-0.18	3.6-5.5	High-----------	0.32		
	44-54	0.06-0.2	0.15-0.20	4.5-6.0	High-----------	0.32		
	54-65	---	---	---	---------------	----		
7----------------	0-5	0.6-2.0	0.10-0.15	4.5-6.5	Low------------	0.43	4	.5-1
Woodtell	5-36	<0.06	0.12-0.18	3.6-5.5	High-----------	0.32		
	36-45	0.06-0.2	0.15-0.20	4.5-6.0	High-----------	0.32		
	45-63	---	---	---	---------------	----		
8----------------	0-4	0.6-2.0	0.10-0.15	4.5-6.5	Low------------	0.43	4	.5-1
Woodtell	4-38	<0.06	0.12-0.18	3.6-5.5	High-----------	0.32		
	38-51	0.06-0.2	0.15-0.20	4.5-6.0	High-----------	0.32		
	51-65	---	---	---	---------------	----		
9----------------	0-18	6.0-20	0.05-0.09	4.5-6.0	Low------------	0.17	5	<.5
Betis	18-62	6.0-20	0.08-0.11	4.5-6.0	Low------------	0.17		
10---------------	0-23	6.0-20	0.05-0.09	4.5-6.0	Low------------	0.17	5	<.5
Betis	23-62	6.0-20	0.08-0.11	4.5-6.0	Low------------	0.17		
11---------------	0-14	0.6-2.0	0.20-0.22	5.6-8.4	Moderate-------	0.32	5	2-4
Caspiana	14-45	0.6-2.0	0.20-0.22	5.6-8.4	Moderate-------	0.32		
	45-60	0.6-2.0	0.15-0.23	6.1-8.4	Low------------	0.32		
12---------------	0-11	0.6-2.0	0.21-0.23	5.6-8.4	Low------------	0.37	5	2-4
Caspiana	11-59	0.6-2.0	0.20-0.22	5.6-8.4	Moderate-------	0.32		
	59-84	0.6-2.0	0.15-0.23	6.1-8.4	Low------------	0.32		
13---------------	0-9	0.2-2.0	0.15-0.20	4.5-6.0	Low------------	0.43	4	.5-1
Keithville	9-36	0.2-0.6	0.15-0.20	4.5-6.0	Low------------	0.37		
	36-70	<0.06	0.15-0.18	4.5-6.0	High-----------	0.32		
14---------------	0-9	0.6-2.0	0.21-0.23	5.6-7.3	Low------------	0.37	5	1-2
Gallion	9-46	0.6-2.0	0.20-0.22	5.6-7.8	Moderate-------	0.32		
	46-63	0.6-2.0	0.20-0.23	6.1-8.4	Low------------	0.37		
15---------------	0-5	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-------	0.32	5	1-2
Gallion	5-47	0.6-2.0	0.20-0.22	5.6-7.8	Moderate-------	0.32		
	47-62	0.6-2.0	0.20-0.23	6.1-8.4	Low------------	0.37		
16---------------	0-8	0.6-2.0	0.20-0.22	5.1-6.0	Low------------	0.43	3	.5-2
Gore	8-46	<0.06	0.14-0.18	4.5-7.3	High-----------	0.32		
	46-65	<0.06	0.14-0.18	5.6-7.8	High-----------	0.32		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
						K	T	
	In	In/hr	In/in	pH				Pct
17*:								
Messer Variant--	0-6	<0.06	0.18-0.20	6.1-7.3	High-----------	0.28	4	---
	6-14	2.0-6.0	0.14-0.16	5.6-6.5	Low------------	0.32		
	14-60	2.0-6.0	0.14-0.16	5.6-6.5	Low------------	0.32		
Guyton Variant--	0-6	<0.06	0.18-0.20	6.1-7.3	High-----------	0.32	5	<2
	6-14	0.6-20	0.20-0.23	5.6-6.5	Low------------	0.49		
	14-60	0.06-0.2	0.15-0.22	5.6-6.5	Low------------	0.43		
18*-------------- Guyton	0-21	0.6-2.0	0.20-0.23	3.6-6.0	Low------------	0.49	3	---
	21-34	0.06-0.2	0.15-0.22	3.6-6.0	Low------------	0.37		
	34-60	0.06-2.0	0.15-0.22	3.6-8.4	Low------------	0.37		
19--------------- Briley	0-28	6.0-20	0.07-0.11	4.5-6.5	Low------------	0.20	5	<0.5
	28-80	0.6-2.0	0.13-0.17	4.5-6.0	Low------------	0.24		
20--------------- Moreland	0-13	<0.06	0.18-0.20	6.1-7.8	Very high------	0.32	5	2-4
	13-40	<0.06	0.18-0.20	6.6-8.4	High-----------	0.32		
	40-60	<0.2	0.18-0.21	7.4-8.4	Very high------	0.32		
21--------------- Forbing	0-4	0.6-2.0	0.21-0.23	5.1-6.5	Low------------	0.43	3	.5-2
	4-12	<0.06	0.18-0.20	5.6-7.3	Very high------	0.32		
	12-61	<0.06	0.16-0.20	6.1-8.4	Very high------	0.32		
	61-75	<0.06	0.16-0.20	7.4-8.4	Very high------	0.32		
22--------------- Moreland	0-8	0.6-2.0	0.21-0.23	6.1-7.8	Low------------	0.43	5	2-4
	8-48	<0.06	0.18-0.20	6.6-8.4	High-----------	0.32		
	48-60	<0.2	0.18-0.21	7.4-8.4	Very high------	0.32		
23--------------- Moreland	0-9	0.06-0.2	0.19-0.21	6.1-7.8	Moderate-------	0.37	5	2-4
	9-32	<0.06	0.18-0.20	6.6-8.4	High-----------	0.32		
	32-60	<0.2	0.18-0.21	7.4-8.4	Very high------	0.32		
24--------------- Moreland	0-13	<0.06	0.18-0.20	6.1-7.8	Very high------	0.32	5	2-4
	13-52	<0.06	0.18-0.20	6.6-8.4	High-----------	0.32		
	52-65	<0.2	0.18-0.21	7.4-8.4	Very high------	0.32		
25--------------- Forbing	0-4	0.6-2.0	0.21-0.23	5.1-6.5	Low------------	0.43	3	.5-2
	4-7	<0.06	0.18-0.20	5.6-7.3	Very high------	0.32		
	7-24	<0.06	0.16-0.20	6.1-8.4	Very high------	0.32		
	24-60	<0.06	0.16-0.20	7.4-8.4	Very high------	0.32		
26--------------- Darden	0-8	6.0-20	0.05-0.09	4.5-7.3	Low------------	0.15	5	<.5
	8-66	6.0-20	0.05-0.09	4.5-7.3	Low------------	0.15		
27--------------- Norwood	0-10	0.6-2.0	0.17-0.21	7.4-8.4	Low------------	0.43	5	.5-2
	10-46	0.6-2.0	0.15-0.22	7.9-8.4	Low------------	0.43		
	46-65	0.6-2.0	0.15-0.22	7.9-8.4	Low------------	0.43		
28--------------- Sacul	0-13	0.6-2.0	0.10-0.20	4.5-5.5	Low------------	0.32	3	.5-1
	13-24	0.06-0.2	0.12-0.18	4.5-5.5	High-----------	0.32		
	24-60	0.2-0.6	0.16-0.24	4.5-5.5	Moderate-------	0.37		
29--------------- Norwood	0-10	0.6-2.0	0.18-0.22	7.4-8.4	Moderate-------	0.32	5	.5-2
	10-38	0.6-2.0	0.15-0.22	7.9-8.4	Low------------	0.43		
	38-60	0.6-2.0	0.15-0.22	7.9-8.4	Low------------	0.43		
30--------------- Sacul	0-15	0.6-2.0	0.10-0.20	4.5-5.5	Low------------	0.32	3	.5-1
	15-27	0.06-0.2	0.12-0.18	4.5-5.5	High-----------	0.32		
	27-60	0.2-0.6	0.16-0.24	4.5-5.5	Moderate-------	0.37		
31--------------- Ruston	0-12	0.6-2.0	0.09-0.16	5.1-6.5	Low------------	0.32	5	.5-1
	12-58	0.6-2.0	0.12-0.17	4.5-6.0	Low------------	0.28		
	58-67	0.6-2.0	0.12-0.15	4.5-6.0	Low------------	0.32		
	67-85	0.6-2.0	0.12-0.17	4.5-6.0	Low------------	0.28		
32--------------- Smithdale	0-16	2.0-6.0	0.14-0.16	4.5-5.5	Low------------	0.28	5	.5-1
	16-39	0.6-2.0	0.15-0.17	4.5-5.5	Low------------	0.24		
	39-63	2.0-6.0	0.14-0.16	4.5-5.5	Low------------	0.28		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
						K	T	
	In	In/hr	In/in	pH				Pct
33 Severn	0-10	2.0-6.0	0.13-0.20	7.4-8.4	Low	0.32	5	0.5-1
	10-60	2.0-6.0	0.11-0.20	7.9-8.4	Low	0.32		
34, 35 Severn	0-6	2.0-6.0	0.13-0.20	7.4-8.4	Low	0.32	5	.5-1
	6-60	2.0-6.0	0.11-0.20	7.9-8.4	Low	0.32		
36 Severn	0-5	2.0-6.0	0.13-0.20	7.4-8.4	Low	0.32	5	---
	5-63	2.0-6.0	0.11-0.20	7.9-8.4	Low	0.32		
37*:								
Metcalf	0-8	0.6-2.0	0.12-0.18	4.5-6.0	Low	0.43	4	.5-1
	8-38	0.2-0.6	0.15-0.20	4.5-6.0	Low	0.37		
	38-65	<0.06	0.15-0.18	4.5-6.0	High	0.32		
Messer	0-28	0.6-2.0	0.15-0.21	4.5-6.0	Low	0.43	4	.5-1
	28-62	0.06-0.2	0.15-0.20	4.5-6.6	Low	0.37		
38*:								
Guyton	0-26	0.6-2.0	0.20-0.23	3.6-6.0	Low	0.49	3	<2
	26-42	0.06-0.2	0.15-0.22	3.6-6.0	Low	0.37		
	42-65	0.06-2.0	0.15-0.22	3.6-8.4	Low	0.37		
Messer	0-30	0.6-2.0	0.15-0.21	4.5-6.0	Low	0.43	4	.5-1
	30-65	0.06-0.2	0.15-0.20	4.5-6.6	Low	0.37		
39*:								
Wrightsville	0-24	0.2-0.6	0.16-0.24	3.6-5.5	Low	0.49	5	.5-1
	24-53	<0.06	0.14-0.22	3.6-5.5	High	0.37		
	53-64	<0.06	0.14-0.22	3.6-8.4	High	0.43		
Messer	0-34	0.6-2.0	0.15-0.21	4.5-6.0	Low	0.43	4	.5-1
	34-62	0.06-0.2	0.15-0.20	4.5-6.6	Low	0.37		
40 Bowie	0-14	2.0-6.0	0.10-0.15	5.1-6.5	Low	0.32	5	<1
	14-35	0.6-2.0	0.15-0.20	4.5-5.5	Low	0.32		
	35-60	0.2-0.6	0.15-0.20	4.5-5.5	Low	0.28		
41 Meth	0-12	0.6-2.0	0.12-0.18	5.1-6.0	Low	0.32	4	.5-2
	12-32	0.2-0.6	0.15-0.18	3.6-6.0	Moderate	0.28		
	32-62	0.6-2.0	0.12-0.18	4.5-6.0	Low	0.32		
42 Meth	0-10	0.6-2.0	0.12-0.18	5.1-6.0	Low	0.32	4	.5-2
	10-32	0.2-0.6	0.15-0.18	3.6-6.0	Moderate	0.28		
	32-70	0.6-2.0	0.12-0.18	4.5-6.0	Low	0.32		
43*:								
Moreland	0-14	<0.06	0.18-0.20	6.1-7.8	Very high	0.32	5	2-4
	14-43	<0.06	0.18-0.20	6.6-8.4	High	0.32		
	43-60	<0.2	0.18-0.21	7.4-8.4	Very high	0.32		
Urban land.								
44*:								
Norwood	0-8	0.6-2.0	0.17-0.21	7.4-8.4	Low	0.43	5	.5-2
	8-33	0.6-2.0	0.15-0.22	7.9-8.4	Low	0.43		
	33-60	0.6-2.0	0.15-0.22	7.9-8.4	Low	0.43		
Urban land.								
45*:								
Woodtell	0-8	0.6-2.0	0.10-0.15	4.5-6.5	Low	0.43	4	.5-1
	8-31	<0.06	0.12-0.18	3.6-5.5	High	0.32		
	31-47	0.06-0.2	0.15-0.20	4.5-6.0	High	0.32		
	47-60	---	---	---	---	----		
Urban land.								

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	In/hr	In/in	pH				Pct
46*:								
Woodtell---------	0-5	0.6-2.0	0.10-0.15	4.5-6.5	Low-------------	0.43	4	0.5-1
	5-34	<0.06	0.12-0.18	3.6-5.5	High-----------	0.32		
	34-49	0.06-0.2	0.15-0.20	4.5-6.0	High-----------	0.32		
	49-60	---	---	---	---------------	----		
Urban land.								
48*:								
Keithville-------	0-9	0.2-2.0	0.15-0.20	4.5-6.0	Low-------------	0.43	4	.5-1
	9-30	0.2-0.6	0.15-0.20	4.5-6.0	Low-------------	0.37		
	30-70	<0.06	0.15-0.18	4.5-6.0	High-----------	0.32		
Urban land.								
49*:								
Forbing----------	0-3	0.6-2.0	0.21-0.23	5.1-6.5	Low-------------	0.43	3	.5-2
	3-11	<0.06	0.18-0.20	5.6-7.3	Very high------	0.32		
	11-34	<0.06	0.16-0.20	6.1-8.4	Very high------	0.32		
	34-60	<0.06	0.16-0.20	7.4-8.4	Very high------	0.32		
Urban land.								
50*:								
Guyton-----------	0-16	0.6-2.0	0.20-0.23	3.6-6.0	Low-------------	0.49	3	<2
	16-47	0.06-0.2	0.15-0.22	3.6-6.0	Low-------------	0.37		
	47-66	0.06-2.0	0.15-0.22	3.6-8.4	Low-------------	0.37		
Urban land.								
51*:								
Ruston-----------	0-10	0.6-2.0	0.09-0.16	5.1-6.5	Low-------------	0.32	5	.5-1
	10-27	0.6-2.0	0.12-0.17	4.5-6.0	Low-------------	0.28		
	27-42	0.6-2.0	0.12-0.15	4.5-6.0	Low-------------	0.32		
	42-60	0.6-2.0	0.12-0.17	4.5-6.0	Low-------------	0.28		
Urban land.								

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "rare," "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
1----------------- Buxin	D	Occasional	Very brief to very long.	Dec-Jul	0-3.0	Apparent	Dec-Apr	High-----	Low.
2----------------- Armistead	C	None--------	---	---	1.5-3.0	Apparent	Dec-Apr	High-----	Low.
3----------------- Beauregard	C	None--------	---	---	1.5-3.0	Apparent	Dec-Mar	High-----	High.
4----------------- Bernaldo	B	None--------	---	---	4.0-6.0	Apparent	Nov-Feb	Moderate	Moderate.
5----------------- Bonn	D	None--------	---	---	0-2.0	Perched	Dec-Apr	High-----	Low.
6, 7, 8----------- Woodtell	D	None--------	---	---	1.5-4.0	Apparent	Dec-Feb	High-----	High.
9, 10------------- Betis	A	None--------	---	---	>6.0	---	---	Low------	Moderate.
11, 12------------ Caspiana	B	None--------	---	---	>4.0	Apparent	Dec-Apr	Moderate	Low.
13---------------- Keithville	D	None--------	---	---	2.0-3.0	Perched	Dec-Apr	High-----	Moderate.
14, 15------------ Gallion	B	None--------	---	---	>4.0	Apparent	Dec-Apr	Moderate	Low.
16---------------- Gore	D	None--------	---	---	>6.0	---	---	High-----	Low.
17*:									
Messer Variant---	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	High-----	Low.
Guyton Variant---	D	None--------	---	---	0-1.5	Perched	Dec-May	High-----	Low.
18*--------------- Guyton	D	Frequent----	Very brief to long.	Jan-Dec	0-1.5	Perched	Dec-May	High-----	Moderate.
19---------------- Briley	B	None--------	---	---	>6.0	---	---	Moderate	High.
20---------------- Moreland	D	None--------	---	---	0-1.5	Perched	Dec-Apr	High-----	Low.
21---------------- Forbing	D	None--------	---	---	>6.0	---	---	High-----	Low.
22, 23, 24-------- Moreland	D	None--------	---	---	0-1.5	Perched	Dec-Apr	High-----	Low.
25---------------- Forbing	D	None--------	---	---	>6.0	---	---	High-----	Low.
26---------------- Darden	A	None--------	---	---	>6.0	---	---	Low------	High.
27---------------- Norwood	B	Rare--------	---	---	>6.0	---	---	High-----	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
28 Sacul	C	None	---	---	>6.0	---	---	High	Moderate.
29 Norwood	B	Rare	---	---	>6.0	---	---	High	Low.
30 Sacul	C	None	---	---	>6.0	---	---	High	Moderate.
31 Ruston	B	None	---	---	>6.0	---	---	Moderate	Moderate.
32 Smithdale	B	None	---	---	>6.0	---	---	Low	Moderate.
33, 34 Severn	B	None	---	---	>6.0	---	---	Low	Low.
35 Severn	B	Occasional	Very brief to long.	Dec-Jun	>6.0	---	---	Low	Low.
36 Severn	B	Frequent	Very brief to long.	Dec-Jun	>6.0	---	---	Low	Low.
37*:									
Metcalf	D	None	---	---	1.5-2.5	Perched	Dec-Apr	High	Moderate.
Messer	C	None	---	---	2.0-4.0	Perched	Dec-Mar	High	Moderate.
38*:									
Guyton	D	None	---	---	0-1.5	Perched	Dec-May	High	Moderate.
Messer	C	None	---	---	2.0-4.0	Perched	Dec-Mar	High	Moderate.
39*:									
Wrightsville	D	None	---	---	0.5-1.5	Perched	Dec-Apr	High	High.
Messer	C	None	---	---	2.0-4.0	Perched	Dec-Mar	High	Moderate.
40 Bowie	B	None	---	---	>6.0	---	---	Moderate	High.
41, 42 Meth	C	None	---	---	>6.0	---	---	High	Moderate.
43*:									
Moreland	D	None	---	---	0-1.5	Perched	Dec-Apr	High	Low.
Urban land.									
44*:									
Norwood	B	Rare	---	---	>6.0	---	---	High	Low.
Urban land.									
45*, 46*:									
Woodtell	D	None	---	---	1.5-4.0	Apparent	Dec-Feb	High	High.
Urban land.									
48*:									
Keithville	D	None	---	---	2.0-3.0	Perched	Dec-Apr	High	Moderate.
Urban land.									

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
49*:									
Forbing----------	D	None--------	---	---	>6.0	---	---	High-----	Low.
Urban land.									
50*:									
Guyton-----------	D	None--------	---	---	0-1.5	Perched	Dec-May	High-----	Moderate.
Urban land.									
51*:									
Ruston-----------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
Urban land.									

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING TEST DATA

[Dashes indicate data were not available]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution							Liquid limit	Plasticity index	Moisture density	
			Percentage passing sieve--				Percentage smaller than--						
	AASHTO	Unified	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Max. dry density	Optimum moisture
										Pct		Lb/ft3	Pct
Armistead clay:[1] (S74LA-017-015)													
Ap--------0 to 7	A-7-5(35)	CH	100	100	100	98	86	64	49	60	30	--	--
IIA1-----15 to 25	A-6 (15)	CL	100	100	100	89	46	37	31	37	17	101	20
IIB21t---25 to 42	A-6 (13)	CL	100	100	100	87	46	30	26	34	16	104	18
Armistead clay:[2] (S75LA-017-009)													
Ap--------0 to 6	A-7-6(30)	CH	100	100	100	98	86	62	48	54	26	99	22
IIA------12 to 22	A-6 (13)	CL	100	100	100	95	48	34	29	36	13	103	19
IIB21t---22 to 30	A-6 (08)	CL	100	100	99	76	37	24	21	31	13	107	17
Bonn silt loam:[3] (S76LA-017-006)													
B&A------15 to 28	A-6 (14)	CL	100	100	100	86	73	46	41	34	17	102	20
B2tg-----28 to 58	A-6 (14)	CL	100	100	100	88	77	49	34	36	16	99	21
Caspiana silt loam:[4] (S75LA-017-002)													
B21t-----17 to 29	A-6 (12)	CL	100	100	100	99	52	27	23	32	12	104	18
B22t-----29 to 44	A-4 (04)	CL-ML	100	100	100	98	38	18	15	26	5	107	18
Caspiana silt loam:[5] (S75LA-017-005)													
B21t-----20 to 38	A-7-6(18)	CL	100	100	100	99	69	38	32	41	16	99	22
Forbing silt loam:[6] (S74LA-017-009)													
B22t------7 to 15	A-7-6(43)	CH	100	100	100	95	77	77	60	67	39	91	27
Forbing silt loam:[7] (S74LA-017-011)													
B22t------9 to 20	A-7-6(57)	CH	100	100	100	98	85	75	67	76	50	93	25
Gallion silt loam:[8] (S76LA-017-001)													
B21t------9 to 18	A-6 (16)	CL	100	100	100	100	--	--	--	37	15	99	22
B22t-----18 to 34	A-6 (14)	CL	100	100	100	100	--	--	--	35	13	101	21

See footnotes at end of table.

TABLE 16.--ENGINEERING TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution							Liquid limit	Plasticity index	Moisture density	
			Percentage passing sieve--				Percentage smaller than--						
	AASHTO	Unified	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Max. dry density	Optimum moisture
										Pct		Lb/ft3	Pct
Gore silt loam:[9] (S76LA-017-002)													
B21t------8 to 17	A-7-6(11)	SC	100	100	100	--	--	--	--	58	32	92	26
B22t-----17 to 28	A-7-6(13)	SC	100	100	100	--	--	--	--	63	38	93	25
Keithville very fine sandy loam:[10] (S74LA-017-014)													
B21t-----10 to 22	A-6 (10)	CL	100	100	99	79	40	38	25	33	15	112	14
IIB2t----38 to 51	A-7-6(15)	CL	100	100	100	71	46	37	34	42	24	105	18
Keithville silt loam:[11] (S76LA-017-012)													
B21t-----10 to 20	A-6 (06)	CL	100	100	98	75	42	27	22	28	11	112	15
B22t-----20 to 28	A-6 (09)	CL	100	100	99	81	46	28	24	30	13	110	16
IIB21t---32 to 45	A-7-6(28)	CH	100	100	100	87	62	48	42	54	29	--	--
Metcalf silt loam:[12] (S74LA-017-001)													
B22t-----16 to 23	A-6 (09)	CL	100	100	99	84	46	33	28	33	12	110	16
B23t-----23 to 30	A-6 (08)	CL	100	100	99	73	42	27	24	32	13	106	18
IIB24t---38 to 55	A-7-6(37)	CH	100	100	100	89	60	49	45	59	39	95	24
Metcalf silt loam:[13] (S74LA-017-002)													
B22t-----15 to 23	A-6 (10)	CL	100	100	97	78	46	32	27	33	14	107	13
IIB2t----35 to 45	A-7-6(42)	CH	100	100	100	90	64	55	52	65	42	--	--
Meth fine sandy loam:[14] (S76LA-017-010)													
B21t-----12 to 24	A-7-6(18)	CH	100	100	100	67	60	51	48	55	27	93	25
B22t-----24 to 32	A-7-5(17)	MH	100	100	100	63	60	55	49	61	27	91	26
Meth fine sandy loam:[15] (S76LA-017-007)													
B21t-----12 to 18	A-6 (05)	SC	100	100	98	47	42	34	31	38	20	111	15
B22t-----18 to 27	A-7-5(19)	CH	100	100	100	67	63	57	52	58	28	88	29
B23t-----27 to 37	A-7-5(22)	CH	100	100	100	65	61	54	48	64	34	91	27

See footnotes at end of table.

TABLE 16.--ENGINEERING TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution							Liquid limit	Plasticity index	Moisture density	
			Percentage passing sieve--				Percentage smaller than--						
	AASHTO	Unified	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Max. dry density	Optimum moisture
										Pct		Lb/ft3	Pct
Sacul fine sandy loam:16 (S76LA-017-004)													
B21t-----15 to 27	A-7-6(29)	CH	100	100	98	86	56	50	47	55	31	93	25
B22t-----27 to 37	A-7-6(18)	CL	100	100	95	74	46	42	42	47	25	--	--
Sacul fine sandy loam:17 (S76LA-017-005)													
B21t-----13 to 24	A-7-6(16)	CL	100	100	100	74	54	47	44	45	23	100	21
B22t-----24 to 34	A-7-6(29)	CH	100	100	100	81	64	59	56	61	32	92	26
Woodtell fine sandy loam:18 (S74LA-017-001)													
B21t------9 to 15	A-7-6(26)	CH	100	100	99	81	56	51	47	54	30	97	23
B22t-----15 to 24	A-7-5(31)	MH	100	100	100	82	62	57	52	66	33	92	26
Woodtell fine sandy loam:19 (S75LA-017-004)													
B21t------5 to 11	A-7-6(41)	CH	100	100	100	90	64	59	54	67	40	88	29
B22t-----11 to 22	A-7-6(42)	CH	100	100	100	91	66	57	52	69	40	89	28

[1]Armistead clay: 1.2 miles west of junction LA 526 and LA 1, 1,100 feet north of LA 526, 200 feet east of northsouth fence; Spanish Land Grant-3, T. 16 N., R. 13 W.

[2]Armistead clay: 0.9 mile west of Self Road from junction U.S. 71, 120 feet north of road, NW1/4SW1/4 sec. 27, T. 20 N., R. 15 W.

[3]Bonn silt loam: 1.3 miles south of Buncombe Road. on Woolworth Rd., then 300 feet west of road; NE1/4NE1/4 sec. 16, T. 16 N., R. 15 W.

[4]Caspiana silt loam: 3,000 feet west of LA 1 & Ellerbe Road junction, 100 feet north of Ellerbe Road on farm road., SE1/4SE1/4 sec. 11, T. 15 N., R. 12 W.

[5]Caspiana silt loam: 2.2 miles south of Gilliam on LA 1, 0.7 mile south of junction of farm road and LA 1 SW1/4SE1/4 sec. 18, T. 21 N., R. 14 W.

[6]Forbing silt loam: 2.9 miles south of junction of LA 526 and Wallace L. Road., 100 feet east of road; NW1/4NE1/4 sec. 30, T. 16 N., R. 13 W.

[7]Forbing silt loam: SE1/4NW1/4 sec. 29, T. 18 N., R. 14 W.

[8]Gallion silt loam: 2.3 miles west of Belcher on Self Road., 2,199 feet north of road; NE1/4SW1/4 sec. 1, T. 20 N., R. 15 W.

[9]Gore silt loam: 3 miles southeast of Forbing, 0.1 mile east on Leonard Road, 150 feet north of road, Spanish Land Grant-22, T. 16 N., R. 13 W.

[10]Keithville very fine sandy loam: 1 mile east of junction Buncombe Road and Woolworth Road, 600 feet south of Buncombe Road, NE1/4SW1/4 sec. 3, T. 16 N., R. 15 W

[11]Keithville silt loam: 1.5 miles north of junction Woolworth Road and LA 525, 400 feet west of Woolworth Road; NE1/4SE1/4 sec. 21, T. 16 N., R. 16 W.

[12]Metcalf silt loam: 1.6 miles west of Keithville, 400 feet west of Keith Road; NW1/4NW1/4 sec. 36, T. 16 N., R. 15. W.

[13]Metcalf silt loam: 4.4 miles west of junction LA 525 and U.S. 171, 0.1 mile south on Keith Road; SW1/4SW1/4 sec. 24, T. 16 N., R. 15 W.

[14]Meth fine sandy loam: 3 miles southeast of Bethany, 0.2 mile northeast on pipeline, 0.3 mile north on access road; NW1/4SE1/4 sec. 27, T. 16 N., R. 16 W.

[15]Meth fine sandy loam: 0.3 mile northeast of Greenwood, 1.7 miles north of junction U.S. 80 and Jefferson Paige Road: NE1/4NE1/4 sec. 18, T. 17 N., R. 15 W.

[16]Sacul fine sandy loam: 3.7 miles west of LA 168 and U.S. 71 junction, 1.8 miles north on Atlanta-Mira Road, 300 feet west; NW1/4NE1/4 sec. 6, T. 23 N., R. 15 W.

[17]Sacul fine sandy loam: 3.5 miles west of Ida, 2 miles north on hard surface road, 0.4 mile west on access road, NW1/4NW1/4 sec. 6, T. 23 N., R. 15 W.

[18]Woodtell fine sandy loam: 5 miles southeast of Greenwood, 120 feet south of Buncombe Road; NW1/4SE1/4 sec. 8, T. 16. N., R. 15 W.

[19]Woodtell fine sandy loam: 1.25 miles south of entrance to Caddo Correctional Institute, 350 feet southwest of LA 789; SW1/4NW1/4 sec. 33, T. 15 N., R. 15 W.

TABLE 17.--PHYSICAL TEST DATA

[Analysis by Soils Labotatory of the Louisiana Agricultural Experiment Station. The symbol < means less than. Dashes indicates analyses not made]

Soil and sample number	Horizon	Depth from surface	Particle size distribution: Sand 2.0-0.05 mm	Particle size distribution: Silt 0.05-0.002 mm	Particle size distribution: Clay <0.002 mm	Water content at tension--: 1/3 Bar	Water content at tension--: 15 Bar	Water retention difference	Water retention difference	Bulk density: Oven-dry	Bulk density: Field moisture	Extensibility COLE*
		In	Pct	Pct	Pct	Pct	Pct	Pct	In	G/cc	G/cc	
Keithville very fine sandy loam:** (S74LA-17-12)	Ap	0-4	51.3	41.9	6.8	11.6	3.9	7.7	0.11	1.38	1.39	.000
	A2	4-10	54.6	39.9	5.5	9.1	2.8	6.3	0.10	1.51	1.51	.000
	B21t	10-20	33.0	48.6	18.4	17.6	7.6	10.0	0.16	1.57	1.56	.002
	B22t	20-28	28.9	50.6	20.5	22.5	8.4	14.1	0.22	1.61	1.59	.004
	B&A	28-32	19.6	45.4	35.0	28.2	15.1	13.1	--	--	--	--
	IIB23t	32-45	17.2	40.2	42.6	27.8	14.2	13.6	0.24	1.98	1.73	.046
	IIB31t	45-60	21.7	41.8	36.5	31.1	16.5	14.6	0.27	1.99	1.82	.030
	IIB32t	60-70	31.6	30.3	38.1	31.1	17.7	13.4	0.24	2.01	1.80	.037
Metcalf silt loam: (S74LA-17-1)	A1	0-3	42.9	53.6	3.5	14.8	3.7	11.1	0.16	1.44	1.44	--
	A2	3-8	37.0	56.2	6.8	11.6	2.9	8.7	0.14	1.57	1.58	--
	B21t	8-16	31.3	49.9	18.8	19.4	7.2	12.2	0.18	1.54	1.51	.007
	B22t	16-23	28.8	45.0	26.2	21.8	10.6	11.2	0.18	1.65	1.62	.006
	B23t	23-30	30.5	47.5	22.0	19.7	8.9	10.8	0.18	1.68	1.63	.010
	B&A	30-38	27.1	49.8	23.1	21.2	9.3	11.9	0.19	1.67	1.58	.019
	IIB24t	38-55	17.8	39.1	43.1	30.0	17.2	12.8	0.19	1.80	1.57	.060
	IIB25t	55-65	16.4	43.0	40.6	33.3	17.7	15.6	0.25	1.88	1.58	.059
Meth fine sandy loam: (S74LA-17-10)	Ap	0-6	80.0	13.7	6.3	6.0	1.4	4.6	0.07	1.52	1.40	.007
	A2	6-12	71.3	21.2	7.5	8.5	1.7	6.8	0.11	1.66	1.60	.012
	B21t	12-18	50.3	17.6	32.1	20.3	10.5	9.8	0.15	1.74	1.62	.024
	B22t	18-27	31.7	13.2	55.1	34.0	20.3	13.7	0.21	1.70	1.52	.038
	B23t	27-37	39.4	16.0	44.6	34.8	17.6	17.2	0.26	1.60	1.53	.015
	B24t	37-54	41.2	15.6	43.2	31.3	18.9	12.4	0.17	1.57	1.40	.029
	B31	54-62	49.7	21.5	28.8	27.2	15.3	11.9	0.16	1.45	1.32	.032
	B32	62-72	55.0	22.7	22.3	25.5	14.7	10.8	0.14	1.47	1.32	.037
Meth fine sandy loam: (S74LA-17-11)	Ap	0-7	74.8	21.4	3.8	8.3	2.1	6.2	0.10	1.61	1.62	--
	A2	7-12	69-7	21.4	8.9	10.7	2.9	7.8	0.13	1.68	1.67	.002
	B21t	12-24	38.6	6.9	54.5	34.1	18.9	15.2	0.23	1.69	1.49	.043
	B22t	24-32	44.0	11.2	44.8	28.2	15.5	12.7	0.19	1.72	1.52	.042
	B23t	32-46	50.4	16.8	32.8	27.9	14.8	13.1	0.21	1.67	1.51	.034
	B31	46-62	49.2	12.6	38.2	27.1	14.0	13.1	0.20	1.64	1.49	.033
	B32	62-72	55.8	12.1	32.1	24.7	12.2	12.5	--	--	--	--

TABLE 17.--PHYSICAL TEST DATA--Continued

Soil and sample number	Horizon	Depth from surface	Particle size distribution			Water content at tension--		Water retention difference		Bulk density		Exten-sibility COLE*
			Sand 2.0-0.05 mm	Silt 0.05-0.002 mm	Clay <0.002 mm	1/3 Bar	15 Bar			Oven Dry	Field Moisture	
		In	Pct	Pct	Pct	Pct	Pct	Pct	In	G/cc	G/cc	
Woodtell fine sandy loam: (S75LA-17-1)	A11	0-1	49.1	44.5	6.4	26.6	7.9	18.7	--	--	--	--
	A12	1-9	53.1	40.5	6.3	13.3	3.5	9.8	0.15	1.55	1.51	.009
	B21t	9-15	31.9	17.2	50.9	34.4	18.6	15.8	0.22	1.76	1.40	.080
	B22t	15-24	26.4	22.1	51.5	35.4	19.5	15.9	0.23	1.80	1.41	.085
	B23t	24-44	24.9	23.5	51.6	35.8	20.1	15.7	0.18	1.84	1.39	.098
	C1	44-54	28.0	24.8	47.2	35.3	17.9	17.4	0.25	1.83	1.41	.091
	C2	54-65	36.0	26.3	37.7	36.7	16.8	19.9	0.29	1.82	1.43	.084
	C3	65-72	6.6	52.6	40.8	45.3	19.3	26.0	0.37	1.79	1.43	.078

* COLE (Coefficient of Linear Extensibility): A quantitative method of determining shrink-swell behavior of soil. It is an estimate of the vertical component of swelling of a natural soil clod. COLE is expressed as: low (0.03); moderate (0.03-0.06); and high (0.06).

** Clay content of parts of the IIBt horizon is slightly less than the minimum 40 percent required in the Keithville series, but this difference is considered to be within the normal error of observation.

TABLE 18.--CHEMICAL TEST DATA

[Analysis by Soils Laboratory of the Louisiana Agricultural Experiment Station. Dashes indicate analyses not made]

Soil and sample number	Horizon	Depth from surface	Extractable bases: Ca	Extractable bases: Mg	Extractable bases: K	Extractable bases: Na	Extractable acidity	Cation exchange capacity (NH Oac4)	Base saturation* (NH Oac4)	Organic carbon	Nitrogen	pH 1:1 H_2O	pH 1:2 $CaCl_2$	Extractable Iron	Extractable Aluminum	Available Phosphorus
		In	Meq/100g	Meq/100g	Meq/100g	Meq/100g	Meq/100g	Meq/100g	Pct	Pct	Pct			Pct	Meq/100g	Ppm
Keithville very fine sandy loam: (S74LA-17-12)	Ap	0-4	0.8	0.6	0.2	0.1	4.7	3.7	46	0.63	.054	5.0	4.1	1.3	0.3	10
	A2	4-10	0.8	0.6	0.1	0.2	2.3	3.0	57	0.18	.022	5.2	4.1	1.7	0.1	5
	B21t	10-20	1.3	1.9	0.2	0.2	6.5	8.0	45	0.06	.030	5.0	4.0	---	2.2	4
	B22t	20-28	1.4	2.4	0.2	0.1	6.6	8.2	50	0.05	.028	4.9	4.0	1.8	2.6	5
	B&A	28-32	2.5	5.2	0.2	0.7	12.0	17.0	51	0.10	.025	4.8	3.6	1.7	7.2	2
	IIB23t	32-45	3.3	7.1	0.3	1.0	12.8	22.8	51	0.06	.020	4.7	3.6	1.3	7.3	2
	IIB31t	45-60	4.4	9.4	0.2	1.3	10.6	25.8	59	0.05	.018	4.6	3.7	1.0	4.8	3
	IIB32t	60-70	4.9	10.2	0.2	1.3	10.0	24.8	67	0.02	.011	4.6	3.7	1.0	4.4	3
Metcalf silt loam: (S74LA-17-1)	A1	0-3	0.9	0.3	0.1	0.1	6.4	5.1	27	0.84	.078	4.7	3.9	0.9	0.6	1
	A2	3-8	0.6	0.2	0.1	0.1	4.4	3.4	29	0.38	.030	4.7	4.0	0.9	1.3	**
	B21t	8-16	1.3	1.3	0.2	0.1	7.9	7.4	39	0.12	.033	4.8	3.9	1.4	3.0	**
	B22t	16-23	1.2	1.5	0.2	0.2	11.1	10.3	30	0.13	.026	4.9	3.9	1.9	5.0	**
	B23t	23-30	1.1	1.2	0.2	0.2	9.3	9.0	30	0.05	.032	4.8	3.9	1.8	4.7	**
	B&A	30-38	1.5	1.4	0.2	0.2	9.7	10.2	32	0.11	.025	5.0	3.8	1.8	4.6	**
	IIB24t	38-55	4.0	3.9	0.2	0.7	14.3	19.9	44	0.19	.026	4.8	3.6	1.7	6.8	**
	IIB25t	55-65	7.5	6.3	0.2	1.3	13.4	25.2	61	0.09	.019	4.7	3.6	0.8	6.8	**
Meth fine sandy loam: (S74LA-17-10)	Ap	0-6	0.6	0.2	0.1	0.1	2.7	2.2	46	0.45	.023	5.0	4.5	0.8	0.0	4
	A2	6-12	1.0	0.3	0.1	0.1	1.4	1.9	79	0.13	.017	5.5	5.0	0.6	0.0	3
	B21t	12-18	3.7	2.6	0.3	0.1	5.7	9.4	71	0.28	.029	5.4	4.8	2.6	0.0	3
	B22t	18-27	6.6	5.9	0.4	0.1	10.9	17.6	74	0.27	.034	5.2	4.7	3.5	0.2	1
	B23t	27-37	5.5	5.7	0.3	0.1	12.5	18.3	63	0.12	.021	5.1	4.4	3.0	2.3	1
	B24t	37-54	4.9	5.6	0.4	0.1	14.3	22.4	49	0.09	.024	4.0	4.3	2.9	3.4	1
	B31	54-62	4.3	5.5	0.3	0.1	15.9	20.2	50	0.13	.017	4.8	3.1	2.7	6.5	2
	B32	62-72	3.9	5.4	0.3	0.1	16.0	19.5	50	0.08	.014	4.7	4.1	2.8	7.0	3
Meth fine sandy loam:*** (S74LA-17-11)	Ap	0-7	1.0	0.3	0.1	0.1	5.0	3.9	41	0.51	.030	5.4	4.8	4.0	0.0	9
	A2	7-12	1.4	0.1	0.2	0.1	3.8	3.8	43	0.26	.021	5.5	4.9	2.7	0.0	3
	B21t	12-24	3.6	5.4	0.3	0.1	16.6	18.4	51	0.24	.028	4.9	4.2	4.7	4.7	1
	B22t	24-32	2.8	5.1	0.3	0.1	17.2	19.2	43	0.17	.020	4.9	4.1	2.5	6.9	1
	B23t	32-46	2.1	5.2	0.2	0.2	19.4	20.7	37	0.09	.016	4.7	4.0	2.4	9.4	1
	B31	46-62	2.0	5.8	0.2	0.2	19.8	20.8	39	0.07	.013	4.5	4.0	1.8	10.4	0
	B32	62-72	2.3	6.6	0.2	0.1	17.8	21.3	43	0.09	.014	4.6	4.0	1.7	8.5	1

See footnotes at end of table.

TABLE 18.--CHEMICAL TEST DATA--Continued

Soil and sample number	Horizon	Depth from surface	Extractable bases: Ca	Mg	K	Na	Ex-tract-able acidity	Cation ex-change capa-city (NH Oac4)	Base saturation*	Organic carbon	Nitro-gen	pH 1:1 H_2O	pH 1:2 $CaCl_2$	Ex-tract-able Iron	Ex-tract-able Alu-minum	Avail-able Phos-phorus
		In	Meq/100g						Pct	Pct	Pct			Pct	Meq/100g	Ppm
Woodtell fine sandy loam: (S75LA-17-1)	A11	0-1	6.0	1.6	0.2	0.2	11.1	13.3	60	4.08	.216	5.7	5.1	1.3	0.0	18
	A12	1-9	1.3	1.0	0.1	0.1	6.7	5.9	42	0.94	.037	5.1	4.4	2.8	0.5	8
	B21t	9-15	4.0	5.9	0.2	0.2	23.6	26.2	39	0.28	.032	4.7	4.0	---	12.0	3
	B22t	15-24	3.3	5.9	0.2	0.2	26.6	28.6	34	0.27	.030	4.8	3.9	1.5	14.3	1
	B23t	24-44	2.3	7.2	0.3	0.4	28.5	30.8	33	0.25	.022	4.5	3.8	1.2	16.1	1
	C1	44-54	2.5	7.7	0.2	0.6	25.0	28.0	39	0.15	.020	4.6	3.8	1.2	14.1	1
	C2	54-65	6.5	11.1	0.3	1.1	15.4	26.8	71	0.15	.018	4.6	4.0	1.0	6.3	1
	C3	65-72	9.4	16.2	0.3	1.1	15.2	32.9	82	0.13	.021	4.5	4.1	0.7	4.5	4

* To calculate percent base saturation by sum of cations, divide sum of extractable bases by sum of extractable acidity multiplied by 100.

** Trace.

*** Base saturation of the 62 to 72 inch layer is slightly lower than allowed for the Meth series, but this difference is within the normal error of observation.

TABLE 19.--MINERALOGY DATA OF SILT AND CLAY FRACTIONS OF SELECTED SOILS

Soil and sample number	Depth from surface	Horizon	Silt fraction*	Clay fraction*	
			2-50	0.2-2.0	<0.2
	In		Micron		
Keithville very fine sandy loam: (S74LA-17-12)	0-4	Ap	Q1	Q2,K2,I2,F2,M3,V3,(C+M)3	K1,I2,M2,(C+M)3
	20-28	B22t	Q1,I3	I2,K2,Q2,F2,V3,(I+C)3	K1,I2,M2,C2,(C+M)2
	60-70	IIB32t	Q1,F2,I2,V3	K2,I2,Q2,F3,M3,(C+M)3	M1,(C+M)1,K2,F3
Keithville very fine sandy loam: (S74LA-17-13)	0-3	A1		Q1,K2,I2,F2,M3,(I+C)3	K2,I2,M2,(C+M)2,F2
	16-22	B22t		Q2,K2,I2,F2,(I+C)3	K2,I2,M2,V2,(C+M)2,F2
	43-60	IIB3t	Q1,F3	K2,I2,Q2,F3,M3,V3	M1,K2,I2
Metcalf silt loam: (S74LA-17-1)	0-3	A1	Q1,F3	Q2,I2,K2,V2,F3,M3	K2,M2,I2,F3,(C+M)3
	16-23	B22t	Q1,F2	Q2,K2,I2,V2,F3,M3,(C+M)3	(C+V+M)1,K1
	55-65	IIB25t	Q1,F3	K1,M2,Q2,I2,F2	M1,K1,F3
Meth fine sandy loam: (S74LA-17-10)	0-6	Ap	Q1,F3	I2,Q2,K2,M2	K1,I2,C2,(C+I)2
	18-27	B22t	Q1	K1,I1	K1,I1
	62-72	B32t	Q1,F3	K2,M2,I2,(C+M)2	K1,(M+V+C+I)1
Meth fine sandy loam: (S74LA-17-11)	0-7	Ap	Q1	K2,I2,Q2,M2,V2,(C+M)2	K1,C2,(C+V+I+M)2
	24-32	B22t		I2,K2,M2,(C+M)2,Q3	K1,M2,(C+M+I)2
	46-62	B31		M1,K2,(C+M)2	M1,K2,(C+M)2
Woodtell fine sandy loam: (S75LA-17-1)	0-1	A11	Q1	K2,Q2,I2,F2,V2,(C+I)2	M2,K2,I2,(C+I)2
	15-24	B22t	Q1,F3	K1,M2,I2,Q3,F3,(C+I)3	M1,K2,C2,(C+I)2
	62-72	C3	Q1,F3	M1,K2,I2,F2,(C+I)2	M1

* Code for mineralogical data in Silt Fractions and Clay Fractions Columns: The letter represents the kind of mineral (A); the combination of letters in parentheses represents the stratification of minerals (B); and the number represents the quantity of mineral (C). Minerals are listed in the table in order of abundance, decreasing from left to right.

A. Kind of mineral:

C--chlorite
F--feldspars
I--illite
K--kaolinite
M--montmorillonite
Q--quartz
V--vermiculite

B. Stratification:

C+I--interstratified (regular) chlorite and illite
C+M--interstratified (regular) chlorite and montmorillonite
C+M+I--interstratified (regular) chlorite, montmorillonite and illite
C+V+I+M--interstratified (regular) chlorite, vermiculite, illite and montmorillonite
C+V+M--interstratified (regular) chlorite, vermiculite, and montmorillonite
I+C--interstratified (regular) illite and chlorite
M+C--interstratified (regular) montmorillonite and chlorite
M+V+C+I--interstratified (regular) montmorillonite, vermiculite, chlorite and illite

C. Quantity of mineral:

1--Abundant--greater than 40 percent
2--Moderate--10 to 40 percent
3--Slight--Less than 10 percent

TABLE 20.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Armistead	Fine-silty, mixed, thermic Aquic Argiudolls
Beauregard	Fine-silty, siliceous, thermic Plinthaquic Paleudults
Bernaldo	Fine-loamy, siliceous, thermic Glossic Paleudalfs
Betis	Sandy, siliceous, thermic Psammentic Paleudults
Bonn	Fine-silty, mixed, thermic Glossic Natraqualfs
Bowie	Fine-loamy, siliceous, thermic Plinthic Paleudults
Briley	Loamy, siliceous, thermic Arenic Paleudults
Buxin	Fine, mixed, thermic Vertic Hapludolls
Caspiana	Fine-silty, mixed, thermic Typic Argiudolls
Darden	Thermic, coated Typic Quartzipsamments
Forbing	Very-fine, montmorillonitic, thermic Vertic Paleudalfs
Gallion	Fine-silty, mixed, thermic Typic Hapludalfs
Gore	Fine, mixed, thermic Vertic Paleudalfs
Guyton	Fine-silty, siliceous, thermic Typic Glossaqualfs
Guyton Variant	Fine-silty, siliceous, thermic Typic Glossaqualfs
Keithville	Fine-silty, siliceous, thermic Glossaquic Paleudalfs
Messer	Coarse-silty, siliceous, thermic Haplic Glossudalfs
Messer Variant	Coarse-loamy, siliceous, thermic Haplic Glossudalfs
Metcalf	Fine-silty, siliceous, thermic Aquic Glossudalfs
Meth	Fine, mixed, thermic Ultic Hapludalfs
*Moreland	Fine, mixed, thermic Vertic Hapludolls
Norwood	Fine-silty, mixed (calcareous), thermic Typic Udifluvents
Ruston	Fine-loamy, siliceous, thermic Typic Paleudults
Sacul	Clayey, mixed, thermic Aquic Hapludults
Severn	Coarse-silty, mixed (calcareous), thermic Typic Udifluvents
Smithdale	Fine-loamy, siliceous, thermic Typic Paleudults
Woodtell	Fine, montmorillonitic, thermic Vertic Hapludalfs
Wrightsville	Fine, mixed, thermic Typic Glossaqualfs

* The Moreland soils in map unit 22, Moreland silt loam, are taxadjuncts to the Moreland series, because they have a reddish brown (5YR 4/4) Ap horizon that is one hue and one value too high for both a mollic epipedon and the series range. The Moreland soils in map units 20, 23, 24, and 43 are within the range of the series and are not taxadjuncts.

TABLE 21.--RELATIONSHIPS BETWEEN SOILS AND TOPOGRAPHY, RUNOFF, DRAINAGE, AND WATER TABLE

Soil series grouped by parent material	Topography	Runoff	Internal drainage class	Seasonal high water table	
				Depth	Duration
				Ft	
Soils that formed in Red River alluvium:					
Armistead	Level	Slow	Somewhat poorly drained.	1.5-3.0	Dec.-Apr.
Buxin	Level	Slow, very slow.	Poorly drained	0-3.0	Dec.-Apr.
Caspiana	Level	Slow	Well drained	4.0	Dec.-Apr.
Gallion	Nearly level	Slow	Well drained	6.0	--
Moreland	Level, gently undulating.	Slow, very slow, medium.	Somewhat poorly drained.	0-1.5	Dec.-Apr.
Norwood	Nearly level	Slow	Well drained	6.0	--
Severn	Nearly level, gently undulating.	Slow, medium.	Well drained	6.0	--
Soils that formed in Pleistocene terrace deposits:					
Bernaldo	Very gently sloping	Medium	Well drained	4.0-6.0	Dec.-Apr.
Bonn	Level	Slow	Poorly drained	0-2.0	Dec.-Apr.
Darden	Gently sloping	Slow	Well drained, somewhat excessively drained.	6.0	--
Forbing	Very gently sloping, gently sloping, moderately sloping.	Medium, rapid	Moderately well drained.	6.0	--
Gore	Gently sloping	Medium	Moderately well drained.	6.0	--
Guyton*	Nearly level	Slow	Poorly drained	0-1.5	Jan.-Dec.
Guyton Variant	Level	Slow	Poorly drained	0-1.5	Dec.-Apr.
Wrightsville	Nearly level	Slow	Poorly drained	0.5-1.5	Dec.-Apr.
Soils that formed in Tertiary Period deposits:					
Beauregard**	Very gently sloping	Slow, medium.	Moderately well drained.	1.5-3.0	Dec.-Mar.
Betis	Gently sloping, moderately sloping, strongly sloping.	Slow	Somewhat excessively drained.	6.0	--
Bowie**	Gently sloping	Medium	Moderately well drained.	6.0	--
Briley	Gently sloping	Slow, very slow.	Well dranined	6.0	--
Keithville	Gently sloping	Medium	Moderately well drained.	2.0-3.0	Dec.-Apr.

See footnotes at end of table.

TABLE 21.--RELATIONSHIPS BETWEEN SOILS AND TOPOGRAPHY, RUNOFF, DRAINAGE, AND WATER TABLE--Continued

Soil series grouped by parent material	Topography	Runoff	Internal drainage class	Seasonal high water table	
				Depth	Duration
				Ft	
Messer**	Convex mounds, circular ridges.	Medium	Moderately well drained.	2.0-4.0	Dec.-Mar.
Messer Variant	Gently undulating	Medium	Moderately well drained.	1.5-3.0	Dec.-Apr.
Metcalf	Nearly level	Slow	Somewhat poorly drained.	1.5-2.5	Dec.-Apr.
Meth	Very gently sloping, gently sloping, moderately sloping.	Medium	Well drained	6.0	--
Ruston**	Gently sloping, moderately sloping.	Medium	Well drained	6.0	--
Sacul	Gently sloping, moderately sloping, strongly sloping.	Medium, rapid.	Moderately well drained.	6.0	--
Smithdale	Strongly sloping, moderately steep.	Medium, rapid.	Well drained	6.0	--
Woodtell	Very gently sloping, gently sloping, moderately sloping, strongly sloping, moderately steep.	Medium, rapid.	Moderately well drained.	1.5-4.0	Dec.-Apr.

* Guyton soils are thought to have formed in both Pleistocene terrace deposits and recent alluvial deposits.

** Beauregard, Bowie, Messer, and Ruston soils are thought to have formed in both Tertiary deposits and Pleistocene terrace deposits.

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