United States
Department of
Agriculture

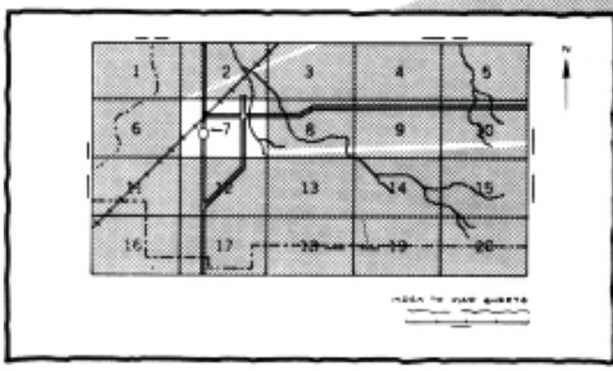
Soil
Conservation
Service

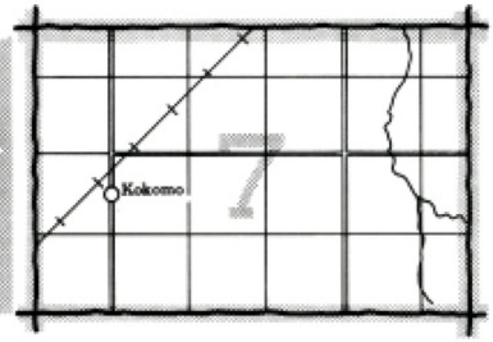
In Cooperation with
the Texas
Agricultural
Experiment Station

Soil Survey of Upshur and Gregg Counties, Texas

HOW TO USE

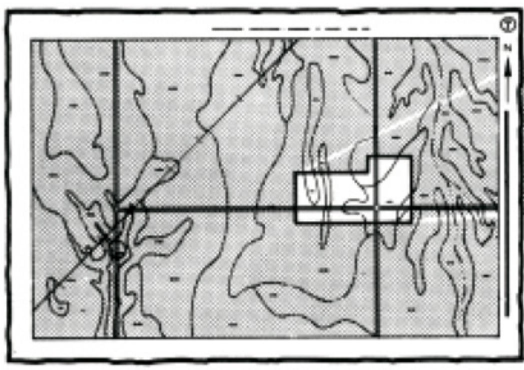
1. Locate your area of interest on the "Index to Map Sheets"

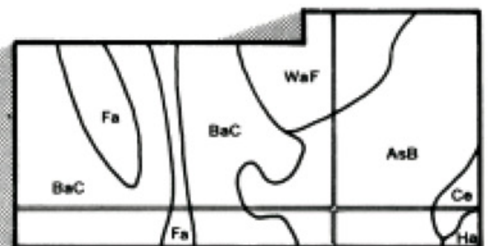




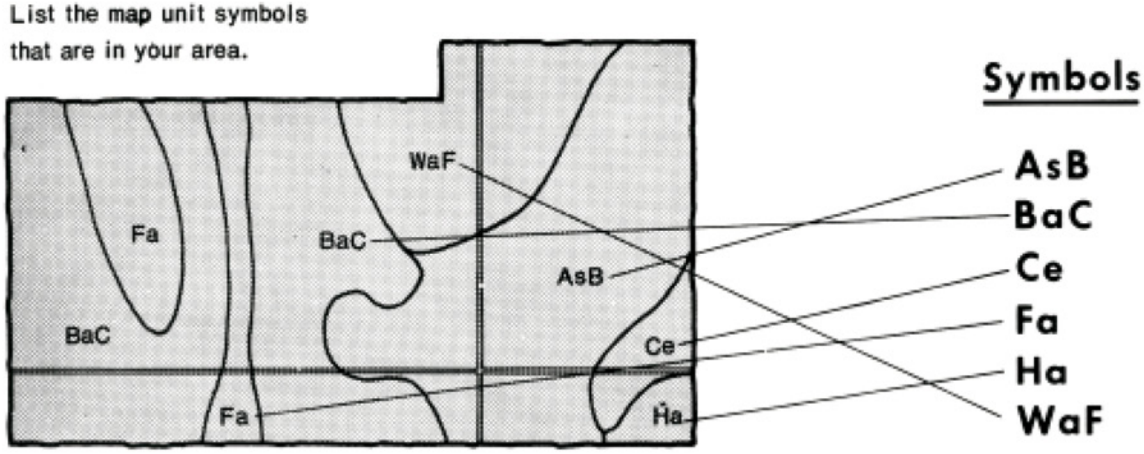
2. Note the number of the map sheet and turn to that sheet.

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



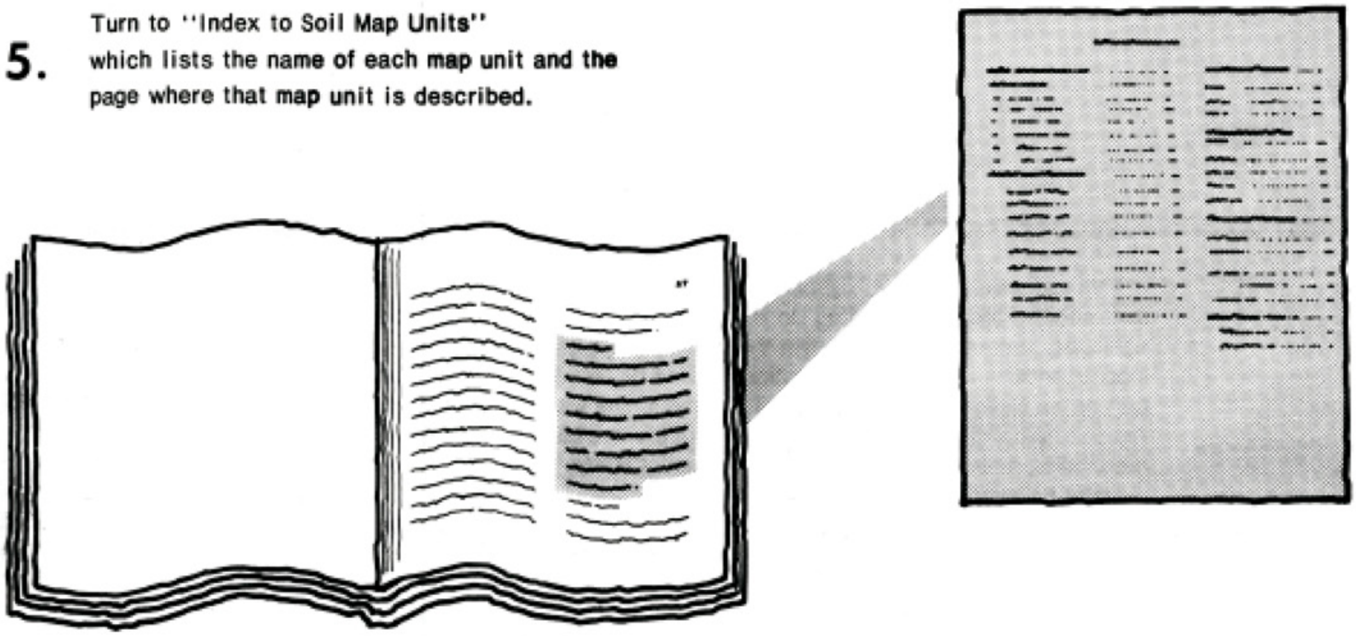


4. List the map unit symbols that are in your area.

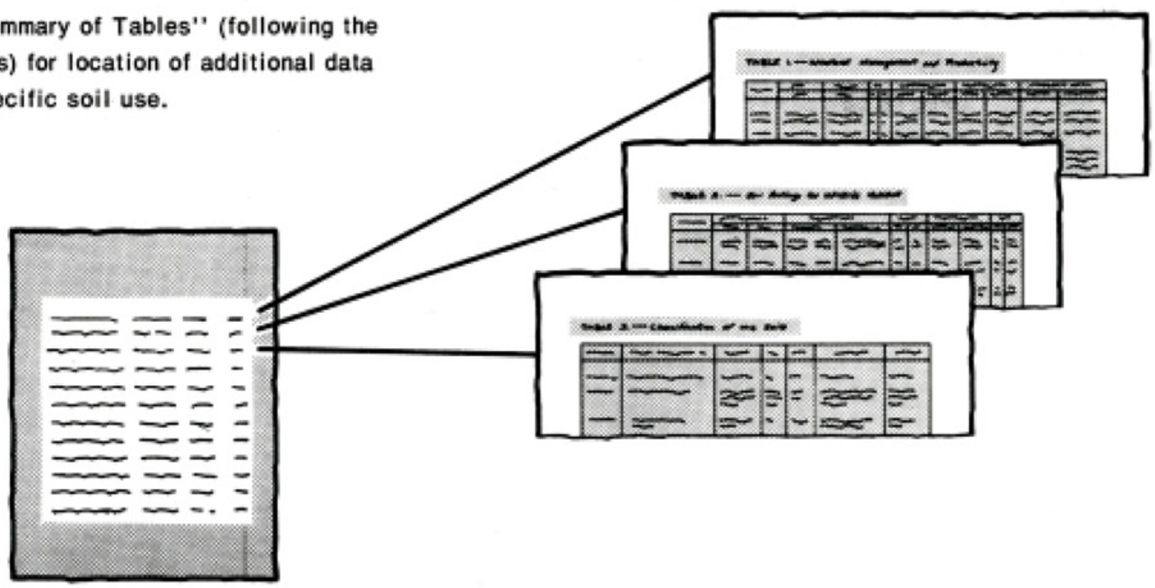


THIS SOIL SURVEY

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; to 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.

This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Upshur-Gregg Soil and Water Conservation District. Major fieldwork for this soil survey was performed in the period 1974-80. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980.

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: Stand of well-managed loblolly pine on Bienville loamy fine sand, 0 to 3 percent slopes. This stand is ready to be thinned. Selected trees will be harvested for pulp and saw logs.

contents

soil series

Issued May 1983

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foreword

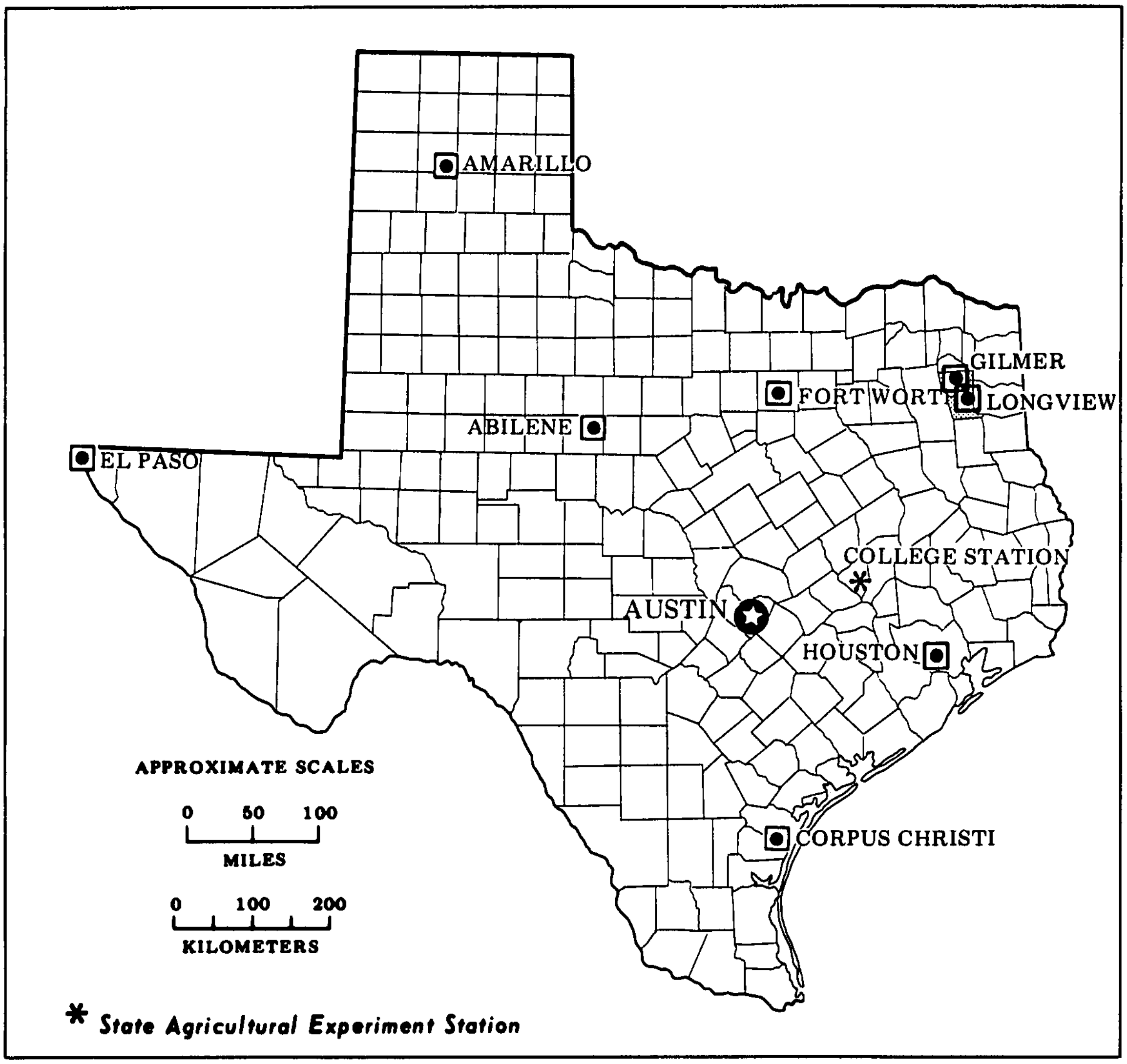
This soil survey contains information that can be used in land-planning programs in Upshur and Gregg Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and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

George C. Marks
State Conservationist
Soil Conservation Service



Location of Upshur and Gregg Counties, Texas

soil survey of
Upshur and Gregg Counties, Texas

By Kirthell Roberts
Soil Conservation Service

Soils survey by Thomas L. Galloway, Gaylon L. Lane,
Kirthell Roberts, and Jesse R. Thomas, Jr.,
Soil Conservation Service

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

UPSHUR AND GREGG COUNTIES are in central northeastern Texas. Gilmer is the county seat of Upshur County, and Longview is the county seat of Gregg County. The total area of the two counties is 873 square miles, or 558,720 acres. Elevation ranges from about 680 feet above sea level in central Upshur County to about 240 feet above sea level in southeastern Gregg County.

The counties are in the East Texas Timberlands Land Resource Area. The topography of the area is nearly level to hilly. The area has a well-defined drainage pattern and is dissected by many streams. The northern and southeastern parts of Upshur County drain into Little Cypress Creek from Kelsey Creek, Lilly Creek, Caney Creek, Gum Creek, and Walnut Creek. The extreme northeast corner of the county drains north into Big Cypress Creek and Lake O'the Pines. The southwestern part drains south into the Sabine River. Gregg County is bisected by the Sabine River. All drainage in Gregg County is into the Sabine River except the northernmost part, which drains into Little Cypress Creek.

Timber, livestock, and dairy farming are the major farming enterprises in the area. According to records of the local field office of the Soil Conservation Service, about 48 percent of the area is used for woodland, 29 percent for pasture and hay, 8 percent for crops, and the remaining 15 percent for urban and built-up areas or water areas.

The soils of the area formed mostly under forest vegetation. The soils on uplands are light colored and dominantly loamy or sandy. In unprotected sloping areas, they are subject to water erosion. The soils on flood plains are loamy or clayey. These soils are mostly along the Little Cypress Creek, Sabine River, and adjoining streams.

general nature of the area

This section provides general information about Upshur and Gregg Counties. It briefly describes the settlement and population, agriculture, natural resources, and climate of the area.

settlement and population

Upshur County was created and organized in 1846 from parts of Harrison and Nacogdoches Counties. It was named in honor of former U.S. Secretary of State A. P. Upshur.

The population of Upshur County, according to the 1980 census, is 28,595. Gilmer, the seat of Upshur County and its major city, has a population of 5,119.

Gregg County was created and organized in 1873 from parts of Upshur and Rusk Counties. It was named in honor of Confederate General John Gregg.

The population of Gregg County is 98,445. Longview, the seat of Gregg County and its major city, has a population of 63,763.

agriculture

Agriculture in the counties has changed drastically over the years. The early settlers were mainly farmers, and sweet potatoes and cotton were the main cash crops. Cattle and hogs were raised for home use. Crop farming has declined over the years, and many old cropland fields and woodland areas have been cleared and planted to pasture.

Most livestock are raised in cow-calf operations. The livestock are mostly pastured in summer and fed hay and feed supplements in winter. Pastures are mainly in Coastal bermudagrass, common bermudagrass, and bahiagrass, which also provide hay for beef production. Cool-season legumes are overseeded in many pastures to improve the soil and provide additional forage.

Dairy farming has become increasingly important in the area. There are more than 50 dairy herds in Upshur County. These are located dominantly in the Kelsey-Shady Grove area, where the farms average more than 100 milk cows each (*5*). Many acres of pasture are required for grazing, hay, and silage.

Crop production is mainly nonirrigated truck crops of corn, peas, sweet potatoes, and watermelons. Most farms are small.

Commercial timber production in the area is mostly on locally owned small tracts. Each year pine and hardwood timber is harvested for pulpwood, saw logs, crossties, posts, and poles. This activity is significant to the local economy. Many fields that were once in cropland have been converted to pine plantations to increase future timber yields.

natural resources

Soil is the most important resource in Upshur and Gregg Counties. The production of livestock, forage, crops, and timber, which are sources of livelihood for many people, all depend on the soil.

Oil and gas production is also significant in the survey area (fig. 1). Gregg County is in the center of the East Texas Oil Field, which also extends into southern Upshur County. The numerous oil and gas wells are sources of income for many landowners. Oil and gas exploration, drilling, and servicing provide employment for countless people.

Sand and gravel are mined in the counties. Sand is mined on the stream terraces of the Sabine River and Big Sandy Creek. Gravel is obtained from an iron ore hill in the area. The sand and gravel are used mainly in construction.

Land leasing for mining of lignite coal has become increasingly important in the northwestern part of the area. The coal is burned to generate electricity.

Water, fish, and wildlife are important natural resources. Lake O'the Pines; Lake Cherokee; Lake Gladewater; the Sabine River; and numerous smaller lakes, ponds, and creeks provide abundant water for the area. These water sources are used for agriculture, industry, recreation, and domestic needs. Fish and wildlife provide recreation and income to the landowners of the counties.

climate

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

Gregg and Upshur Counties have long, hot summers because moist tropical air from the Gulf of Mexico persistently covers the area. Winters are cool and fairly short, with only a rare cold wave that moderates in 1 or 2 days. Precipitation is fairly heavy throughout the year, and prolonged droughts are rare. Summer precipitation, mainly afternoon thundershowers, is adequate for all crops.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Gilmer, Texas, in the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 46 degrees F, and the average daily minimum temperature is 34 degrees. The lowest temperature on record, which occurred at Gilmer on February 2, 1951, is minus 3 degrees. In summer the average temperature is 81 degrees, and the average daily maximum temperature is 92 degrees. The highest recorded temperature, which occurred at Gilmer on August 17, 1951, is 109 degrees.

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

The total annual precipitation is 48 inches. Of this, 24 inches, or 50 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 16 inches. The heaviest 1-day rainfall during the period of record was 7.88 inches at Gilmer on April 23, 1966. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 2 inches. The greatest snow depth at any one time during the period of record was 5 inches. Seldom is there a day with an inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in spring.

Figure 1.—Oil derricks along the Sabine River in Gregg County.

Severe local storms, including tornadoes, strike occasionally in or near the area. They are short and cause variable and spotty damage. Every few years in summer or autumn, a tropical depression or remnant of a hurricane that has moved inland causes extremely heavy rains for 1 to 3 days.

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 counties 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 units" and "Detailed soil map units."

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 units

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

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

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

There are eight general soil map units in Upshur and Gregg Counties. These units make up 99 percent of the total acreage. The rest is covered by water.

soil descriptions

1. Bowie-Cuthbert-Kirvin

Gently sloping to steep, well drained and moderately well drained, loamy and gravelly soils; on uplands

This map unit is made up of Bowie soils on stream divides and concave areas along small drainageways, Cuthbert soils on side slopes adjacent to streams or flood plains, and Kirvin soils on low, oval hills or convex ridgetops higher than the Bowie soils. There is a well-defined drainage pattern with low hills and ridges intermingled with gentle slopes.

This unit covers about 52 percent of the survey area. It is about 32 percent Bowie soils, 30 percent Cuthbert soils, 15 percent Kirvin soils, and 23 percent other soils (fig. 2).

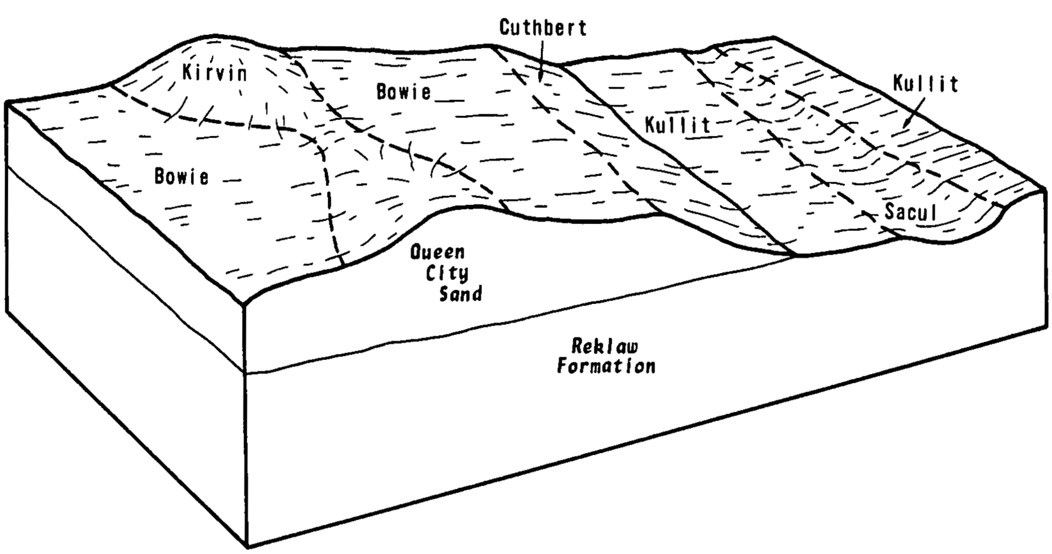


Figure 2.—Pattern of soils in the Bowie-Cuthbert-Kirvin and Kullit-Sacul soil associations.

Bowie soils are gently sloping and moderately well drained. Typically, these soils have a brown, fine sandy loam surface layer about 6 inches thick. The subsurface layer, which extends to a depth of 12 inches, is pale brown fine sandy loam. The subsoil, to a depth of 72 inches, is sandy clay loam that is yellowish brown mottled with red in the upper part and light brownish gray in the lower part. The soil is slightly acid in the upper part and very strongly acid in the lower part.

Cuthbert soils are strongly sloping to steep and are well drained. Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsoil, which extends to a depth of 36 inches, is red clay with brownish mottles and gray shale fragments in the lower part. The underlying layer, to a depth of 60 inches, is reddish and yellowish fine sandy loam and grayish shale. The soil is slightly acid in the upper part and very strongly acid in the lower part.

Kirvin soils are gently sloping to sloping and are well drained. Typically, the surface layer is brown gravelly fine sandy loam about 10 inches thick. The upper part of the subsoil, which extends to a depth of 42 inches, is red clay with brownish mottles. The lower part of the subsoil, which extends to a depth of 57 inches, is mottled reddish, brownish, and grayish clay loam. The underlying layer, to a depth of 65 inches, is stratified shaly clay and sandy clay loam. The soil is medium acid in the upper part and very strongly acid in the lower part.

Other soils in this unit are in the Ruston, Sacul, Lilbert, Tenaha, Briley, and Iuka series. The loamy Ruston soils are on very old, high, upland terraces. The loamy Sacul soils are on slightly concave side slopes. The sandy Lilbert, Briley, and Tenaha soils are on convex hills and side slopes along streams. The loamy Iuka soils are on flood plains of small streams.

Most areas of this unit are used for pasture and woodland. A few areas are in crops.

The main pasture grasses are Coastal bermudagrass, common bermudagrass, and bahiagrass. Many pastures are overseeded to crimson clover and arrowleaf clover to increase forage production. Wheat, oats, and ryegrass are planted in a few small areas for winter grazing. Forage yields are high under good management. Applications of fertilizer and lime are essential for high yields.

These soils produce a native woodland of mixed hardwoods and pine. Loblolly pine and shortleaf pine are the principal commercial trees suited to these soils. Slope is a limiting feature for woodland production in some areas.

The main crops on these soils are corn and truck crops such as sweet potatoes, watermelons, and peas. Applications of fertilizer and lime are necessary for good yields. Constructing terraces and farming on the contour can reduce erosion.

These soils are suited to most urban uses. The moderately slow or slow permeability and the slope are limitations that affect septic tank absorption fields and sanitary landfills.

2. Lilbert

Gently sloping, well drained, sandy soils; on uplands

This map unit is on stream divides and low convex ridges. Slopes are 2 to 5 percent.

This unit covers about 15 percent of the survey area. It is about 75 percent Lilbert soils and 25 percent other soils (fig. 3).

Lilbert soils are well drained.

Typically, they have a brown loamy fine sand surface layer about 6 inches thick. Below this, to a depth of 30 inches, is pale brown loamy fine sand. The subsoil, to a depth of 72 inches, is sandy clay loam that is yellowish brown in the upper part and mottled with browns, reds, and grays in the lower part. The soil is slightly acid in the upper part and very strongly acid in the lower part.

Other soils in this unit are in the Briley, Rentzel, Trep, Tenaha, Darco, Bowie, Kirvin, and Iuka series. Areas of Briley, Rentzel, Trep, and Darco soils are intermingled with areas of Lilbert soils. Tenaha soils are on side slopes along streams. The loamy Bowie and Kirvin soils are on side slopes and ridgetops. The loamy Iuka soils are on flood plains of small streams.

Most areas of this unit are used for pasture and woodland. A few small areas are in crops.

The major pasture grasses are Coastal and common bermudagrass and bahiagrass. Wheat, oats, and Elbon rye are excellent cool-season pastures on these soils. Some areas are planted to vetch or arrowleaf clover for additional forage production. Applications of fertilizer and lime are essential for high yields.

Mixed hardwoods and pine are adapted to these soils. The principal commercial trees are loblolly and shortleaf pine. Some small areas are in slash pine plantings. Droughtiness is a limiting feature of these soils for woodland production.

The main crops are corn, sweet potatoes, and watermelons. Fertilizer and lime are needed for high yields. Droughtiness is the main limitation. Constructing terraces and farming on the contour are needed in some places to control water erosion.

These soils are suited to most urban uses. Low strength affects roads and streets, and the sandy surface layer is a limitation for recreation areas.

3. Mantachie-Iuka

Nearly level, somewhat poorly drained and moderately well drained, loamy soils; on flood plains

The map unit is on flood plains of Little Cypress Creek, Lilly Creek, and several other major streams. Slopes are 0 to 1 percent.

This unit covers about 13 percent of the survey area. It is about 47 percent Mantachie soils, 35 percent Iuka soils, and 18 percent other soils (fig. 4).

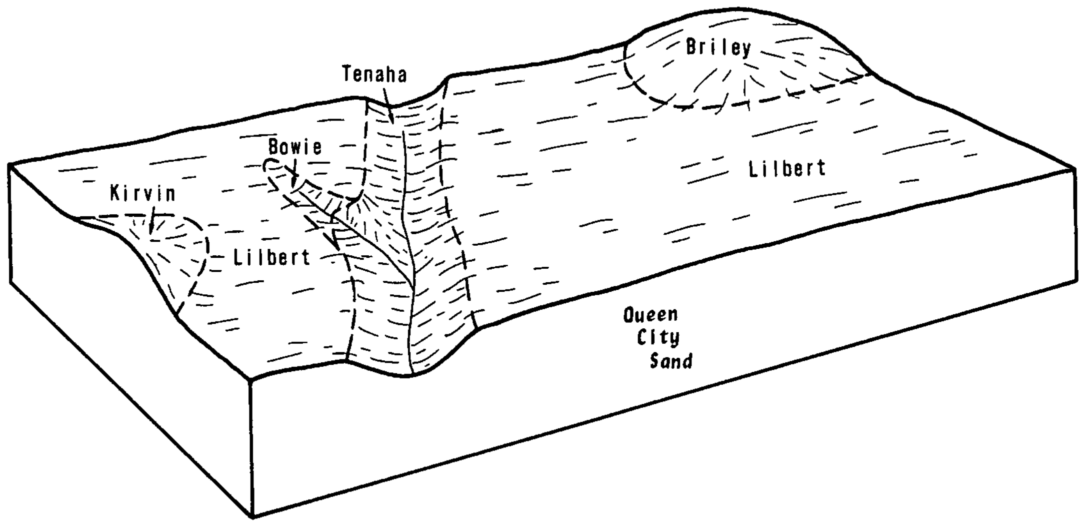


Figure 3.—Pattern of soils in the Lilbert soil association.

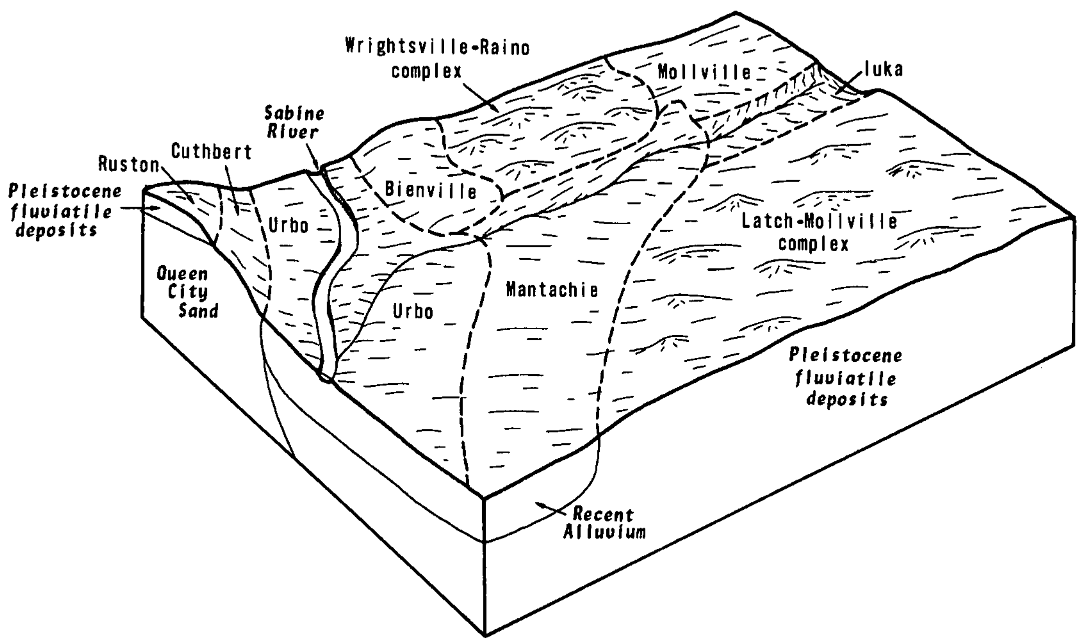


Figure 4.—Pattern of soils along the Sabine River.

Mantachie soils are somewhat poorly drained. Typically, the surface layer is brown loam about 8 inches thick. The subsoil, to a depth of 65 inches, is clay loam that is dark grayish brown in the upper part and grades to grayish brown in the lower part. Brownish and reddish mottles occur in most of this layer. The soil is very strongly acid throughout.

Iuka soils are moderately well drained. Typically, the surface layer is dark grayish brown and brown fine sandy loam about 12 inches thick. Below this, to a depth of 60 inches, is fine sandy loam that is brown with brownish and grayish mottles in the upper part and mottled gray, brown, and yellow in the lower part. The soil is strongly acid in the upper part and very strongly acid in the lower part.

Other soils in this map unit are in the Bowie, Latch, Bienville, Mollville, Raino, and Wrightsville series. The loamy Bowie soils are on foot slopes. The sandy Latch and Bienville soils are on low ridges and mounds of stream terraces. The loamy Mollville and Wrightsville soils are on stream terraces. The loamy Raino soils are on small, oval mounds of stream terraces.

The soils of this unit are used mainly for woodland and pasture. A few acres of the Iuka soils are in crops.

The major trees on these soils are hardwoods. Loblolly pine and shortleaf pine, however, are well adapted to the Iuka soils. Wetness and flooding are the main limiting features.

The main pasture grasses are bahiagrass on the Mantachie soils and Coastal bermudagrass and common bermudagrass on the Iuka soils. Cool season tall fescue overseeded with white clover is commonly planted and is well adapted to these frequently flooded soils.

These soils are not suited to cultivation because of frequent flooding. A few small areas of the Iuka soils that flood less frequently, however, are used to produce sugarcane. Syrup is made from the cane for home and local use.

These soils are unsuited to urban uses. Flooding and wetness are the main limitations.

4. Kullit-Sacul

Gently sloping to strongly sloping, moderately well drained, loamy soils; on uplands

This map unit is made up of Kullit soils on concave stream divides, on foot slopes, and at the heads of drainageways and Sacul soils on low hills and side slopes along streams. Slopes are 1 to 12 percent.

This unit covers about 8 percent of the survey area. It is about 37 percent Kullit soils, 30 percent Sacul soils, and 33 percent other soils (fig. 2).

Kullit soils are gently sloping and moderately well drained. Typically, the surface layer is brown very fine sandy loam about 7 inches thick. The upper part of the subsoil, to a depth of 49 inches, is yellowish brown clay loam. The lower part of the subsoil, to a depth of 70 inches, is mottled red, gray, and strong brown clay. The soil is medium acid in the upper part and very strongly acid in the lower part.

Sacul soils are gently sloping to strongly sloping and moderately well drained. Typically, the surface layer is dark grayish brown and brown fine sandy loam about 8 inches thick. The upper part of the subsoil, to a depth of 30 inches, is red clay. The lower part of the subsoil, to a depth of 64 inches, is light brownish gray silty clay with reddish and brownish mottles. It grades with depth to light gray silty clay loam. The soil is strongly acid in the upper part and very strongly acid in the lower part.

Other soils in this unit are in the Bowie, Cuthbert, Kirvin, and Trep series. The loamy Bowie and Kirvin soils are on the higher upland ridges and side slopes. The moderately deep, loamy Cuthbert soils are on side slopes along streams. The sandy Trep soils are on foot slopes.

Most areas of this unit are used for pasture and woodland. A few areas are in cultivation.

The major pasture grasses on these soils are Coastal and common bermudagrass and bahiagrass. Many areas are overseeded to clover or other legumes. The main legumes are crimson clover, arrowleaf clover, and hairy vetch. Wheat, oats, ryegrass, and other cool-season grasses are planted in some areas for winter grazing. Fertilizer and lime are needed for high yields.

Much of this unit is in mixed hardwoods and pine. Loblolly and shortleaf pine are the principal commercial trees. Species of oak, elm, hickory, and gum trees, however, are common. Proper woodland management practices can increase timber production.

A few areas are in crops of corn, peanuts, and vegetables. Applications of lime and fertilizer are needed for good yields. Constructing terraces and farming on the contour can reduce erosion. Slope is the major limitation.

These soils are suited to most urban uses. The main limitations are corrosivity of underground steel pipe, slope, shrink-swell properties, and low strength that affects roads and streets.

5. Urbo

Nearly level, somewhat poorly drained, clayey soils; on flood plains

This soil is on flood plains of the Sabine River. Slopes are 0 to 1 percent.

This unit covers about 4 percent of the survey area. It is about 77 percent Urbo soils and 23 percent other soils (fig. 4).

Typically, Urbo soils have a surface layer of very dark grayish brown clay about 4 inches thick. The upper part of the subsoil, to a depth of 36 inches, is grayish brown clay loam that grades with depth to clay. The lower part of the subsoil, to a depth of 70 inches, is dark grayish brown clay that grades with depth to clay loam. The soil is strongly acid in the upper part and very strongly acid in the lower part.

The other soils in this unit are in the Mantachie, Iuka, Latch, Bienville, Raino, Mollville, and Wrightsville series. Areas of the loamy Mantachie and Iuka soils are intermingled on flood plains with areas of the Urbo soils. The sandy Latch and Bienville soils are on low ridges and mounds of the higher stream terraces. The loamy Raino soils are on oval mounds of stream terraces. The loamy Mollville and Wrightsville soils are on stream terraces and are poorly drained.

The soils of this unit are mainly used for woodland. A few areas are in pasture.

The dominant trees on these soils are hardwoods. The principal ones are water oak, willow oak, ash, and sweetgum. Wetness and flooding are limiting features for pine timber production.

Some areas have been cleared and planted to pasture. Common bermudagrass and bahiagrass are the most adapted warm-season grasses. Tall fescue and white clover provide additional cool-season forage. Flooding and wetness are the most limiting features. Applications of fertilizer and lime can increase production.

These soils are not suited to crops. Frequent flooding is the main hazard.

These soils are not suited to urban uses. Flooding and wetness are the main hazards and limitations.

6. Darco

Gently sloping to moderately steep, well drained, sandy soils; on uplands

This map unit is on broad upland stream divides and convex upland ridges. Slopes are 2 to 15 percent.

This unit covers about 3 percent of the survey area. It is about 74 percent Darco soils and 26 percent other soils (fig. 5).

Typically, Darco soils have a surface layer of brown fine sand about 10 inches thick. Below this, to a depth of 62 inches, is light yellowish brown fine sand. The subsoil, to a depth of 80 inches, is yellowish red sandy clay loam with strong brown mottles. The soil is medium acid in the upper part and very strongly acid in the lower part.

The other soils in this unit are in the Briley, Lilbert, Tenaha, Bowie, and Cuthbert series. Areas of the sandy Briley, Lilbert, and Tenaha soils are intermingled with areas of the Darco soils. The loamy Bowie and Cuthbert soils are on side slopes and ridgetops.

Most areas of this unit are used for pasture and woodland. A few areas are in crops.

The major pasture grasses on these soils are Coastal bermudagrass and lovegrass. Applications of fertilizer and lime are essential for high production. Good management practices can increase forage yields.

The woodland produced on these soils consists of mixed hardwoods and pine. Shortleaf and loblolly pine are the principal commercial trees. A few old fields have been planted to slash pine. Droughtiness limits the growth of trees on these soils. Good woodland management practices, however, can increase timber yields.

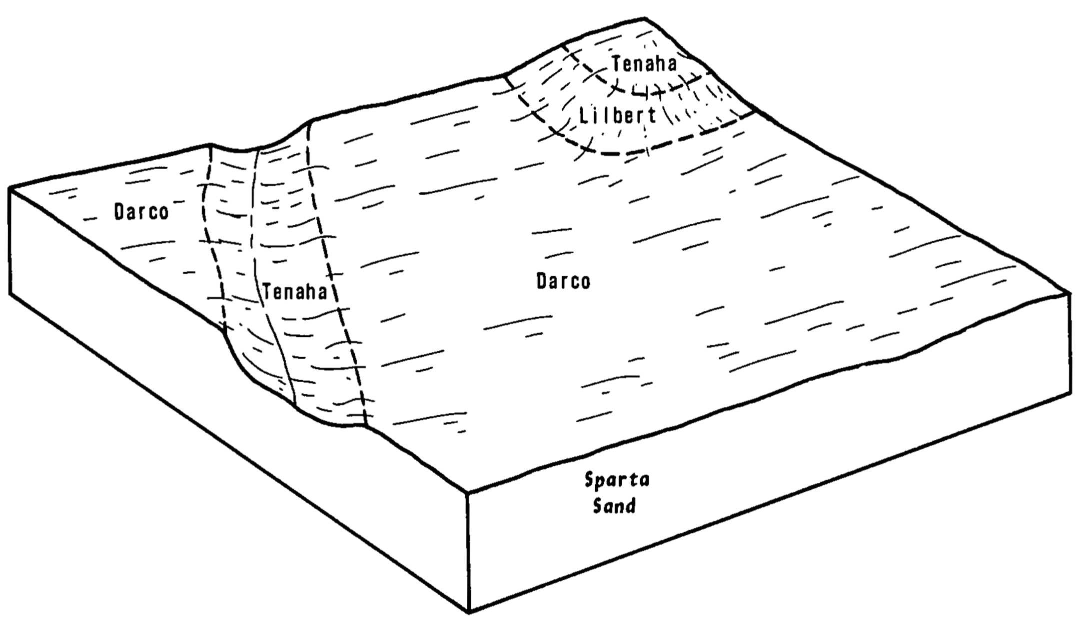


Figure 5.—Pattern of soils in the Darco soil association.

A few areas of these soils are in cultivation. Watermelons, peas, peanuts, and sweet potatoes are the dominant crops. Erosion, slope, and droughtiness are the main limitations. Applications of lime and fertilizer are essential for high yields. Contour farming can reduce erosion.

These soils are suited to most urban uses. Corrosivity is a limiting feature for concrete and steel. Seepage is a limiting feature for most sanitary facilities.

7. Mollville-Latch

Nearly level, poorly drained and moderately well drained, loamy and sandy soils; on stream terraces

This map unit is made up of Mollville soils on low, wet, slightly depressed areas of stream terraces and of Latch soils on low, oblong or oval mounds intermingled with Mollville soils. Slopes are 0 to 1 percent.

This unit covers about 2 percent of the survey area. It is about 36 percent Mollville soils, 32 percent Latch soils, and 32 percent other soils (fig. 4).

Mollville soils are poorly drained and slowly permeable. Typically, the surface layer is dark grayish brown and grayish brown very fine sandy loam about 8 inches thick. The upper part of the subsoil, to a depth of 27 inches, is grayish brown sandy clay loam with brownish mottles, tongues, and streaks of grayish loam. The lower part of the subsoil, to a depth of 55 inches, is light brownish gray sandy clay loam with brownish and light gray mottles. Below this, to a depth of about 67 inches, is light gray loamy fine sand. The soil is very strongly acid in the upper part and slightly acid in the lower part.

Latch soils are moderately well drained and moderately permeable. Typically, these soils have a surface layer of dark grayish brown loamy fine sand about 8 inches thick. Below this, to a depth of 52 inches, is brown and pale brown loamy fine sand. The subsoil, to a depth of 62 inches, is light brownish gray sandy clay loam with brownish and reddish mottles. Below this, to a depth of 80 inches, is light gray and very pale brown sand. The soil is very strongly acid in the upper part and medium acid in the lower part.

The other soils in this unit are in the Bienville, Raino, Wrightsville, Urbo, and Mantachie series. The sandy Bienville soils are on low, broad ridges of stream terraces. The loamy Raino and Wrightsville soils are on undulating stream terraces. The loamy and clayey, frequently flooded Mantachie and Urbo soils are on lower flood plains.

Most areas of this unit are in woodland. Some areas are in pasture. A few areas are in crops.

Mixed hardwoods and pine make up the native woodland on these soils. Loblolly pine, sweetgum, water oak, and willow oak are the main trees. Loblolly pine is well suited to the sandy Latch soils; willow and water oak are the dominant trees on the wet, poorly drained Mollville soils. Wetness makes harvesting timber difficult and limits pine production on the Mollville soils.

Coastal bermudagrass, common bermudagrass, bahiagrass, and fescue are well suited pasture grasses on these soils. Some areas are planted to white clover or singletary peas for additional cool-season forage. Applications of fertilizer and lime can increase forage production. A drainage system can also increase yields.

Some small areas of these soils are cultivated. Wetness, slow permeability, and seasonal droughtiness are the most limiting features. Drainage is needed in most cropped areas of Mollville soils. Applications of lime and fertilizer can increase yields.

These soils are suited to urban uses but are severely limited by wetness.

8. Cuthbert-Redsprings

Strongly sloping to steep, well drained, gravelly soils; on uplands

This map unit is on hills locally known as "mountains," which are the highest points in the survey area. Slopes are 8 to 40 percent.

This unit covers about 2 percent of the survey area. It is about 37 percent Cuthbert soils, 30 percent Redsprings soils, and 33 percent other soils (fig. 6).

The Cuthbert soils are strongly sloping to steep. Typically, they have a brownish gravelly fine sandy loam surface layer about 16 inches thick. The subsoil, to a depth of 38 inches, is yellowish red clay.

The underlying material, to a depth of 60 inches, is stratified reddish yellow, pink, and strong brown fine sandy loam and shaly clay. The soil is slightly acid in the upper part and very strongly acid in the lower part.

The Redsprings soils are moderately steep to steep. Typically, they have a surface layer of dark reddish brown gravelly loam about 7 inches thick. The subsoil, to a depth of 46 inches, is dark red clay in the upper part and red clay in the lower part. The underlying material, to a depth of 60 inches, is yellowish brown, weathered glauconite. The soil is medium acid in the upper part and strongly acid in the lower part.

The other soils in this unit are in the Elrose, Kirvin, Sacul, and Tenaha series. The loamy Elrose soils are on colluvial foot slopes. The loamy Kirvin and Sacul soils are on narrow ridges. The sandy Tenaha soils are on convex upper hillsides.

Most areas of this unit are used for woodland or wildlife habitat. A few areas have been cleared and planted to pasture.

These soils produce a mixed native woodland. Oak, hickory, elm, and pine are common, but loblolly and

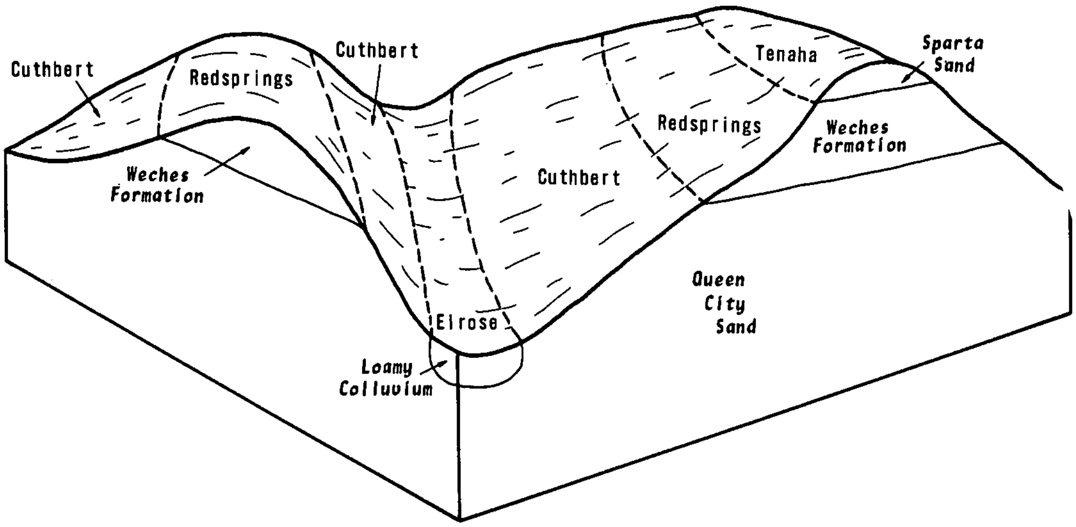


Figure 6.—Pattern of soils in the Cuthbert-Redsprings soil association.

shortleaf pine are the major commercial trees. Because of stoniness and slope, these soils produce low-quality timber. These soils provide a natural refuge for deer and other wildlife. Most areas are inaccessible to vehicles.

These soils are unsuited to pasture or crops. Slopes and ironstone fragments or gravel are the main limitations.

These soils are unsuited to urban uses, but they provide scenic homesites. Slope, ironstone fragments, and shrink-swell properties are the major limitations.

detailed soil map units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, 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, Kirvin very fine sandy loam, 2 to 5 percent slope, is one of several phases in the Kirvin series.

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

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. Latch-Mollville complex, 0 to 1 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Cuthbert and Redsprings soils, 15 to 40 percent slopes, is an undifferentiated group in this survey area.

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

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Oil wasteland is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

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

BeB—Bienville loamy fine sand, 0 to 3 percent slopes. This nearly level to gently sloping soil is on low ridges of stream terraces adjacent to flood plains of the Sabine River and the larger local streams. Mapped areas are oblong in shape. They average about 40 acres and range from 15 to 100 acres in size.

Typically, the surface layer is brown loamy fine sand about 8 inches thick. The subsurface layer, which extends to a depth of 22 inches, is also brown loamy fine sand. The upper part of the subsoil, to a depth of 50 inches, is strong brown loamy fine sand with spots of pale brown. The lower part of the subsoil, to a depth of 80 inches, is strong brown loamy fine sand with lamellae of yellowish red fine sandy loam. The soil is strongly acid in the upper part and medium acid in the lower.

This soil is somewhat excessively drained. Runoff is slow, and permeability is moderately rapid. This soil has a high water table within 4 to 6 feet of the surface during the winter and spring months. The available water capacity is low. The root zone is deep and easily penetrated by plant roots. The erosion hazard is none to slight.

Included with this soil in mapping are small areas of Latch, Mollville, Wrightsville, and Raino soils. Latch soils are in slightly lower areas than the Bienville soil and have a loamy subsoil. Mollville soils are in low, wet areas and are loamy throughout. Wrightsville soils are low and wet and have a clayey subsoil. Raino soils are loamy throughout and occur on low mounds. These inclusions make up less than 20 percent of the unit.

Most of this Bienville soil is used for pasture and woodland. A few acres are in cultivation.

Coastal bermudagrass, lovegrass, and bahiagrass are well-suited pasture plants. Proper applications of fertilizer and lime can increase forage yields.

Some areas are in shortleaf pine and loblolly pine. This soil is suited to the production of commercial pine timber. Droughtiness is a minor limitation.

Corn, peanuts, and watermelons are the main crops grown on this soil. Fertilizer and lime are essential for good yields. Contour farming can reduce erosion in some places.

This soil is suited to most urban uses. The seasonal high water table, however, is a limiting feature for septic tank absorption fields. Corrosivity is a limitation feature for concrete. This can be lessened by treating concrete for corrosive agents.

This soil is in capability subclass IIs.

BoC—Bowie fine sandy loam, 2 to 5 percent slopes. This deep, gently sloping soil is on uplands on broad interstream divides. Surfaces are plane to weakly convex. Mapped areas are irregularly shaped. They range from 10 to 200 acres in size and average about 40 acres.

Typically, this soil has a brown, fine sandy loam surface layer about 6 inches thick. The subsurface layer, which extends to a depth of 12 inches, is pale brown fine sandy loam. The upper part of the subsoil, to a depth of 44 inches, is yellowish brown sandy clay loam that has reddish and grayish mottles near the lower part. The lower part of the subsoil, to a depth of 72 inches, is mottled reddish, brownish, and grayish sandy clay loam that is 5 to 8 percent nodular plinthite. Ironstone pebbles range from few to common throughout the soil. The soil is slightly acid in the upper part and very strongly acid in the lower.

This soil is moderately well drained. Runoff is medium, and permeability is moderately slow. The available water capacity is high. The root zone is deep, but roots are restricted in some areas by masses of hardened plinthite in the lower part of the soil. Erosion is a moderate hazard.

Included with this soil in mapping are small areas of Kirvin, Kullit, and Lilbert soils. Kirvin soils have a reddish clayey subsoil, are higher in the landscape, and are less than 5 percent plinthite. Kullit soils have gray mottles in the upper part of the subsoil and are clayey in the lower part of the subsoil. Lilbert soils have a sandy surface layer 20 to 40 inches thick. These inclusions make up less than 20 percent of the unit.

This soil is mainly in pasture (fig. 7). Some areas are in woodland and a small acreage is in cropland.

The main pasture grasses are Coastal bermudagrass, common bermudagrass, and bahiagrass. Many pastures are overseeded with clover and vetch for additional forage production. With good management, forage yields are high. Proper use of fertilizer and lime are essential for high yields.

Loblolly pine and shortleaf pine are the principal commercial trees suited to this soil. This soil is one of the better soils for woodland production in the area. It has no major limitations.

Corn and truck crops such as sweet potatoes, watermelons, and peas are the main crops. Fertilizer and lime are necessary for good yields. Constructing terraces and farming on the contour will help prevent erosion.

This soil is suited to most urban uses. Moderately slow permeability is a limiting feature for septic tank absorption fields, and corrosivity is a limiting feature for underground steel and concrete.

This soil is in capability subclass IIIe.

BuC—Bowie-Urban land complex, 2 to 5 percent slopes. This gently sloping map unit is on broad uplands. Areas are oblong and range from 40 to 500 acres in size.

This unit is 40 to 75 percent Bowie soil, 15 to 35 percent Urban land, and about 10 to 25 percent other soils. Areas of these soils and Urban land are so intricately mixed that separation was not practical at the scale mapped.

Typically, the surface layer is grayish brown fine sandy loam about 6 inches thick. The subsurface layer, which extends to a depth of 12 inches, is pale brown fine sandy loam. The upper part of the subsoil, to a depth of 44 inches, is yellowish brown sandy clay loam with reddish and grayish mottles near the lower part. The lower part of the subsoil, to a depth of 72 inches, is mottled reddish, brownish, and grayish sandy clay loam that is 5 to 8 percent nodular plinthite. Ironstone pebbles range from few to common throughout the soil. The soil is slightly acid in the upper part and very strongly acid in the lower.

The Bowie soil is moderately well drained. Runoff is medium, and permeability is moderately slow. The available water capacity is high. Erosion is a moderate hazard.

Urban land consists of areas covered by dwellings, commercial buildings, schools, churches, driveways, streets, parking lots, and railroad yards. It also includes areas that have been disturbed by cutting, filling, or grading. The soil has been altered to such an extent that further classification is not possible.

Figure 7.—Improved pasture on Bowie fine sandy loam. Cuthbert and Redsprings soils are on hills in background.

Included in mapping are small areas of Kirvin soils that are more clayey than the Bowie soil in the subsoil, Ruston soils that are redder in the subsoil, Kullit soils that are slowly permeable, and Lilbert soils that have a sandy surface layer. These inclusions make up about 10 percent of the unit.

This unit is suited to most urban uses. The Bowie soil is corrosive, however, to steel and concrete, and precautions are needed to reduce underground pipe corrosion. This unit should be strengthened when it is used as base material for streets and roads. Septic tank absorption fields in this unit should be well designed.

This unit is not placed in a capability subclass.

ByC—Briley loamy fine sand, 2 to 5 percent slopes. This deep, gently sloping soil is on upland stream divides. Mapped areas are irregularly shaped and range from 10 to 50 acres in size.

Typically, the surface layer is brown loamy fine sand about 8 inches thick. The subsurface layer, which extends to a depth of 26 inches, is light yellowish brown loamy fine sand. The upper part of the subsoil, to a depth of 58 inches, is red sandy clay loam with strong brown and brownish yellow mottles. The lower part of the subsoil, to a depth of 80 inches, is strong brown sandy clay loam with reddish and brownish mottles. The soil is medium acid in the upper part and very strongly acid in the lower.

This soil is well drained. Runoff is slow, and permeability is moderate. The available water capacity is medium. The root zone is deep and easily penetrated by plant roots.

Included with this soil in mapping are small areas of Lilbert and Ruston soils. Lilbert soils have a yellow subsoil. Ruston soils have a thinner surface layer and are less sandy. These inclusions make up less than 15 percent of the unit.

Most of this Briley soil is pasture. A minor amount is woodland and cropland.

Coastal bermudagrass, bahiagrass, lovegrass, crimson clover, and vetch are well-suited pasture plants. Good management practices can improve production. Light applications of fertilizer and lime at frequent intervals can increase forage production.

Mixed hardwoods and pine are suited to this soil. Loblolly pine, shortleaf pine, and slash pine are the main commercial trees. Droughtiness is the most limiting feature of this soil for timber production.

In a few areas corn, watermelons, peanuts, peas, and sweet potatoes are grown on this soil. Lime and fertilizer are needed for high yields. Contour farming reduces erosion. Droughtiness is the main limitation for crop production.

This Briley soil is suited to most urban uses. Seepage is a limiting feature for area sanitary landfills, and corrosivity is a limiting feature for concrete and steel. These problems can be overcome by good design and careful installation.

This soil is in capability subclass IIIe.

CbE—Cuthbert fine sandy loam, 8 to 25 percent slopes. This strongly sloping to steep soil is on uplands. Soil areas are on hillslopes above drains and are long and narrow. They range from 30 to 300 acres in size and average about 100 acres.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsoil, which extends to a depth of 36 inches, is red clay with brownish mottles and gray shale fragments in the lower part. The underlying layer, to a depth of 60 inches, is reddish and yellowish fine sandy loam and grayish shale. The soil is slightly acid in the upper part and very strongly acid in the lower.

This soil is well drained. Runoff is rapid, and permeability is moderately slow. The available water capacity is medium. The root zone is moderately deep. Erosion is a severe hazard.

Included with this soil in mapping are small areas of Tenaha and Sacul soils and Cuthbert gravelly soils. Tenaha soils have a sandy surface layer more than 20 inches thick. Because of wetness, Sacul soils have gray mottles in the upper part of the subsoil. The closely similar Cuthbert gravelly and cobbly soils are 15 to 50 percent by volume ironstone fragments that are less than 3 inches across. These inclusions make up less than 20 percent of the unit.

This soil is mainly woodland. Some areas have been cleared and planted to pasture.

Shortleaf pine and loblolly pine are the principal commercial trees produced for timber on this soil. The limiting features for timber production is the slope and clayey subsoil.

Some areas of this soil are in common bermudagrass or bahiagrass pasture that have been overseeded with clover or vetch. Adequate fertilization and liming programs can increase yields. Good management of grazing can reduce erosion.

Strong and steep slopes and the hazard of erosion make this soil unsuited for cultivation.

This soil is unsuited to most urban uses. It is highly corrosive to uncoated steel and concrete. Low strength and steep slopes are limitations for streets and roads, and slope and shrink-swell properties are limitations for building sites. These problems can be overcome by good design and careful installation.

This soil is in capability subclass VIe.

CcE—Cuthbert-Urban land complex, 8 to 25 percent slopes. This unit consists of strongly sloping to steep soils on uplands and Urban land. Areas are long and narrow in shape and range from 15 to 200 acres in size.

The unit is 40 to 75 percent Cuthbert soil, 15 to 35 percent Urban land, and 10 to 25 percent or less other soils. Areas of these soils and Urban land are so intricately mixed that separation was not practical at the scale mapped.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsoil, which extends to a depth of 36 inches, is red clay with brownish mottles and gray shale fragments in the lower part. The underlying layer, to a depth of 60 inches, is reddish and yellowish fine sandy loam and grayish shale. The soil is slightly acid in the upper part and very strongly acid in the lower.

The Cuthbert soil is well drained. Runoff is rapid, and permeability is moderately slow. The available water capacity is medium. The root zone is moderately deep. Erosion is a severe hazard.

Urban land consists of areas covered by dwellings, commercial buildings, schools, churches, driveways, streets, parking lots, and railroad yards. It also includes areas that have been disturbed by cutting, filling, or grading. The soil has been altered to such an extent that further classification is not possible.

Included with this unit in mapping are small areas of Tenaha soils, Sacul soils, and Cuthbert gravelly soils. Tenaha soils have a sandy surface layer more than 20 inches thick. Because of wetness, Sacul soils have gray mottles in the upper part of the subsoil. The closely similar Cuthbert gravelly and cobbly soils are 15 to 50 percent by volume ironstone fragments. These inclusions make up less than 10 percent of the unit.

This unit is unsuited to most urban uses. The soils are highly corrosive to uncoated steel and concrete, and low strength and steep slopes are limitations for streets and roads. Slope and shrink-swell properties are limitations for building sites. These problems can be overcome, however, by good design and careful installation.

This unit is not placed in a capability subclass.

CrF—Cuthbert and Redsprings soils, 15 to 40 percent slopes. This unit consists of moderately deep and deep, moderately steep and steep soils on uplands. These soils are on the hills known locally as "mountains" that make up the highest parts of the survey area. Mapped areas are generally oval in shape and may include one hill or several hills joined together. The areas range from 50 to 1,000 acres and average about 300 acres.

In most areas this unit consists of 40 to 60 percent Cuthbert soil, 30 to 50 percent Redsprings soil, and about 10 percent other soils. The Redsprings soil is absent or makes up less than 30 percent of some mapped areas. Both Cuthbert and Redsprings soils have variable surface textures of fine sandy loam, loam, or their gravelly counterparts. Ironstone pebbles and stones are on the surface in some spots. Areas of these soils neither are uniform nor occur in a regular pattern.

Typically, the surface layer of the Cuthbert soil is brownish, slightly acid gravelly fine sandy loam about 16 inches thick. The subsoil, which extends to a depth of 38 inches, is yellowish red, very strongly acid clay. The underlying material, to a depth of 60 inches, is stratified; reddish yellow, pinkish gray, and strong brown; very strongly acid fine sandy loam and shaly clay.

The Cuthbert soil is well drained. Surface runoff is rapid, and permeability is moderately slow. Available water capacity is medium. The root zone is moderately deep. There is a severe erosion hazard.

Typically, the Redsprings soil has a dark reddish brown gravelly loam surface layer 7 inches thick. The upper part of the subsoil, to a depth of 16 inches, is dark red clay with common ironstone fragments. The lower part of the subsoil, to a depth of 46 inches, is red clay with common ironstone fragments. This layer is about 25 percent fragments of yellowish weathered glauconite in the lower part. The underlying material, to a depth of 60 inches, is yellowish brown weathered glauconite. The soil is medium acid in the upper part and strongly acid in the lower part.

The Redsprings soil is well drained. Surface runoff is medium to rapid, and permeability is moderately slow. Available water capacity is medium. The root zone is deep. This soil has a severe erosion hazard.

Included in mapping are small areas of Tenaha, Elrose, Kirvin, and Sacul soils. Tenaha soils have a sandy surface more than 20 inches thick. Elrose soils have a loamy subsoil more than 60 inches thick. Because of wetness, the Sacul soils have gray mottles in the upper part of the subsoil. Kirvin soils have a thicker subsoil. These inclusions make up less than 10 percent of the unit.

These soils are used mainly for woodland or wildlife habitat. A few areas have been cleared and planted to pasture.

Loblolly and shortleaf pine are the major commercial trees. The trees grow small, and the timber produced is used mainly for pulpwood in paper production rather than for lumber. Because of slope, most soil areas are inaccessible to vehicles and domestic livestock but are a natural refuge for deer and other wildlife.

These soils are unsuited to crops or pasture. Slope is the main limitation. The hazard of erosion and the fragments of ironstone are also limitations.

These soils are unsuited to urban uses. However, some areas provide homesites with scenic views. Slope, ironstone fragments, and shrink-swell properties are the major limitations.

This unit is in capability subclass VIIe.

DaC—Darco fine sand, 2 to 5 percent slopes. This gently sloping soil is on uplands on broad interstream divides and slightly oblong ridges. Surfaces are plane to convex. Mapped areas range from 10 to 300 acres in size and average about 40 acres.

Typically, the surface layer is brown fine sand about 10 inches thick. The subsurface layer, which extends to a depth of 62 inches, is light yellowish brown fine sand. The subsoil, to a depth of 80 inches, is yellowish red sandy clay loam with strong brown mottles. The soil is medium acid in the upper part and very strongly acid in the lower.

This soil is well drained. Runoff is slow, and permeability is moderate. The available water capacity is low. The root zone is deep and easily penetrated by plant roots.

Included with this soil in mapping are small areas of Lilbert, Briley, and Tenaha soils. These soils have a sandy surface layer 20 to 40 inches thick. These similar soils make up less than 20 percent of any mapped area.

This Darco soil is mainly pasture and woodland. A very small acreage is cropland.

Coastal bermudagrass and weeping lovegrass are well-suited pasture grasses (fig. 8). Pastures on this soil require light applications of fertilizer and lime at frequent intervals for high production. Low available water capacity is a limiting feature of this soil.

The woodland produced is mixed hardwoods and pine. Shortleaf and loblolly pine are the principal commercial trees. A few areas have been planted to slash pine. Droughtiness limits the growth of trees and decreases the survival rate of seedlings.

Watermelons, peanuts, peas, and sweet potatoes are crops well suited to this soil. Fertilizer and lime are essential for good yields. Erosion, slope, and droughtiness are the main limitations. Cover crops, high-residue crops, and green-manure crops can reduce erosion and maintain fertility.

This soil is suited to most urban uses. Corrosivity is a limiting feature for concrete and steel. Seepage is a limiting feature for most sanitary facilities.

This soil is in capability subclass IIIs.

DaE—Darco fine sand, 8 to 15 percent slopes. This strongly sloping to moderately steep soil occurs on side slopes along drainageways. Mapped areas are commonly long and narrow. They range from 20 to 200 acres in size and average about 50 acres.

Typically, the surface layer is fine sand about 65 inches thick. It is brown in the upper part, pale brown in the middle part, and light yellowish brown in the lower part. The subsoil, to a depth of 80 inches, is yellowish red sandy loam. The soil is medium acid in the upper part and strongly acid in the lower.

This soil is well drained. Runoff is slow, and permeability is moderate. The available water capacity is low. The root zone is deep and easily penetrated by plant roots. Erosion is a moderate hazard.

Figure 8.—A well-managed Coastal bermudagrass meadow on Darco fine sand, 2 to 5 percent slopes. Cuthbert and Redsprings soils are on hills in background.

Included with this soil in mapping are small areas of Tenaha and Cuthbert soils. Tenaha soils have a sandy surface 20 to 40 inches thick. Cuthbert soils have a loamy surface. These inclusions make up less than 20 percent of the unit.

The major use of this Darco soil is woodland production. Some areas are cleared and planted to pasture.

Shortleaf and loblolly pine are the primary commercial trees on this soil, but many hardwoods are suited. Good management can increase timber yields. Droughtiness is the main limitation of timber production.

Coastal bermudagrass and weeping lovegrass are well suited to this soil. Light applications of fertilizer and lime at frequent intervals are essential for high production. Low available water capacity limits pasture production.

Slope and the hazard of erosion causes this soil to be unsuited to cropland.

This Darco soil is suited to most urban uses. It is corrosive to concrete and steel, but this can be lessened by coating steel and treating concrete. Slope is a limiting feature for building sites and roads and streets, but this can be overcome by good design and careful installation.

This soil is in capability subclass VIe.

ErC—Elrose fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on narrow foot slopes above drainageways. Mapped areas range from 15 to 75 acres in size and average about 40 acres.

Typically, this soil has a fine sandy loam surface layer about 8 inches thick that is strong brown in the upper part and yellowish red in the lower part. The subsoil, to a depth of 80 inches, is red sandy clay loam. The upper part has some brownish mottles, and the lower part contains fragments of brownish glauconite. The soil is strongly acid in the upper part and very strongly acid in the lower.

This Elrose soil is well drained. Runoff is medium, and permeability is moderate. The available water capacity is high. The root zone is deep. Erosion is a moderate hazard.

Included with this soil in mapping are small areas of Bowie and Redsprings soil. Bowie soils have a yellowish subsoil that is more than 5 percent plinthite in some areas. Redsprings soils have a clayey subsoil. These inclusions make up less than 15 percent of the unit.

This Elrose soil is mostly pasture and woodland. A few small areas are cropland.

Bahiagrass, common bermudagrass, Coastal bermudagrass, crimson clover, arrowleaf clover, and vetch are well-suited pasture grasses and legumes. Under good management, forage yields are high. Proper use of fertilizer and lime is essential for good production.

Some areas of this soil are in mixed hardwoods and pine. Loblolly pine and shortleaf pine are the principal commercial trees. A few old cropland fields have been planted to slash pine for timber production. This is one of the better soils in the area for woodland production. It has no major limitation.

Corn, oats, and vegetable crops such as peas, beans, and sweet potatoes do well. Lime and fertilizer are essential for good yields. Planting cover crops, constructing terraces, and farming on the contour can reduce erosion.

This Elrose soil is suited to most urban uses. Seepage is a limiting feature for sewage lagoons and trench sanitary landfills. Corrosivity is a limiting feature for underground steel and concrete. These problems can be overcome, however, by good design and careful installation.

This soil is in capability subclass IIIe.

Iu—Iuka fine sandy loam, frequently flooded. This deep, nearly level soil is on flood plains of the smaller streams in the area. Slopes range from 0 to 1 percent. Mapped areas are long, mostly 200 feet to 500 feet wide, and average about 40 acres in size.

Typically, the surface layer is about 12 inches thick. It is fine sandy loam that is dark grayish brown in the upper part and brown in the lower part. The underlying layer, to a depth of 60 inches, is fine sandy loam. The upper part is brown with brownish and grayish mottles. The lower part is mottled gray, brown, and yellow. The soil is strongly acid in the upper part and very strongly acid in the lower.

This soil is moderately well drained. Runoff is slow, and permeability is moderate. These soils are flooded two to four times during most years for average durations of about 2 days. Flooding is usually during winter and spring. The water table is usually 1 to 3 feet below the surface during these months. The available water capacity is medium, and the root zone is deep.

Included with this soil in mapping are small areas of Mantachie soils in low wet spots. Also included are small areas of Iuka soils that are occasionally flooded. These inclusions make up less than 20 percent of most mapped areas.

This Iuka soil is mainly woodland. Improved pasture has been established in a few cleared areas.

Loblolly pine, sweetgum, water oak, and willow oak are the dominant trees on this soil. The primary commercial trees are loblolly pine and shortleaf pine. Trees that are suited produce well on this soil. Wetness and flooding are the major limiting features that affect the harvesting of timber.

The main pasture grasses are Coastal bermudagrass, common bermudagrass, and bahiagrass. Some pastures are planted to cool-season tall fescuegrass and overseeded with white clover, a combination that is well suited to seasonally wet soils. Proper use of fertilizer and lime can increase yields.

This soil is not suited to cultivation because of the frequent flooding. A few small areas that are flooded less frequently, however, are used to produce sugarcane. Syrup is made from the cane for home and local use.

This soil is not suited to most urban uses. Flooding and wetness are the main limitations.

This soil is in capability subclass Vw.

KfC—Kirvin very fine sandy loam, 2 to 5 percent slopes. This deep, gently sloping soil is on oval to oblong ridges and stream divides. Mapped areas range from 15 to 200 acres in size and average about 50 acres.

Typically, the surface layer is dark brown very fine sandy loam about 4 inches thick. The subsurface layer, which extends to a depth of 12 inches, is brown very fine sandy loam. The subsoil, to a depth of 51 inches, is red clay with brownish mottles and grayish shale fragments in the lower part. The underlying layer, to a depth of 61 inches, is stratified, grayish shale and reddish sandy clay loam. The soil is strongly acid in the upper part and very strongly acid in the lower.

This soil is well drained. Runoff is medium to rapid, and permeability is moderately slow. Available water capacity is medium, and the root zone is deep. Erosion is a moderate hazard.

Included in mapping are small areas of Bowie, Ruston, and Briley soils. Bowie soils have a yellowish loamy subsoil. Ruston soils are loamy and have a thicker subsoil. Briley soils have a sandy surface layer 20 to 40 inches thick. These inclusions make up less than 20 percent of the unit.

This Kirvin soil is mainly pasture. Some areas are woodland, and a small acreage is cropland.

Improved pasture grasses such as bahiagrass, common bermudagrass, and Coastal bermudagrass are well suited to this soil. Clover and vetch are often overseeded on pastures for additional forage production. Proper use of fertilizer and lime is essential for high yields.

Shortleaf pine and loblolly pine are the primary commercial trees. Various hardwoods are also suited to this soil. Good woodland management practices can increase timber yields. There are no major limitations for woodland on this soil.

Corn, oats, and vegetable crops do well on this soil. Fertilizer and lime are essential for good yields. Planting cover crops, constructing terraces, and farming on the contour can reduce erosion.

This soil is suited to most urban uses. Low strength is a limiting feature for roads and streets, and corrosivity is a limiting feature for underground steel and concrete. These problems can be overcome, however, by good design and careful installation.

This soil is in capability subclass IIIe.

KgC—Kirvin gravelly fine sandy loam, 3 to 8 percent slopes. This deep, gently sloping to sloping soil is on oval ridges and stream divides. Mapped areas range from 15 to 150 acres in size and average about 40 acres.

Typically, the surface layer is brown gravelly fine sandy loam about 10 inches thick. The upper part of the subsoil, to a depth of 42 inches, is red clay with brownish mottles and grayish shale fragments near the lower part. The lower part of the subsoil, to a depth of 57 inches, is mottled reddish, brownish, and grayish clay loam. The underlying layer, to a depth of 65 inches, is stratified, reddish and grayish shaly clay and sandy clay loam. The soil is medium acid in the upper part and very strongly acid in the lower.

This soil is well drained. Runoff is medium to rapid, and permeability is moderately slow. Available water capacity is medium, and the root zone is deep. Erosion is a moderate hazard.

Included with this soil in mapping are small areas of Cuthbert, Bowie, and Briley soils. Cuthbert soils are 20 to 40 inches thick. Bowie soils have a yellowish loamy subsoil. Briley soils have a sandy upper layer 20 to 40 inches thick. These inclusions make up less than 20 percent of any mapped area.

This Kirvin soil is mainly woodland. Some areas are pasture, and a lesser amount is cropland.

Shortleaf pine and loblolly pine are the major commercial trees produced on the gravelly Kirvin soils. The gravel reduces the available water capacity and limits timber production. Proper woodland management, however, can increase woodland yields.

The dominant pasture grasses adapted to the gravelly Kirvin soils are bahiagrass, common bermudagrass, and Coastal bermudagrass. Legumes such as crimson clover, arrowleaf clover, and vetch are often overseeded on grass pastures for additional forage. Fertilizer, lime, and good management in general can increase yields.

The erosion hazard is the major limiting feature for crops. Cover crops, terraces, and contour farming practices are needed to help control erosion.

This soil is suited to most urban uses (fig. 9). Moderately slow permeability is a limiting feature for septic tank absorption fields, low strength is a limiting feature for roads and streets, and corrosivity is a limiting feature for underground steel and concrete. These problems can be overcome, however, by good design and careful installation.

This soil is in capability subclass IVe.

KrC—Kirvin-Urban land complex, 2 to 5 percent slopes. Areas of these gently sloping soils and Urban land are on uplands. Mapped areas are oblong in shape. They range from 20 to 100 acres in size and average about 40 acres.

This unit is 50 to 75 percent Kirvin soil, 15 to 35 percent Urban land, and 20 percent or less other soils. The surface layer of the Kirvin soil ranges from gravelly fine sandy loam to very fine sandy loam. Areas of these soils and Urban land are so intricately mixed that separation was not practical at the scale mapped.

Typically, the surface layer of the Kirvin soil is brown very fine sandy loam about 12 inches thick. The subsoil, to a depth of 51 inches, is red clay with brownish mottles and grayish shale fragments in the lower part. The underlying layer, to a depth of 61 inches, is stratified, grayish shale and reddish sandy clay loam. The soil is strongly acid in the upper part and very strongly acid in the lower.

The Kirvin soil is well drained. Runoff is medium to rapid, and permeability is moderately slow. The available water capacity is medium, and there is a moderate erosion hazard.

Urban land consists of areas covered by dwellings, commercial buildings, schools, churches, driveways, streets, parking lots, and railroad yards. It also includes areas that have been disturbed by cutting, filling, or grading. The soil has been altered to such an extent that further classification is not possible.

Included in mapping are small areas of Bowie, Cuthbert, Kirvin gravelly, and Sacul soils. Bowie soils have a yellow, loamy subsoil. Cuthbert soils have a solum less than 40 inches deep. The closely similar Kirvin gravelly soils are 15 to 50 percent ironstone gravel. Because of wetness, Sacul soils have gray mottles in the upper part of the subsoil. These inclusions make up less than 20 percent of the map unit.

This unit is suited to most urban uses. Kirvin soils are highly corrosive to uncoated underground steel and concrete, have low strength for streets and roads, and have shrink-swell problems for buildings. These limitations can be overcome, however, by good design and careful installation.

This map unit is not placed in a capability subclass.

KsC—Kirvin soils, graded, 3 to 8 percent slopes. These deep, gently sloping to sloping soils are on oval, convex ridges. The surface layer of this soil has been removed as a source of gravel for construction (fig. 10). Soil areas generally follow the surface contour. Mapped areas range from 10 to 100 acres in size and average about 30 acres.

Typically, the original surface layer of gravelly fine sandy loam has been removed. To a depth of about 40 inches is red clay that is about 5 percent ironstone gravel in the upper part and has fragments of shale and sandstone in the lower part. The underlying layer, to a depth of 60 inches, is stratified, reddish and brownish weakly cemented sandstone and grayish shale. These soils are very strongly acid.

Kirvin soils, graded, are well drained. Runoff is medium to rapid, and permeability is moderately slow. The available water capacity is medium, and erosion is a severe hazard.

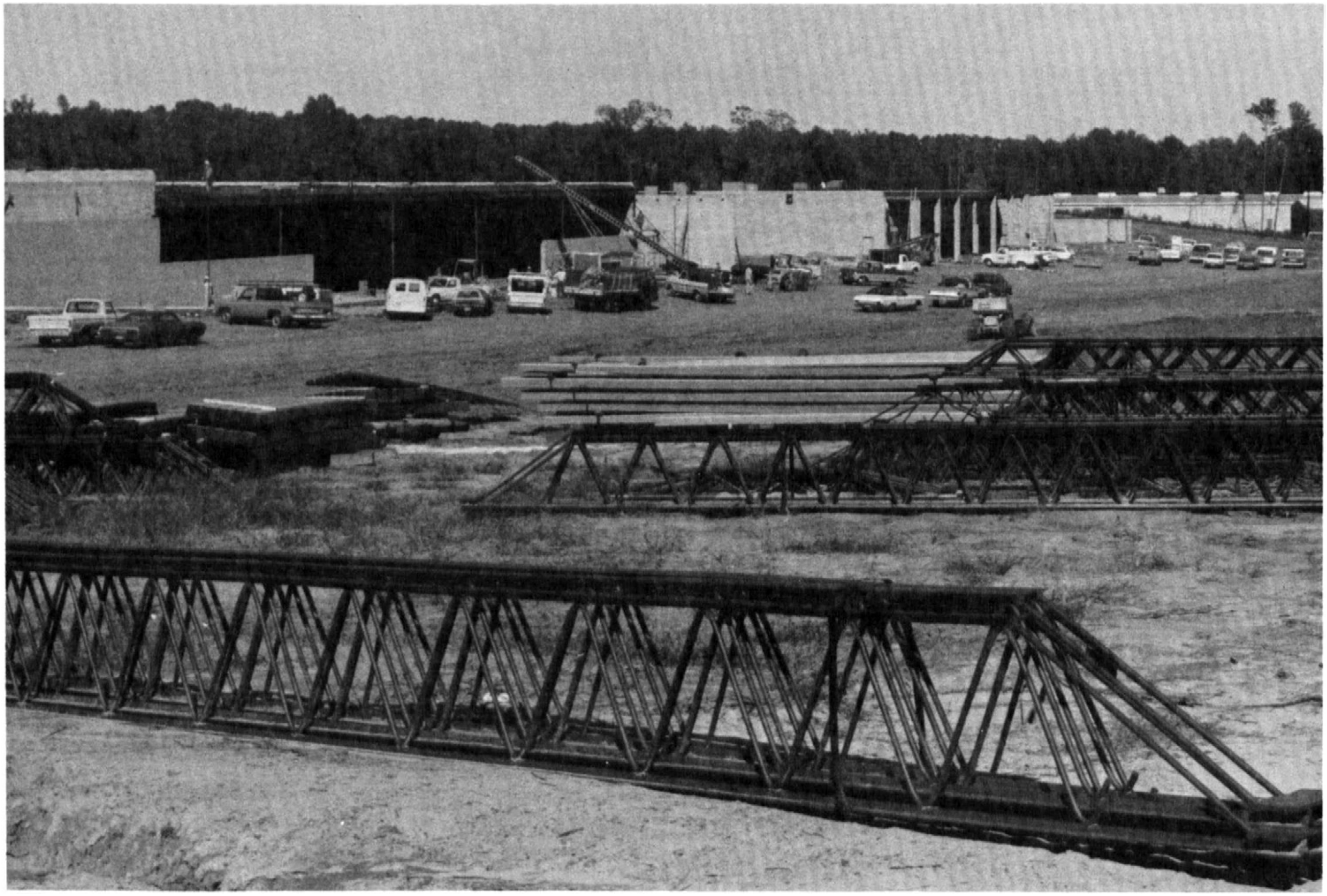


Figure 9.—Building a shopping center on Kirvin gravelly fine sandy loam, 3 to 8 percent slopes.

Included with this unit in mapping are areas of the similar Cuthbert and Redsprings soils. These soils are particularly significant in the hilly areas of Upshur County. Small areas of Cuthbert and Redsprings soils make up as much as 20 percent of some mapped areas.

Most areas of these Kirvin soils are idle. A few areas are in improved pasture.

Coastal bermudagrass, common bermudagrass, and bahiagrass are suitable pasture grasses. Good management practices along with proper application of lime and fertilizer are needed, however, for establishment and maintenance.

A few areas of Kirvin soils, graded, are returning naturally to stands of shortleaf pine and loblolly pine. Some small areas have been planted. Timber on these soils is usually of low quality. High seedling mortality rates and droughtiness are the major limitations.

These soils are not suited to cultivation. The severe erosion hazard is the major limitation.

These Kirvin soils, graded, are moderately suited to most urban uses. Low strength affecting roads and streets, corrosivity of underground concrete and steel, and moderate shrink-swell problems are limitations, but these can be overcome by good design and proper installation.

This unit is in capability subclass VIe.

KtB—Kullit very fine sandy loam, 1 to 3 percent slopes. This soil is on gently sloping stream divides, on foot slopes, and at the heads of streams. Surfaces are concave or plane. Areas are irregularly shaped. They range from 15 to 200 acres in size and average about 40 acres.

Typically, the surface layer is brown very fine sandy loam about 7 inches thick. The upper part of the subsoil,

Figure 10.—Kirvin soils, graded, 3 to 8 percent slopes. The gravelly surface layer has been removed for base material of roads.

to a depth of 49 inches, is yellowish brown clay loam with brownish, grayish, and reddish mottles near the lower part. The lower part of the subsoil, to a depth of 70 inches, is mottled red, gray, and strong brown clay. The soil is medium acid in the upper part and very strongly acid in the lower.

This soil is moderately well drained. Runoff is medium, and permeability is moderately slow. The available water capacity is medium. This soil has a perched water table within 2 to 3 feet of the surface during the winter and spring months. The root zone is deep. There is a moderate erosion hazard.

Included with this soil in mapping are small areas of Bowie and Sacul soils. Bowie soils do not have gray mottles in the upper part of the subsoil. Sacul soils have a subsoil that is reddish and clayey in the upper part. These inclusions make up less than 10 percent of the unit.

Most of this Kullit soil is used for improved pasture. A few areas are woodland, some are cropland, and a few are in truck crops (fig. 11).

Pasture grasses such as Coastal bermudagrass, common bermudagrass, and bahiagrass and legumes such as crimson clover, arrowleaf clover, and vetch are well suited. Wheat, oats, ryegrass, and other cool-season grasses are planted in some areas for winter grazing. Fertilizer and lime are needed for high yields.

Much of this soil is in mixed hardwoods and pine. Loblolly and shortleaf pine are the principal commercial trees, but oak, elm, hickory, and gum trees are common. Proper woodland management practices can increase timber production.

A few areas are in cultivation. Corn, oats, peanuts, and vegetable crops do well. Fertilizer and lime are essential for high yields. Planting cover crops, constructing terraces, and farming on the contour can reduce erosion.

This soil is suited to most urban uses. Kullit soil is highly corrosive to uncoated underground steel and concrete. This soil should be strengthened when it is used as base material for streets and roads. Proper foundation design is required to overcome the moderate to high shrink-swell condition in the lower part of the subsoil.

This soil is in capability subclass IIe.

KuB—Kullit-Urban land complex, 1 to 3 percent slopes. This unit consists of areas of gently sloping soil and Urban land on broad ridges, on wide foot slopes, and at the heads of streams. Mapped areas are oblong in shape and range from 20 to 150 acres.

This unit is 55 to 80 percent Kullit soil, 15 to 35 percent Urban land, and 10 percent or less other soils. Areas of these soils and Urban land are so intricately mixed that separation was not practical at the scale mapped.

Typically, the surface layer of the Kullit soil is brown very fine sandy loam about 7 inches thick. The upper part of the subsoil, to a depth of 49 inches, is yellowish brown clay loam with brownish, grayish, and reddish mottles near the lower part. The lower part of the subsoil, to a depth of 70 inches, is mottled red, gray, and brown clay. The soil is medium acid in the upper part and very strongly acid in the lower.

The Kullit soil is moderately well drained. Runoff is medium, and permeability is moderately slow. This soil has a perched water table within 2 to 3 feet of the surface during the winter and spring months. The available water capacity is medium, and there is a moderate erosion hazard.

Urban land consists of areas covered by dwellings, commercial buildings, schools, churches, driveways, streets, parking lots, and railroad yards. It also includes areas that have been disturbed by cutting, filling, or grading. The soil has been altered to such an extent that further classification is not possible.

Included in mapping are small areas of Bowie and Sacul soils. The Bowie soils do not have gray mottles in the upper part of the subsoil. Sacul soils have a subsoil that is reddish and clayey in the upper part. These inclusions make up less than 10 percent of the unit.

Figure 11.—Peas grown on Kullit very fine sandy loam, 1 to 3 percent slopes, for truck crop market.

This unit is suited to most urban uses. Kullit soils are highly corrosive to uncoated underground steel and concrete. This unit should be strengthened when it is used as the base material for streets and roads. Proper foundation design is required to overcome the moderate to high shrink-swell properties in the lower part of the subsoil.

This soil is not placed in a capability subclass.

LaA—Latch-Mollville complex, 0 to 1 percent slopes. This deep, nearly level soil complex is on slightly undulating stream terraces. Mapped areas are irregular in shape. They range from 50 to 500 acres in size and average 150 acres.

This complex consists of a series of ridges or mounds and flats. The Latch soil is on ridges and mounds that are 2 to 4 feet higher than the adjacent Mollville soil on flats. The ridges are 200 to 1,000 feet long and 40 to 150 feet wide. The flats are 40 to 80 feet wide.

This Latch-Mollville complex averages about 50 percent Latch soil, 35 percent Mollville soil, and 15 percent other soils. Areas of these soils are so intricately mixed that separation was not practical at the scale mapped.

Typically, the Latch soil has a surface layer of dark grayish brown loamy fine sand about 8 inches thick. The subsurface layer, which extends to a depth of 52 inches, is loamy fine sand that is brown in the upper part and pale brown with grayish and brownish mottles in the lower part. The subsoil, to a depth of 62 inches, is light brownish gray sandy clay loam with brownish and reddish mottles. The underlying layer, to a depth of 80 inches, is light gray and very pale brown sand. The soil is very strongly acid in the upper part and medium acid in the lower.

The Latch soil is moderately well drained. Runoff is slow, and permeability is moderate. During periods of the cool-season, the water table is 2 1/2 to 4 feet below the surface. The available water-holding capacity is low, and the root zone is deep.

Typically, the Mollville soil has a surface layer of grayish very fine sandy loam about 9 inches thick. The upper part of the subsoil, to a depth of 34 inches, is grayish sandy clay loam with brownish mottles and contains tongues and streaks of surface layer material. The lower part of the subsoil, to a depth of 47 inches, is mottled grayish and brownish loam. The underlying layer, to a depth of 77 inches, is yellowish, brownish, and whitish sandy loam and loamy fine sand. The soil is strongly acid in the upper part and medium acid in the lower.

The Mollville soil is poorly drained. Runoff is very slow, and permeability is slow. Water ponds on this soil for 2 to 6 weeks during the cool season. Available water capacity is medium, and the root zone is deep.

Included in mapping are small areas of Wrightsville, Raino, and Bienville soils. These soils are on flats, mounds, or low ridges and make up less than 15 percent of the unit.

Most areas of this unit are woodland. A few small areas have been cleared and planted to improved pasture.

Loblolly pine, sweetgum, water oak, and willow oak are the dominant trees. Loblolly pine is well suited to the sandy Latch soil. Willow oak and water oak are the dominant trees on the wet, poorly drained Mollville soil. Wetness makes harvesting difficult, and limits pine production on the Mollville soil.

Coastal bermudagrass, common bermudagrass, bahiagrass, and fescue are well-suited pasture grasses on these soils. Some areas are planted to white clover or singletary peas for additional cool-season forage. Fertilizer and lime can increase forage production. Wetness and ponding are the main limitations. A proper drainage system can increase yields.

Small areas of this complex are in cultivation. Wetness, slow permeability, and seasonal droughtiness are the most limiting features. Drainage and fertilization can increase yields.

These soils are suited to most urban uses, but seasonal ponding and wetness are limitations.

This unit is in capability subclass IIIw.

LbC—Lilbert loamy fine sand, 2 to 5 percent slopes. This gently sloping soil is on uplands. Mapped areas are broad and irregular in shape and are located on broad interstream divides and slightly convex ridges. They range from 15 to 100 acres in size and average about 40 acres.

Typically, the surface layer is brown loamy fine sand about 6 inches thick. The subsurface layer, which extends to a depth of 30 inches, is pale brown loamy fine sand. The upper part of the subsoil, to a depth of 48 inches, is yellowish brown sandy clay loam with reddish and brownish mottles. The lower part of the subsoil, to a depth of 72 inches, is mottled red, gray, and brown sandy clay loam. The soil is slightly acid in the upper part and very strongly acid in the lower.

This soil is well drained. Runoff is slow, and permeability is moderately slow. The available water capacity is medium. The root zone is deep, but roots are restricted in the lower layers.

Included with this soil in mapping are small areas of Rentzel, Briley, and Bowie soils. Rentzel soils are in concave spots. Briley soils are on ridgetops higher in the landscape. Bowie soils have a thinner surface layer and are less sandy than the Lilbert soil. These inclusions make up less than 20 percent of the unit.

Most of this soil is pasture. A minor portion is woodland and cropland.

The major pasture grasses are Coastal bermudagrass, common bermudagrass, and bahiagrass. Wheat, oats, and Elbon rye are excellent cool-season pasture grasses for grazing forage. Some areas are overseeded with crimson clover, arrowleaf clover, or hairy vetch for additional forage production. Light applications of fertilizer and lime at frequent intervals can increase forage yields.

Mixed hardwoods and pine are suited to this soil. Loblolly pine and shortleaf pine are the principal commercial trees (fig. 12). Slash pine plantations have been established on some fields that were once cultivated. A moderate rate of seedling mortality and droughtiness are the main limitations for timber production.

The main crops are corn, peas, sweet potatoes, peanuts, and watermelons. Lime and fertilizer are needed for high yields. The use of contour farming, cover crops, high-residue crops, and green-manure crops can reduce erosion and help maintain fertility.

The Lilbert soil is suited to most urban uses. The moderately slow permeability is a limiting feature for septic tank absorption fields, and corrosivity is a limiting feature for underground concrete and steel. These problems can be overcome, however, by good design and careful installation.

This soil is in capability subclass IIIe.

LuC—Lilbert-Urban land complex, 2 to 5 percent slopes. This unit is on broad, gently sloping uplands. Areas are oblong in shape and range from 15 to 100 acres in size.

This complex is 55 to 75 percent Lilbert soils, 15 to 35 percent Urban land, and 10 percent or less other soils.

Typically, the surface layer is brown loamy fine sand about 6 inches thick. The subsurface layer, which extends to a depth of 30 inches, is pale brown loamy fine sand. The upper part of the subsoil, to a depth of 48 inches, is yellowish brown sandy clay loam with reddish and brownish mottles. The lower part of the subsoil, to a depth of 72 inches, is mottled red, gray, and brown sandy clay loam. The soil is slightly acid in the upper part and very strongly acid in the lower.

The Lilbert soil is well drained. Runoff is slow, and permeability is moderately slow. The available water capacity is medium. The root zone is deep.

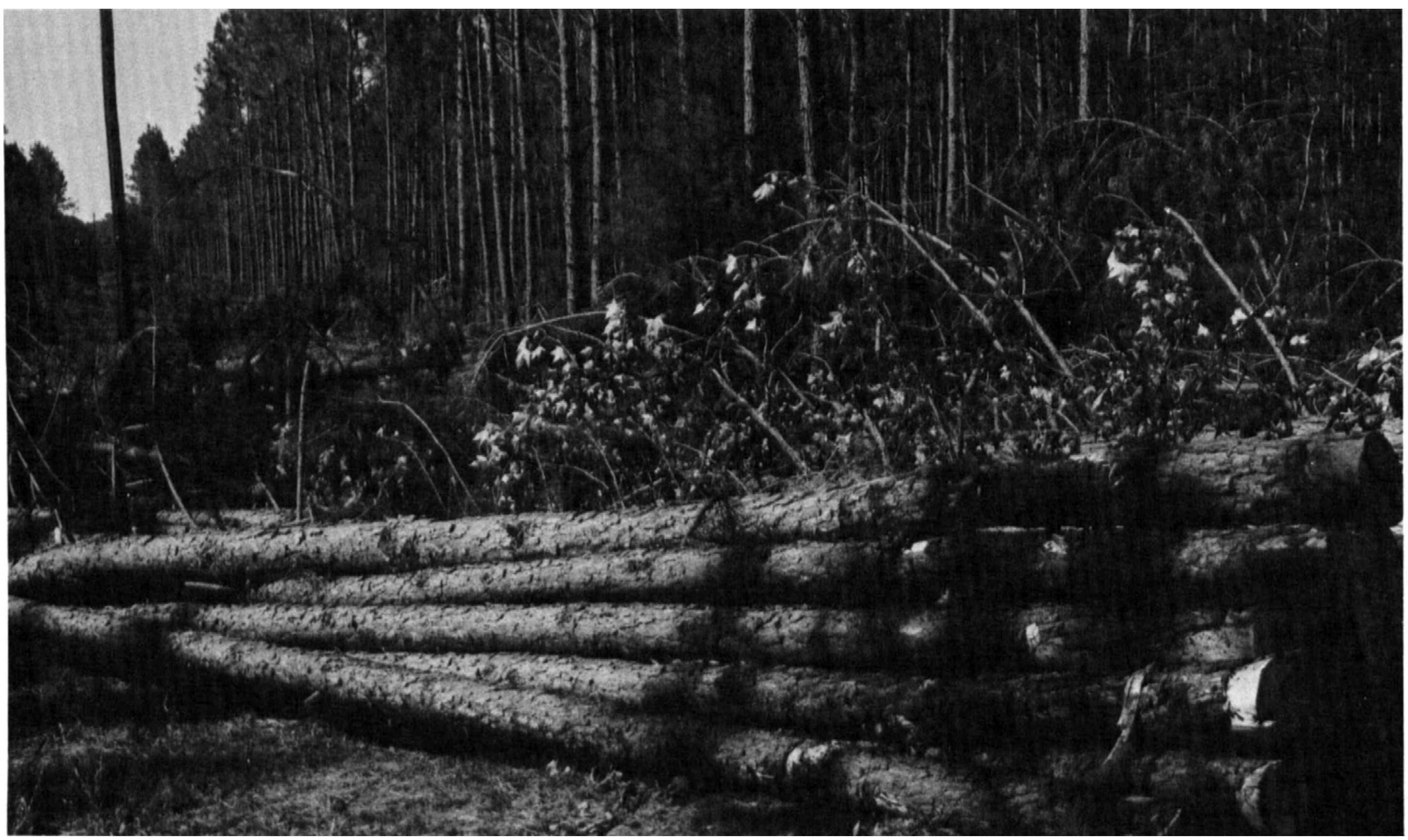


Figure 12.—Poles harvested from well-managed woodland on Lilbert loamy fine sand, 2 to 5 percent slopes.

Urban land consists of areas covered by dwellings, commercial buildings, schools, churches, driveways, streets, parking lots, and railroad yards. It also includes areas that have been disturbed by cutting, filling, or grading. The soil has been altered to such an extent that further classification is not possible.

Included in mapping are small areas of Rentzel, Briley, and Bowie soils. Rentzel soils have gray mottles in the surface layer. Briley soils are on higher ridgetops. Bowie soils have a thinner, loamy surface layer. These inclusions make up less than 20 percent of the unit.

This soil is suited to most urban uses. It is moderately corrosive to uncoated steel and highly corrosive to concrete. These problems can be overcome, however, by good design and careful installation.

This soil is not placed in a capability subclass.

Ma—Mantachie loam, frequently flooded. This deep, nearly level, frequently flooded soil is on flood plains of the larger streams in the area. Slopes range from 0 to 1 percent. Mapped areas are long and about 500 feet to 4,000 feet wide. They are extensive and range up to several thousand acres, and average about 400 acres.

Typically, this soil has a surface layer of brown loam about 8 inches thick. The upper part of the subsoil, to a depth of 34 inches, is dark grayish brown clay loam over light brownish gray clay loam with yellowish brown and yellowish red mottles. Below this, to a depth of 54 inches, is grayish brown clay loam with mottles of yellowish brown and red. From a depth of 54 to 65 inches is grayish brown clay loam with red and yellowish brown mottles. The soil is very strongly acid throughout.

This soil is somewhat poorly drained. Runoff is slow, and permeability is moderate. The water table is 1 to 1 1/2 feet below the surface during the wet season. These soils are flooded several times a year for brief durations during the winter and spring months. The available water capacity is high, and the root zone is deep.

Included with this soil in mapping are small areas of Urbo, Iuka, and Bienville soils. Urbo soils are more clayey than this Mantachie soil and are mainly on the Sabine River flood plains. Iuka soils are better drained and have a sandier subsoil. Bienville soils have a thick sandy surface and are on low ridges. These inclusions make up less than 15 percent of any mapped area.

This soil is mainly woodland. A few areas are improved pasture.

The forests on this Mantachie soil are dominantly hardwood. Water oak, willow oak, and sweetgum are the principal trees. Flooding and wetness limit this soil for pine timber production and make harvesting difficult. The hardwood forests on this soil provide excellent wildlife habitat.

The main pasture grasses suited to this Mantachie soil are bahiagrass and dallisgrass. Cool-season tall fescue overseeded with white clover is commonly planted and is well suited to this frequently flooded soil. Fertilizer, lime, and good management in general are essential for high yields.

This Mantachie soil is unsuited to cultivation because of frequent flooding.

This soil is unsuited to urban use because of the frequent flooding and poor drainage.

This soil is in capability subclass Vw.

MoA—Mollville very fine sandy loam, 0 to 1 percent slopes. This nearly level soil is on stream terraces of the Sabine River and the larger local streams. The soil is in wet flats adjacent to flood plains. Mapped areas are oblong. They range from 20 to 100 acres in size and average about 40 acres.

Typically, the surface layer is a dark grayish brown very fine sandy loam about 3 inches thick. The subsurface layer, which extends to a depth of 8 inches, is grayish brown very fine sandy loam. The upper part of the subsoil, to a depth of 27 inches, is grayish brown sandy clay loam with brownish mottles and tongues and streaks of grayish loam. The lower part of the subsoil, to a depth of 55 inches, is light brownish gray sandy clay loam with brownish mottles over light gray fine sandy loam with yellowish mottles. The underlying material, to a depth of 67 inches, is light gray loamy fine sand. The soil is very strongly acid in the upper part and slightly acid in the lower.

This soil is poorly drained. Runoff is very slow, and permeability is slow. Water ponds for 2 to 6 weeks during the cool season. The available water capacity is medium, and the root zone is deep.

Included with this soil in mapping are small areas of Wrightsville, Raino, and Bienville soils. Wrightsville soils have a clayey subsoil. Raino soils are better drained and occur on mounds. Bienville soils are sandy throughout. These inclusions make up less than 15 percent of the unit.

This Mollville soil is mostly used for woodland production. Some small areas are pasture.

The dominant forest type on this soil consists of wetness-tolerant hardwoods. Willow oak, water oak, and sweetgum are the primary trees. After loblolly pine are established, they do well on this soil. Wetness is the most limiting feature for timber harvesting and pine production.

Common bermudagrass, bahiagrass, and fescue are well suited to this soil. Some areas are planted to white clover or singletary peas for additional cool-season forage. Fertilizer and lime can increase forage production. A proper drainage system can also increase yields.

Wetness and ponding limit this soil for crop production. Drainage is usually needed where this soil is cultivated. Lime and fertilizer can increase crop yields.

This Mollville soil is not suited to most urban uses. The main limiting feature is ponding.

This soil is in capability subclass IVw.

Ow—Oil wasteland. This map unit consists of small areas of various soils that have been affected by oilfield activity. Slopes are variable. Some areas on flood plains are nearly level. Others on uplands are gently sloping to sloping. Gradients range from 0 to 8 percent.

The soils in this unit have been damaged by heavy machinery and the addition of oil derivatives and byproducts such as salt brine, drilling mud, and sludge.

Oil wasteland areas are well drained to poorly drained. Permeability is moderately rapid to very slow, and available water capacity is low to high. There is a severe erosion hazard on gently sloping to sloping areas damaged by oil spills or salt.

Included with this unit in mapping are some small areas of undisturbed soils. A few areas of this unit that were damaged in the early 1930's have returned to native vegetation of pine and hardwoods. These inclusions make up less than 15 percent of the unit.

The productivity of these soils is virtually destroyed, and very little vegetation remains. Generally, the reclamation of these areas for the growth of vegetation or for urban development is possible but costly.

This unit has not been placed in a capability subclass.

ReB—Rentzel loamy fine sand, 0 to 3 percent slopes. This nearly level to gently sloping soil is on uplands, on foot slopes, and in slightly depressed areas. Mapped areas are long or oval. They range from 15 to 70 acres in size and average about 30 acres.

Typically, the surface layer is brown loamy fine sand about 6 inches thick. The subsurface layer, which extends to a depth of 28 inches, is light yellowish brown loamy fine sand. The subsoil, to a depth of 72 inches, is sandy clay that is brownish yellow with grayish and reddish mottles in the upper part and mottled grayish, reddish, and brownish in the lower part. The soil is medium acid in the upper part and very strongly acid in the lower.

This soil is somewhat poorly drained. Runoff is slow, and permeability is moderately slow. The water table is 1 1/2 to 2 1/2 feet below the surface during the winter and spring months. The available water capacity is medium. The root zone is deep.

Included with this soil in mapping are small areas of Lilbert, Trep, Bowie, and Kullit soils. Lilbert soils are better drained and do not have gray mottles above a depth of 30 inches. Trep soils are in similar positions but are clayey in the lower part. Bowie soils are on stream divides and have a loamy surface layer. Kullit soils are in similar positions but have a loamy surface layer. These inclusions make up less than 20 percent of the unit.

This Rentzel soil is mostly woodland and pasture.

Many hardwoods and pines are suited to this soil. The principal commercial trees are loblolly and shortleaf pine. This soil has few limitations for timber production. Proper woodland practices can increase timber yields.

Bahiagrass, common bermudagrass, and Coastal bermudagrass are the dominant pasture grasses suited to this soil. Some areas are overseeded with white clover or singletary peas for additional forage production. Light applications of fertilizer and lime at frequent intervals can increase forage production.

A few areas of this soil are cultivated. Corn, peas, and sweet potatoes are commonly grown. Lime and fertilizer can increase yields. The use of contour farming, cover crops, high-residue crops, and green-manure crops can reduce erosion and improve fertility.

The Rentzel soil is suited to most urban uses. It is corrosive to underground concrete and steel. The high water table and wetness affect roads and streets. These problems can be overcome, however, by good design and careful installation.

This soil is in capability subclass IIIw.

RuC—Ruston fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on interstream divides of uplands. Mapped areas range from 10 to 70 acres in size and average about 30 acres.

Typically, this soil has a fine sandy loam surface layer about 9 inches thick that is dark grayish brown in the upper part and brown in the lower part. The subsoil, to a depth of 66 inches, is red sandy clay loam with pockets and streaks of uncoated sand in the lower part. The soil is slightly acid in the upper part and very strongly acid in the lower.

This soil is well drained. Runoff is medium, and permeability is moderate. The available water capacity is medium. The root zone is deep. There is a moderate erosion hazard.

Included with this soil in mapping are small areas of Bowie, Briley, and Kirvin soils. Bowie soils are lower in the landscape and have a yellowish subsoil. Briley soils have a sandier, thicker surface layer than does the Ruston soil. Kirvin soils have a more clayey subsoil. These inclusions make up less than 20 percent of the unit.

This Ruston soil is mainly pasture. Some areas are woodland, and a small acreage is cropland.

The main pasture grasses are Coastal bermudagrass, common bermudagrass, and bahiagrass. Many pastures are overseeded with crimson clover and hairy vetch for additional forage production. Under good management, forage yields are high. Proper use of fertilizer and lime can increase yields.

Some areas of this soil are in mixed hardwoods and pine. Loblolly pine and shortleaf pine are the principal commercial trees. A few fields that were once in cropland have been planted to slash pine for timber production. This is one of the better soils in the area for woodland production. It has no major limitations.

Corn, oats, and vegetable crops such as peas, beans, and sweet potatoes do well on this soil. Lime and fertilizer are essential for good yields. Use of cover crops, green-manure crops, terraces, and contour farming can reduce erosion and improve fertility.

This Ruston soil is suited to most urban uses. Moderate permeability is a limiting feature for septic tank absorption fields, low strength is a limiting feature for roads and streets, and corrosivity is a limiting feature for underground steel and concrete. These problems can be overcome, however, by good design and careful installation.

This soil is in capability subclass IIIe.

SaC—Sacul fine sandy loam, 2 to 5 percent slopes. This deep, gently sloping soil is on low hills and side slopes along streams of uplands. Mapped areas are broad and irregular in shape. They range from 20 to 80 acres in size and average about 35 acres.

Typically, the surface layer is fine sandy loam about 9 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The upper part of the subsoil, to a depth of 44 inches, is red clay with brownish and grayish mottles. With depth, there is a gradual transition to mottled clay. The lower part of the subsoil, to a depth of 48 inches, is mottled reddish, brownish, and grayish clay loam. The underlying layer, to a depth of 65 inches, is stratified clay loam and shale. The soil is strongly acid in the upper part and very strongly acid in the lower.

This soil is moderately well drained. Runoff is medium to rapid, and permeability is slow. The available water capacity is high. The water table is 2 to 4 feet below the surface during the winter and spring months. The root zone is deep. Erosion is a moderate hazard.

Included with this soil in mapping are small areas of Kullit soils that have a yellowish upper subsoil, Kirvin soils that have no gray mottles in the upper part of the subsoil, and Bowie soils that are more permeable. These inclusions make up less than 15 percent of the unit.

Sacul soils are used mostly for woodland pasture. Some small areas are in cultivation.

The major pasture grasses on this soil are Coastal bermudagrass, common bermudagrass, and bahiagrass (fig. 13). Many pastures are overseeded with crimson clover, arrowleaf clover, or hairy vetch. Some areas are planted to cool-season grasses such as wheat, oats, and ryegrass for additional winter forage. Proper use of lime and fertilizer is needed for high yields.

Mixed hardwoods and pine make up the common forest type on this soil. Shortleaf pine and loblolly pine are the principal commercial trees. The main limitation of this soil for timber production is the clayey subsoil. Good management, however, can increase timber yields.

A very small acreage of this soil is cropped. Home gardens are the dominant crop usage. The hazard of erosion and slight wetness problems are the main limitations. Use of terracing, contouring, cover crops, green-manure crops, fertilizer, and lime can reduce erosion and maintain fertility.

This soil is unsuited to most urban uses. Shrinking and swelling, corrosivity, and low strength affecting roads and streets are problems encountered for some urban uses. These can be overcome, however, by good design and careful installation.

This soil is in capability subclass IVe.

SaD—Sacul fine sandy loam, 5 to 12 percent slopes. This deep, sloping to strongly sloping soil is on side slopes along streams of uplands. Mapped areas are long and narrow. They range from 30 to 250 acres in size and average about 50 acres.

Typically, the surface layer is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer, which extends to a depth of 8 inches, is brown fine sandy loam. The upper part of the subsoil, to a depth of 30 inches, is red clay with brownish and grayish mottles in the lower part. The lower part of the subsoil, to a depth of 64 inches, is light brownish gray silty clay with reddish and brownish mottles. With depth, there is a gradual transition to light gray silty clay loam. The soil is strongly acid in the upper part and very strongly acid in the lower.

This soil is moderately well drained. Runoff is rapid, and permeability is slow. The available water capacity is high. The water table is 2 to 4 feet below the surface during the spring and winter months. The root zone is deep. There is a severe erosion hazard.

Included in mapping with this soil are small areas of Cuthbert and Kirvin soils. These inclusions make up less than 20 percent of the unit.

This Sacul soil is mostly woodland. Some areas have been cleared and established to improved pasture.

The forest type common on this soil consists of southern red oak, post oak, sweetgum, elm, shortleaf pine, and loblolly pine. Loblolly pine and shortleaf pine are the main commercial trees for timber production. The slope and clayey subsoil are the main limiting features for timber production on this soil. Good management, however, can increase timber yields.

The major pasture grasses on this soil are Coastal bermudagrass, common bermudagrass, and bahiagrass. Many pastures are overseeded with crimson clover, arrowleaf clover, or hairy vetch. Some areas are planted to cool-season grasses such as wheat, oats, and ryegrass for additional winter forage. Proper use of lime and fertilizer is needed for high yields.

The slope and hazard of erosion make this soil unsuited to cultivation.

This soil is unsuited to most urban uses. The slope and the shrinking and swelling limit its use for building

Figure 13.—Bahiagrass pasture on Sacul fine sandy loam, 2 to 5 percent slopes.

sites. Corrosivity is a problem with uncoated steel and concrete, and low strength affects roads and streets. These can be overcome, however, with good design and careful installation.

This soil is in capability subclass VIe.

SuC—Sacul-Urban land complex, 2 to 8 percent slopes. This unit consists of gently sloping to sloping soils and Urban land on uplands. Mapped areas are irregular in shape and range from 15 to 50 acres in size.

This unit is 55 to 80 percent Sacul soil, 15 to 35 percent Urban land, and less than 10 percent other soils. Areas of these soils and Urban land are so intricately mixed that separation was not practical at the scale mapped.

Typically, the surface layer is fine sandy loam about 9 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The upper part of the subsoil, to a depth of 44 inches, is red clay with brownish and grayish mottles. With depth, there is a gradual transition to mottled clay. The lower part of the subsoil, to a depth of 48 inches, is mottled reddish, brownish, and grayish clay loam. The underlying layer, to a depth of 65 inches, is stratified clay loam and shale. The soil is strongly acid in the upper part and very strongly acid in the lower.

This soil is moderately well drained. Runoff is medium, permeability is slow, and available water capacity is high. The water table is 2 to 4 feet below the surface during the winter and spring months. The root zone is deep. There is a moderate to severe erosion hazard.

Urban land consists of areas covered by dwellings, commercial buildings, schools, churches, driveways, streets, parking lots, and railroad yards. It also includes areas that have been disturbed by cutting, filling, or grading. The soil has been altered to such an extent that further classification is not possible.

Included in mapping are small areas of Kirvin, Bowie, Kullit, and Cuthbert soils. Kirvin soils have no gray mottles of wetness in the upper part of the subsoil. Bowie and Kullit soils have a subsoil that is yellowish in the upper part. Cuthbert soils are 20 to 40 inches deep over stratified loamy material, shale, and sandstone. These inclusions make up less than 20 percent of the unit.

This unit is unsuited to most urban uses. The soils are corrosive to uncoated underground steel and concrete. The low strength affects roads and streets. The shrinking and swelling and slope affect building sites, roads, and streets. These problems can be overcome, however, by good design and careful installation.

This soil is not placed in a capability subclass.

TeE—Tenaha loamy fine sand, 8 to 20 percent slopes. This strongly sloping to moderately steep soil is on uplands. Mapped areas are on side slopes above drainageways and are long and narrow. They range from 20 to 150 acres in size and average about 50 acres.

Typically, the surface layer is dark grayish brown loamy fine sand about 4 inches thick. The subsurface layer, which extends to a depth of 22 inches, is brown loamy fine sand. The upper part of the subsoil, to a depth of 29 inches, is yellowish red loamy fine sand. The lower part of the subsoil, to a depth of 52 inches, is red sandy clay loam over red loam with yellowish brown mottles. The underlying layer, to a depth of 64 inches, is stratified sandstone and shaly clay. The soil is medium acid in the upper part and very strongly acid in the lower.

This soil is well drained. Runoff is slow, and permeability is moderate. The available water capacity is medium. The root zone is deep and easily penetrated by plant roots. Erosion is a moderate hazard.

Included with this soil in mapping are small areas of Briley, Cuthbert, Darco, and Lilbert soils and areas of Urban land. Briley soils are deeper than the Tenaha soil and occur on ridges. Cuthbert soils have loamy upper layers. Darco soils have thicker sandy upper layers. Lilbert soils are on ridges and have a yellow subsoil. These inclusions make up less than 15 percent of the unit.

Most areas of this Tenaha soil are woodland. A lesser extent is improved pasture.

Mixed hardwoods and pine are suited to this soil. Loblolly pine and shortleaf pine are the principal commercial trees. A high rate of seedling mortality and the slope are the main limitations for timber production.

The major pasture grasses on this soil are Coastal bermudagrass, common bermudagrass, and bahiagrass. Some pastures are overseeded with crimson clover, arrowleaf clover, or hairy vetch for additional forage production. Light applications of fertilizer and lime at frequent intervals can increase forage yields. Seasonal droughtiness and slope limit pasture production.

This soil is unsuited to crops. Droughtiness during the growing season and slope are the limiting features.

Tenaha soils are suited to most urban uses. Caving of cutbanks is a hazard in excavation. Slope and seepage are problems that affect building sites. These hazards and limitations can be overcome, however, by proper design and installation procedures.

This soil is in capability subclass VIe.

TrC—Trep loamy fine sand, 1 to 8 percent slopes. This gently sloping to sloping soil is on uplands. Soil areas are on slightly depressed uplands or on foot slopes. Mapped areas are 10 to 80 acres in size and average about 30 acres.

Typically, the surface layer is dark grayish brown loamy fine sand about 6 inches thick. The subsurface layer, which extends to a depth of 30 inches, is pale brown loamy fine sand. The upper part of the subsoil, to a depth of 48 inches, is yellowish brown sandy clay loam with yellowish mottles. With depth, there is a gradual transition to mottled brownish, grayish, and reddish sandy clay loam. The lower part of the subsoil is mottled reddish, brownish, and grayish sandy clay. The soil is slightly acid in the upper part and very strongly acid in the lower.

This soil is moderately well drained. Surface runoff is slow, and permeability is moderately slow. This soil has a perched water table 3 1/2 to 5 feet below the surface during the winter and spring months. Available water capacity is medium. The root zone is deep.

Included with this soil in mapping are small areas of Lilbert, Rentzel, and Darco soils. Lilbert soils have less clay in the subsoil than does the Trep soil. Rentzel soils have gray mottles in the surface layer. Darco soils have thicker sandy upper layers. These inclusions make up less than 20 percent of the unit.

This Trep soil is primarily pasture. Some areas are forested with hardwoods and pine, and a small acreage is cropped.

Bahiagrass, common bermudagrass, and Coastal bermudagrass are the main pasture grasses planted on this soil. Some pastures are overseeded with legumes such as crimson clover, arrowleaf clover, or hairy vetch for additional forage production. Light applications of fertilizer and lime at frequent intervals can increase forage yields.

Many hardwood and pine trees are suited to this soil. Southern red oak, post oak, white oak, elms, sweetgum, hickory, shortleaf pine, and loblolly pine are common. The principal commercial trees are shortleaf and loblolly pine. This soil has minimal limitations for timber production. Proper woodland management can increase timber yields.

A few areas of this soil are in crops of corn, peas, sweet potatoes, peanuts, and other vegetable crops. Lime and fertilizer can increase yields. The use of contour farming, terraces, cover crops, and green-manure crops can reduce erosion and improve fertility.

This soil is suited to most urban uses. It is corrosive to underground concrete and steel, and it has low strength for roads and streets. These limitations can be overcome, however, by good design and careful installation procedures.

This soil is in capability subclass IIIs.

Ud—Udorthents, loamy and clayey. These nearly level to moderately steep soils are on uplands. Slopes range from 0 to 12 percent. Mapped areas are square, rectangular, or oblong in shape. They range from 10 to 100 acres in size and average about 30 acres.

The soil material has been stripped off these areas to a depth of 2 to 20 feet. In most areas, none of the original soil remains. The present soils are variable from one area to another. A common clayey soil consists of mottled brownish, reddish, and grayish shaly clay to a depth of 70 inches. Streaks and pockets of silt are present throughout. Reaction is very strongly acid. The texture varies throughout from fine sandy loam to sandy clay loam, clay loam, clay, and shaly clay. In some areas there are random layers of two or more of these textures.

This unit is well drained to somewhat poorly drained. Runoff is slow to rapid. Permeability is moderately rapid to very slow and available water capacity is low to high. The root zone is deep, and there is a severe erosion hazard (fig. 14).

Included with this unit in mapping are small areas of Bienville, Kullit, or Bowie soils. These inclusions make up less than 10 percent of the unit.

Most areas of Udorthents are idle land. Deep excavations, ponding, and droughtiness limit revegetation in these areas.

These soils are normally so low in fertility and poor in physical condition that establishment of pasture, crops, or woodland is likely to fail without extra reclamation. Smoothing the surface, reducing erosion, and increasing

Figure 14.—Bank erosion after excavation on an area of Udorthents, loamy and clayey.

the level of fertility are usually needed to reclaim these areas.

These soils are not suited to urban uses because of the roughness of the topography that is made up of pits and moundy areas. Other limitations are low strength affecting roads and streets, clayey texture, corrosivity to underground steel and concrete, and moderate to high shrink-swell problems.

These soils are not placed in a capability subclass.

Ur—Urbo clay, frequently flooded. This deep, nearly level soil is on wide flood plains of the Sabine River (fig. 15). Slopes range from 0 to 1 percent. Mapped areas are broad and range from 300 to 2,000 acres in size.

Typically, the surface layer is very dark grayish brown clay about 4 inches thick. The upper part of the subsoil, to a depth of 36 inches, is grayish brown clay loam with brownish mottles. With depth, there is a gradual transition to clay with similar colors. The lower part of the subsoil, to a depth of 70 inches, is dark grayish brown clay with brownish mottles over clay loam. The soil is strongly acid in the upper part and very strongly acid in the lower.

This soil is somewhat poorly drained. Runoff is slow,

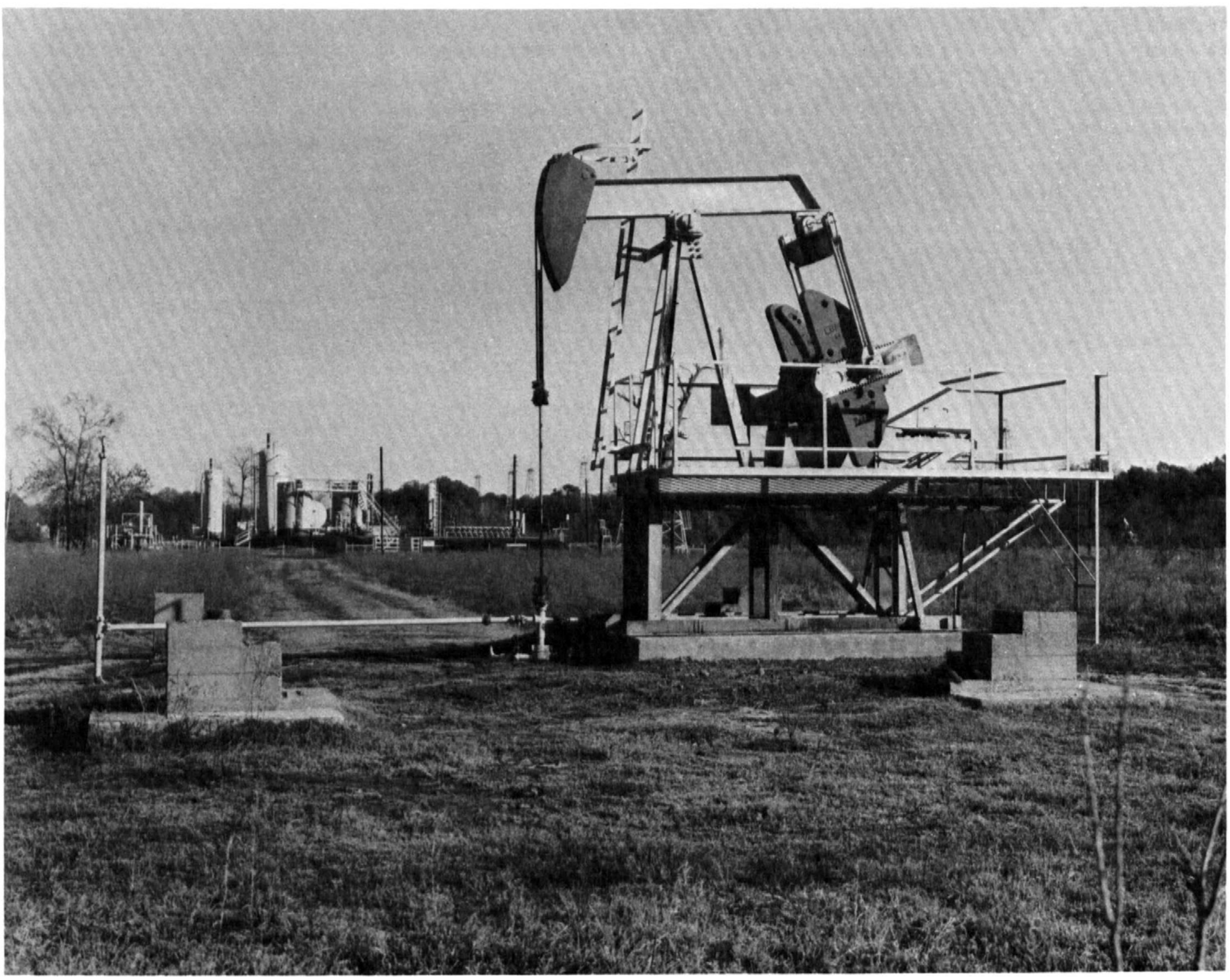


Figure 15.—Oil well on Urbo clay, frequently flooded. Oil is a major industry in the survey area.

and permeability is very slow. The water table is 1 foot to 2 feet below the surface during the winter and spring months. This soil is usually flooded at least once each year during the winter and spring. The available water capacity is high, and the root zone is deep.

Included in mapping are small areas of Mantachie, Iuka, and Bienville soils. Mantachie soils are less clayey. Iuka soils are better drained and have a sandy loam subsoil. Bienville soils have a thicker, sandier surface layer and are on low ridges. These inclusions make up less than 15 percent of the unit.

Urbo soils are mostly in hardwood forest. A few areas have been cleared and planted to improved pasture.

Water oak and willow oak are the dominant trees in wooded areas of this soil. Other trees such as sweetgum, elm, and ash are common. Wetness and flooding are limiting features for pine production as well as timber harvesting.

Some pastures are planted to common bermudagrass or bahiagrass, which are the most suitable warm-season grasses. Tall fescue and white clover make a good cool-season forage combination for grazing. Flooding and wetness limit pasture production of this soil. Fertilizer and lime, however, can increase yields.

This soil is not suited to crops. Frequent flooding is the main hazard.

This soil is not suited to urban uses because of the frequent flooding and wetness.

This soil is in capability subclass Vw.

WrA—Wrightsville-Raino complex, 0 to 1 percent slopes. This deep, nearly level complex is on stream terraces that have mounds and slightly concave depressions. Mapped areas are broad and irregular in shape. They range from 40 to over 400 acres in size and average about 100 acres.

This complex consists of Wrightsville soils on broad flats and Raino soils on scattered mounds that are 2 to 4 feet higher than the flats. The mounds are circular and are 40 to 100 feet across and 100 to 200 feet apart. The overall slope is less than 1 percent.

This unit is about 60 percent Wrightsville soil, 30 percent Raino soil, and 10 percent other soils. Areas of these soils are so intricately mixed that separation was not practical at the scale mapped.

Typically, the Wrightsville soil has a surface layer of dark grayish brown silt loam about 3 inches thick. The subsurface layer, which extends to a depth of 17 inches, is light brownish gray silt loam. The upper part of the subsoil, to a depth of 48 inches, is grayish brown clay with yellowish mottles. It contains tongues of grayish silt loam near the subsurface layer. The lower part of the subsoil, to a depth of 61 inches, is light brownish gray silty clay with brownish mottles. The underlying layer, to a depth of 80 inches, is grayish silty clay with brownish mottles. The soil is medium acid in the upper part and strongly acid in the lower.

This Wrightsville soil is poorly drained. Runoff is slow, and permeability is very slow. Water ponds on this soil for 2 to 6 weeks during the winter and spring. Available water capacity is high, and the root zone is deep.

Typically, the Raino soil has a surface layer of dark grayish brown loam about 5 inches thick. The upper part of the subsoil, to a depth of 20 inches, is yellowish brown loam with grayish mottles. Below this, to a depth of 32 inches, is yellowish brown sandy clay loam with grayish and reddish mottles and pockets and streaks of uncoated sand and silt. Below this, to a depth of 68 inches, is mottled gray, brown, and red clay. Below this, to a depth of 80 inches, is mottled gray, brown, and red sandy clay loam. The soil is slightly acid in the upper part and very strongly acid in the lower.

This Raino soil is moderately well drained. Runoff is slow, and permeability is very slow. During the winter and spring months, the water table is 2 to 3 1/2 feet below the surface. Available water capacity is high, and the root zone is deep.

Included in mapping are small areas of Mollville, Latch, and Bienville soils. Mollville soils have a less clayey subsoil and are slowly permeable. Latch and Bienville soils are sandy and are on low ridges. These inclusions make up less than 10 percent of the unit.

This unit is mostly forested with hardwoods. A few areas are improved pasture.

Loblolly pine and sweetgum grow well on the Raino soil. Water oak and willow oak (fig. 16) are the dominant trees on the wet, poorly drained Wrightsville soil. Loblolly pine is the principal commercial tree suited to this complex. Wetness limits pine production and makes harvesting difficult.

Common bermudagrass, bahiagrass, and tall fescuegrass are well-adapted pasture grasses for these soils. White clover or singletary peas are overseeded in some areas for additional cool-season forage. Fertilizer and lime can increase forage yields. Wetness and ponding limit pasture production on this unit. A drainage system can also increase pasture yields.

This unit is too poorly drained for most cultivated crops grown in the area. A drainage system and the addition of fertilizer and lime can increase yields.

This unit is suited to some urban uses, but has severe limitations for others. Wetness, shrinking and swelling, and very slow permeability are the limiting features for septic tank absorption fields, building sites, and roads and streets. Proper design and installation is essential to overcome these limitations.

This unit is in capability subclass IVw.

Figure 16.—Water and willow oak on Wrightsville-Raino complex, 0 to 1 percent slopes.

prime farmland soils

Each year thousands of acres of land throughout the United States are converted from agricultural to industrial, urban, and other uses. Some of this land is prime farmland. This section provides information about the prime farmland in Upshur and Gregg Counties. It defines prime farmland and lists the soils that make up the prime farmland in the area.

Prime farmland is the best land for farming. It is one of several kinds of farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. Because the amount of this high-quality farmland is limited, it should be used with wisdom and foresight.

Prime farmland is the land best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops where it is treated and managed with acceptable farming methods. Given minimal inputs of energy and economic resources, prime farmland produces higher yields and less damage to the environment than other kinds of land.

Prime farmland may now be cropland, pasture, woodland, or anything other than urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

The soils that make up prime farmland usually have an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity is suitable. These soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope gradient is mostly less than 6 percent.

Some soils that have limitations—a high water table, flooding, or inadequate rainfall—may qualify as prime farmland if these limitations are overcome by corrective measures. Onsite evaluation is necessary, however, to see if the corrective measures are effective. More information on the criteria for prime farmland soils can be obtained from the local staff of the Soil Conservation Service.

Nearly 23 percent, or about 127,000 acres, of the land in Upshur and Gregg Counties is prime farmland. It is scattered throughout the county, but map units 1, 4, and 7 of the general soil map have the largest areas of prime farmland. Map units 2, 3, 5, and 6 have substantial areas, and map unit 8 has only small, scattered areas. Many acres of prime farmland are used for cultivated crops, mainly sweet potatoes, peas, corn, and watermelon.

A recent trend in some parts of the counties has been the conversion of prime farmland to urban and industrial uses. Such loss of prime farmland to nonfarm uses increases farming on less suitable soils that generally are more erodible and droughty, are difficult to cultivate, and are less productive.

The detailed soil map units that make up the prime farmland in Upshur and Gregg Counties are listed in this section. These units are prime farmland except where they are urban or built-up land [1] or they fail to meet the criteria noted. This list, however, is not a recommendation for a particular land use.

BoC—Bowie fine sandy loam, 2 to 5 percent slopes
ErC—Elrose fine sandy loam, 3 to 5 percent slopes
KtB—Kullit very fine sandy loam, 1 to 3 percent slopes
MoA—Mollville very fine sandy loam, 0 to 1 percent slopes [2]
RuC—Ruston fine sandy loam, 3 to 5 percent slopes

[1] Urban and built-up land is defined as any continuous unit of land that is 10 acres or more that is used for such purposes as residences, industrial sites, commercial sites, institutional sites, railroad yards, parks, cemeteries, airports, golf courses, sanitary landfills, borrow pits, sewage treatment plants, water control structures and spillways, and shooting ranges.

[2] If artificially drained.

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 bedrock, 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

Claude K. Compton, agronomist, Soil Conservation Service, helped prepare this section.

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

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

Over the years, the production of row crops in Upshur and Gregg Counties has declined to primarily truck cropping and gardening. Gilmer was once considered the "Yam Capital" of the country. Now only a few acres of sweet potatoes are grown commercially in the area.

The principal crops in the counties are corn, peas, watermelons, sweet potatoes, peanuts, small grains used for pasture, and beans. Fertilization, liming, and weed control are required for profitable yields. Good management practices such as contour farming, terracing, and residue management are essential for high production and soil maintenance.

Pasture and haylands are important in the counties because raising livestock is one of the main farm enterprises. The more important grasses grown are common bermudagrass, Coastal bermudagrass, and Pensacola bahiagrass. Weeping lovegrass and tall fescue are also well suited. Crimson clover, white clover, arrowleaf clover, and vetch are the main legumes planted with the perennial grasses.

Most improved pastures are on old cropland areas. An improved pasture or meadow is one in which introduced grasses are used to obtain higher production of forage crops. These pastures require grazing control, weed and brush control, fertilization, and other appropriate management practices.

All soils in Upshur and Gregg Counties need fertilizer for production of high-quality forage. Most of the soils need lime to make them less acid. Many of the soils on bottom lands need some improvement in surface drainage before high production can be attained.

yields per acre

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

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

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

The estimated yields reflect the productive capacity of each soil for each of the principal crops and pasture. 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 and pasture 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 woodland and for engineering purposes.

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

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

Class I soils have 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 slight 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.

woodland management and productivity

John M. Patterson, forester, Soil Conservation Service, helped prepare this section.

Slightly less than half of the total survey area is woodland. According to records of the local field office of the Soil Conservation Service, most of the woodland, about 269,000 acres, is commercial forestland. Farmers and other private landowners own 93 percent of this commercial forestland; the rest is in public ownership. The forest is 30 percent loblolly-shortleaf-slash cover type, 29 percent oak-pine, 21 percent oak-hickory, 16 percent oak-gum, and 4 percent elm-ash-cottonwood.

Over the past 15 years, there has been a 30 percent reduction in woodland in the survey area. This reduction is largely the result of rapid urbanization around the city of Longview and the conversion of pine plantations to improved pasture.

Control of undesirable species is the major management problem. Improper harvesting methods is the major limitation to increased production.

Timber products are a major source of income in the counties. Lumber, pulpwood, poles, posts, and other wood products are manufactured from the timber produced. There are several pulpwood marketing yards and a lumber mill in the area. Timber production would be greater if woodland areas were more properly managed for higher yields.

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 ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, 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 symbol, a letter, indicates the major kind of soil limitation. The letter *w* indicates excessive water in or on the soil; *c*, clay in the upper part of the soil; and *s*, sandy texture. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: w, c, and s.

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.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common 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 determined 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.

woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Table 7 shows, for each soil suitable for woodland use, the potential for producing understory vegetation. The total production of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4 1/2 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimum part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

Table 7 also lists the common names of the characteristic vegetation on each soil and the percentage composition, by air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of woodland in which the production of wood crops is highest.

recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, 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 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

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, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

wildlife habitat

Ed M. Schwille, biologist, Soil Conservation Service, and John D. Wallace, wildlife biologist, Texas Parks and Wildlife Department, helped prepare this section.

Squirrel, white-tailed deer, furbearers, and waterfowl are the most utilized wildlife resources in Upshur and Gregg Counties. Flood plains along the Sabine River and Big Cypress, Little Cypress, Lilly, Big Sandy, and Rabbit Creeks provide excellent habitat for gray squirrel. Fox squirrels are found throughout both counties in areas of hardwood trees. Retention of mature hardwoods in the stand helps to maintain a desirable squirrel habitat in which a population density of one squirrel per acre can be expected.

White-tailed deer inhabit the northeastern and west-central parts of Upshur County and the lower Sabine River bottoms in Gregg County. Densities are estimated at 4 deer per 1,000 acres in Gregg County and 6 deer per 1,000 acres in Upshur County.

In the past, an abundance of good quail habitat was found in these counties. Reforestation of old crop fields and conversion to improved pastures have reduced the amount of good quail habitat. Quail in numbers sufficient for hunting are found in some places.

Furbearers such as raccoon, bobcat, coyote, and fox are harvested each year for pelts. Beavers have become a nuisance on various creeks in both counties. Several acres of improved pasture have been inundated because of beaver dams.

Hunting of migratory game is common in the survey area. Moderate to good dove hunting is found early in the season. Waterfowl—particularly mallard, wood duck, and teal—are harvested in the Sabine River bottoms, the upper ends of Lake O'Pines, Gladewater Lake, Cherokee Lake, other small lakes, and numerous small livestock ponds. Small wetland areas provide feeding places for ducks.

Several endangered and threatened wildlife species are in Upshur and Gregg Counties. Bald eagles winter around Lake O'Pines. A few alligators inhabit areas along the Sabine River bottoms and other isolated areas in the counties. Although no colonies of red-cockaded woodpeckers have been observed, there is a good habitat for this species and some individuals have been spotted. The river otter, rare in northeast Texas, has been recently seen.

Lake O'Pines, Lake Gladewater, Lake Cherokee, and numerous smaller lakes and ponds, as well as the Sabine River and various creeks, provide good fishing for warm water species such as black bass, channel catfish, crappie, flathead catfish, and various sunfish. Channel catfish and fathead minnows are stocked in many small ponds. Commercial catfish operations have been established near Kilgore in Gregg County.

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

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

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

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

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

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

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

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, pecan, ash, sweetgum, elm, hawthorn, dogwood, hickory, blackberry, and hackberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are plum, honeysuckle, and crabapple.

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

Wetland plants are annual and perennial wild herbaceous and woody 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, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, Japanese millet, buttonbush, swamp cyrilla, rushes, sedges, and reeds.

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

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

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

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, bobcat, crow, cardinal, woodpeckers, armadillo, squirrels, gray fox, raccoon, deer, and coyote.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are wood duck, mallards, herons, shore birds, nutria, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. 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, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, 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, 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 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, 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, for dwellings with 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 bedrock, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

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

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

sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and 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, depth to bedrock, and flooding affect absorption of the effluent. Depth to bedrock interferes with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to 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 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and depth to bedrock 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 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture and soil reaction affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

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

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

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

construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by a high water table and 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, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have 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 natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are 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, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, 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 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas 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, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

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

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

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones. 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 bedrock or other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; and susceptibility to flooding. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, 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.

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, wetness, and depth to bedrock 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, slope, and depth to bedrock affect the construction of grassed waterways. Low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The 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 17.

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

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

engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If 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 (AASHTO) (*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.

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

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

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

physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

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

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

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 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 15, 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 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils 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 are not considered flooding.

Table 16 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 no more than once 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 are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, 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 16.

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

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by the Texas State Department of Highways and Public Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Specific gravity (Particle index) T 100 (AASHTO), D 693 (ASTM).

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*8*). 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 18, 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 their morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*7*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*8*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Bienville series

The Bienville series consists of deep, sandy soils on stream terraces. These soils are somewhat excessively drained and moderately rapidly permeable. They formed in acidic, sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Bienville loamy fine sand, 0 to 3 percent slopes; from the intersection of Farm Road 2087 and Farm Road 1845 in Longview, 1.9 miles south on Farm Road 2087, and 50 feet west in pasture:

Ap—0 to 8 inches; brown (10YR 4/3) loamy fine sand; weak fine subangular blocky structure; loose; many medium and fine roots; strongly acid; clear smooth boundary.

A2—8 to 22 inches; brown (7.5YR 5/4) loamy fine sand; massive; loose; common fine roots; medium acid; gradual wavy boundary.

B&A—22 to 50 inches; strong brown (7.5YR 5/6) loamy fine sand (B2t); common coarse distinct mottles of pale brown (10YR 6/3) uncoated sand grains (A2); weak fine subangular blocky structure; loose; few fine roots; medium acid; gradual wavy boundary.

B2t—50 to 80 inches; strong brown (7.5YR 5/6) loamy fine sand; common medium distinct spots of pale brown (10YR 6/3) uncoated sand grains; common distinct lamellae of yellowish red (5YR 4/6) fine sandy loam; weak medium blocky structure; loose; few fine roots; clay bridging some sand grains; medium acid.

Thickness of the solum is more than 60 inches. Depth to lamellae ranges from 30 to 60 inches but is commonly less than 40 inches.

The Ap or A1 horizon is dark grayish brown, brown, or dark yellowish brown. The A2 horizon is brown, yellowish brown, light yellowish brown, or pale brown. Some pedons have a few brownish streaks or mottles. Reaction ranges from very strongly acid to slightly acid.

The B2t horizon is loamy fine sand with lamellae of fine sandy loam or loamy fine sand. It is strong brown, brown, and yellowish brown. Reddish and brownish lamellae range from few to common. This horizon is very strongly acid to medium acid.

Bowie series

The Bowie series consists of deep, loamy soils on uplands. These soils are moderately well drained and slowly permeable. They formed in acidic, loamy sediments. Slopes range from 2 to 5 percent.

Typical pedon of Bowie fine sandy loam, 2 to 5 percent slopes; from the intersection of U.S. Highway 259 and Loop 281 in Longview, 0.7 mile north of U.S. Highway 259, and 200 feet west in woodland:

A1—0 to 6 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; slightly hard, very friable; many fine and medium roots; few ironstone pebbles 2 to 10 mm in diameter; slightly acid; clear smooth boundary.

A2—6 to 12 inches; pale brown (10YR 6/3) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; many fine and medium roots; few fine pores; few ironstone pebbles 2 to 5 mm in diameter; slightly acid; gradual smooth boundary.

B21t—12 to 20 inches; yellowish brown (10YR 5/8) sandy clay loam; weak medium subangular blocky structure; hard, friable; common fine roots; many fine pores; patchy clay films; common ironstone pebbles 2 to 10 mm in diameter; strongly acid; gradual wavy boundary.

B22t—20 to 36 inches; yellowish brown (10YR 5/8) sandy clay loam; common fine prominent red mottles; moderate medium subangular blocky structure; hard, friable; few fine roots; patchy clay films; few ironstone pebbles 2 to 10 mm in diameter; very strongly acid; gradual wavy boundary.

B23t—36 to 44 inches; yellowish brown (10YR 5/8) sandy clay loam; common fine distinct light brownish gray and common fine prominent dark red mottles; moderate medium subangular blocky structure; hard, friable; few fine roots; patchy clay films; common ironstone pebbles 3 to 5 mm in diameter; very strongly acid; gradual wavy boundary.

B24t—44 to 64 inches; mottled yellowish brown (10YR 5/8), red (2.5YR 4/8), and light brownish gray (10YR 6/2) sandy clay loam; few vertical gray (10YR 6/1) streaks; moderate subangular blocky structure; hard, friable; few fine roots; 5 to 8 percent nodular plinthite; patchy clay films; few ironstone pebbles 3 to 5 mm in diameter; very strongly acid; gradual smooth boundary.

B25t—64 to 72 inches; mottled light brownish gray (10YR 6/2), yellowish brown (10YR 5/8), and red (2.5YR 4/8) sandy clay loam; moderate coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable; few fine roots; 5 to 8 percent nodular plinthite; patchy clay films; few streaks of uncoated sand; very strongly acid.

The solum is more than 60 inches thick. Depth to horizons that contain more than 5 percent plinthite is 30 to 60 inches. Content of nodular plinthite ranges from 5 to 15 percent in some part of B2t horizon. Content of ironstone pebbles 2 to 10 mm in diameter range from none to about 10 percent by volume.

The A horizon is 8 to 20 inches thick and is strongly acid to slightly acid. The A1 horizon is dark grayish brown, grayish brown, or brown. The A2 horizon is brown, pale brown, very pale brown, or light yellowish brown.

The upper part of the B2t horizon is yellowish brown, brownish yellow, or strong brown and contains none to many mottles of red and yellowish red. The lower part of the B2t horizon is mottled or has the same matrix colors as the upper part of the B2t. In addition it has gray, light gray, or light brownish gray mottles. Some pedons have streaks of uncoated sand. Clay content of the B2t horizon ranges from 18 to 35 percent. Texture is sandy clay loam or clay loam, and reaction is very strongly acid to strongly acid.

Briley series

The Briley series consists of deep, sandy soils on uplands. These soils are well drained and moderately permeable. They formed in sandy and loamy sediments. Slopes range from 2 to 5 percent.

Typical pedon of Briley loamy fine sand, 2 to 5 percent slopes; 0.4 mile north on Shell-Richie Road from its intersection with U.S. Highway 80 in Gladewater, and 150 feet north of road in pasture:

A1—0 to 8 inches; brown (10YR 4/3) loamy fine sand; weak fine granular structure; loose; many fine roots; medium acid; clear smooth boundary.

A2—8 to 26 inches; light yellowish brown (10YR 6/4) loamy fine sand; weak fine subangular blocky structure; loose; many fine roots; strongly acid; clear smooth boundary.

B21t—26 to 48 inches; red (2.5YR 4/6) sandy clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; slightly hard, friable; few fine roots; many fine pores; patchy clay films; very strongly acid; gradual smooth boundary.

B22t—48 to 58 inches; red (2.5YR 4/6) sandy clay loam; common medium distinct strong brown (7.5YR 5/6) and few fine prominent brownish yellow (10YR 6/6) mottles; slightly hard, friable; few fine roots; many fine pores; patchy clay films; few ironstone pebbles; very strongly acid; gradual wavy boundary.

B23t—58 to 68 inches; strong brown (7.5YR 5/6) sandy clay loam; many coarse prominent red (2.5YR 4/8) and many coarse distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; slightly hard, friable; few fine roots; many fine pores; patchy clay films; few ironstone pebbles; very strongly acid; gradual wavy boundary.

B24t—68 to 80 inches; strong brown (7.5YR 5/6) sandy clay loam; many common distinct yellowish red (5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; few fine roots; many fine and medium pores; patchy clay films; vertical streaks of pale brown (10YR 6/3) uncoated sand on some ped faces; few ironstone pebbles 4 to 10 mm in diameter; very strongly acid.

The solum is more than 60 inches thick.

The A horizon is very strongly acid to slightly acid. The A1 horizon is dark brown, brown, or dark grayish brown. The A2 horizon is pale brown, yellowish brown, or light yellowish brown.

The B2t horizon is red, yellowish red, reddish brown, or strong brown sandy clay loam or loam. In some pedons the upper part has few or common reddish, brownish, or yellow mottles. In the lower part, mottling increases with depth and some pedons have no dominant matrix color. The horizon is very strongly to medium acid.

Cuthbert series

The Cuthbert series consists of moderately deep, loamy soils on uplands. These soils are well drained and moderately slowly permeable. They formed in acidic, interbedded sandstone and shale rocks of sedimentary deposits. Slopes range from 8 to 40 percent.

Typical pedon of Cuthbert fine sandy loam; from the intersection of U.S. Highway 259 and Farm Road 726 south of Ore City, 0.2 mile east on Farm Road 726, 0.4 mile south on county road to Walnut Springs Church, and 200 feet southwest of road in woodland:

A1—0 to 3 inches; brown (7.5YR 4/2) fine sandy loam; weak fine granular structure; slightly hard, very friable; many fine roots; few fine pores; 8 percent by volume ironstone fragments 4 to 20 mm in diameter; slightly acid; clear smooth boundary.

A2—3 to 8 inches; brown (7.5YR 5/4) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; 8 percent by volume ironstone fragments 4 to 20 mm in diameter; slightly acid; abrupt boundary.

B21t—8 to 20 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; very hard, very firm; few fine roots; continuous clay films on surface of peds; very strongly acid; gradual boundary.

B22t—20 to 36 inches; red (2.5YR 4/6) clay; common fine prominent yellowish brown (10YR 5/8) mottles and light brownish gray (10YR 6/2) shale fragments; moderate fine subangular blocky structure; very hard, very firm; few fine roots; continuous clay films on surface of peds; very strongly acid; clear boundary.

C—36 to 60 inches; stratified red (2.5YR 4/8) loam, reddish yellow (7.5YR 6/8) fine sandy loam, and light brownish gray (10YR 6/2) shale; few fine roots; very strongly acid.

The solum is 20 to 40 inches thick. Content of ironstone fragments less than 3 inches across ranges from nearly 0 to 50 percent by volume throughout the upper horizons. Ironstone fragments greater than 10 inches across are on the surface of some pedons.

The A1 horizon is brown, very dark grayish brown, and dark grayish brown. It is 2 to 7 inches thick. The A2 horizon is brown, light brown, pale brown, yellowish brown, and light yellowish brown. This horizon, where present, is up to 14 inches thick. The A horizon is fine sandy loam, loam, gravelly fine sandy loam, or gravelly loam. It is very strongly acid to slightly acid.

The B2t horizon is dark red, red, and yellowish red with or without few to common brownish or yellowish mottles. Grayish horizontally oriented shale fragments are in the lower part. This horizon is extremely acid to strongly acid.

Some pedons have a thin B3 horizon.

The C horizon is stratified clay loam, sandy clay loam, loam, fine sandy loam, shaly clay, and weakly cemented sandstone. Mica flakes are on shale material in most pedons. Discontinuous ironstone layers are in some pedons. Reaction is extremely acid or very strongly acid.

Darco series

The Darco series consists of deep, sandy soils on uplands. These soils are well drained and moderately permeable. They formed in sandy and loamy sediments. Slopes range from 2 to 15 percent.

Typical pedon of Darco fine sand, 2 to 5 percent slopes; 4.3 miles south of Pritchett on old Pritchett-Big Sandy County Road to intersection, and 100 feet north on county road to roadcut on east roadbank in woodland:

A1—0 to 10 inches; brown (10YR 5/3) fine sand; single grained; loose; common fine roots; medium acid; clear smooth boundary.

A21—10 to 47 inches; light yellowish brown (10YR 6/4) fine sand; single grained; loose; common fine roots; medium acid; gradual wavy boundary.

A22—47 to 62 inches; light yellowish brown (10YR 6/4) fine sand; common medium prominent yellowish red (5YR 4/8) mottles; single grained; loose; common fine roots; medium acid; clear smooth boundary.

B21t—62 to 73 inches; yellowish red (5YR 4/6) sandy clay loam; common fine distinct strong brown mottles; weak coarse subangular blocky structure; hard, friable; few fine roots between peds; patchy clay films on faces of peds; very strongly acid; gradual wavy boundary.

B22t—73 to 80 inches; yellowish red (5YR 5/8) sandy clay loam; many medium distinct strong brown (7.5YR 5/6) and few fine prominent gray mottles; weak medium subangular blocky structure; hard, friable; few thin clay films and clay-coated sand grains; many fine mica flakes; very strongly acid; gradual wavy boundary.

The solum is more than 80 inches thick. The thickness of the A horizon ranges from 40 to 72 inches. Base saturation at a depth of 72 inches ranges from 15 to 35 percent.

The A1 horizon is very dark grayish brown, dark grayish brown, grayish brown, dark brown, or brown. It is strongly acid to slightly acid. The A2 horizon is brown, pale brown, light yellowish brown, or yellowish brown. It is very strongly acid to slightly acid.

The B2t horizon is red, yellowish red, strong brown, or yellowish brown, or it is mottled in these colors. Brownish or reddish mottles occur in most pedons and mottles of chroma of 2 or less may occur below a depth of 50 inches. Texture is sandy loam or sandy clay loam with clay content ranging from 15 to 35 percent. Reaction is very strongly acid or strongly acid.

Elrose series

The Elrose series consists of deep, loamy soils on uplands. These soils are well drained and moderately permeable. They formed in glauconitic marine sediments. Slopes range from 3 to 5 percent.

Typical pedon of Elrose fine sandy loam, 3 to 5 percent slopes; 2.6 miles west of Latch store on Farm Road 1795 west of Gilmer, and 0.1 mile south on private road, and 400 feet east of road in woodland:

Ap—0 to 4 inches; strong brown (7.5YR 5/6) fine sandy loam; moderate fine subangular blocky structure; slightly hard, very friable; many fine roots; 5 percent by volume ironstone fragments up to 2 inches across; strongly acid; clear wavy boundary.

A12—4 to 8 inches; yellowish red (5YR 4/6) fine sandy loam; weak fine subangular blocky structure; slightly hard, very friable; many fine roots; 5 percent by volume ironstone fragments up to 2 inches across; strongly acid; clear wavy boundary.

B21t—8 to 21 inches; red (2.5YR 4/6) sandy clay loam; moderate fine subangular blocky structure; hard, friable; common fine roots; continuous clay films on surfaces of peds; medium acid; gradual wavy boundary.

B22t—21 to 42 inches; red (2.5YR 4/6) sandy clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; few fine roots; continuous dark red clay films on faces of peds; very strongly acid; gradual wavy boundary.

B23t—42 to 68 inches; red (2.5YR 4/6) sandy clay loam; common coarse and medium strong brown (7.5YR 5/6) fragments of glauconite and few fine spots of uncoated sand; moderate medium subangular blocky structure; hard, friable; few fine roots; patchy clay films; about 7 percent by volume ironstone pebbles; very strongly acid; gradual wavy boundary.

B24t—68 to 80 inches; red (2.5YR 4/6) sandy clay loam; common medium strong brown (7.5YR 5/6) fragments of glauconite and common fine spots of uncoated sand; weak medium subangular blocky structure; hard, friable; few fine roots; patchy clay films; few thin fragments of ironstone; very strongly acid.

The solum is more than 60 inches thick.

The A horizon is 6 to 14 inches thick. It is strong brown, reddish brown, or yellowish red. Reaction is strongly acid to medium acid.

The B2t horizon is dark red, red, reddish brown, strong brown, or yellowish red. Texture is sandy clay loam or clay loam. Clay content decreases with depth. Reaction is very strongly acid to slightly acid.

Iuka series

The Iuka series consists of deep, loamy soils on flood plains (fig. 17). These soils are moderately well drained and moderately permeable. They formed in loamy alluvium on flood plains of local streams. Slopes range from 0 to 1 percent.

Typical pedon of Iuka fine sandy loam, frequently flooded; from intersection of Texas Highway 300 with U.S. Highway 271 in Gilmer, 5.4 miles southeast on Texas Highway 300, 0.4 mile south on county road, and 100 feet north of road along creek in woodland:

A11—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; many coarse faint yellowish brown (10YR 5/4) mottles; moderate fine granular structure; slightly hard, very friable; many fine and medium roots; many partially decomposed bits of forest litter; strongly acid; clear smooth boundary.

A12—4 to 12 inches; brown (10YR 4/3) fine sandy loam; few fine faint yellowish brown mottles; moderate fine subangular blocky structure; slightly hard, very friable; common fine roots; few fine pores; strongly acid; gradual smooth boundary.

C1—12 to 22 inches; brown (7.5YR 4/4) fine sandy loam with few thin strata of sandy loam and loamy sand; few fine distinct grayish brown (10YR 5/2) and few fine faint strong brown (7.5YR 5/6) mottles; massive; slightly hard, very friable; few fine roots; few fine pores; strongly acid; gradual smooth boundary.

C2—22 to 35 inches; mottled light brownish gray (10YR 6/2) and dark yellowish brown (10YR 4/4) fine sandy loam; massive; slightly hard, very friable; few fine roots; few fine pores; very strongly acid; gradual smooth boundary.

C3—35 to 60 inches; coarsely mottled light brownish gray (10YR 6/2), yellowish brown (10YR 5/6), and brownish yellow (10YR 6/8) fine sandy loam; slightly hard, very friable; few fine roots; very strongly acid.

The A horizon is dark grayish brown, brown, or pale brown in the upper part and dark yellowish brown, brown, yellowish brown, or light yellowish brown in the lower part. Brownish mottles may be present. Reaction is very strongly acid or strongly acid except where the soil has been limed.

The C horizon is brown, pale brown, or light yellowish brown. Mottles in shades of gray, brown, or red range from few to common, or the matrix is mottled with these colors. Mottles with chroma of 2 or less are few to common in the upper 24 inches. Reaction is very strongly acid or strongly acid.

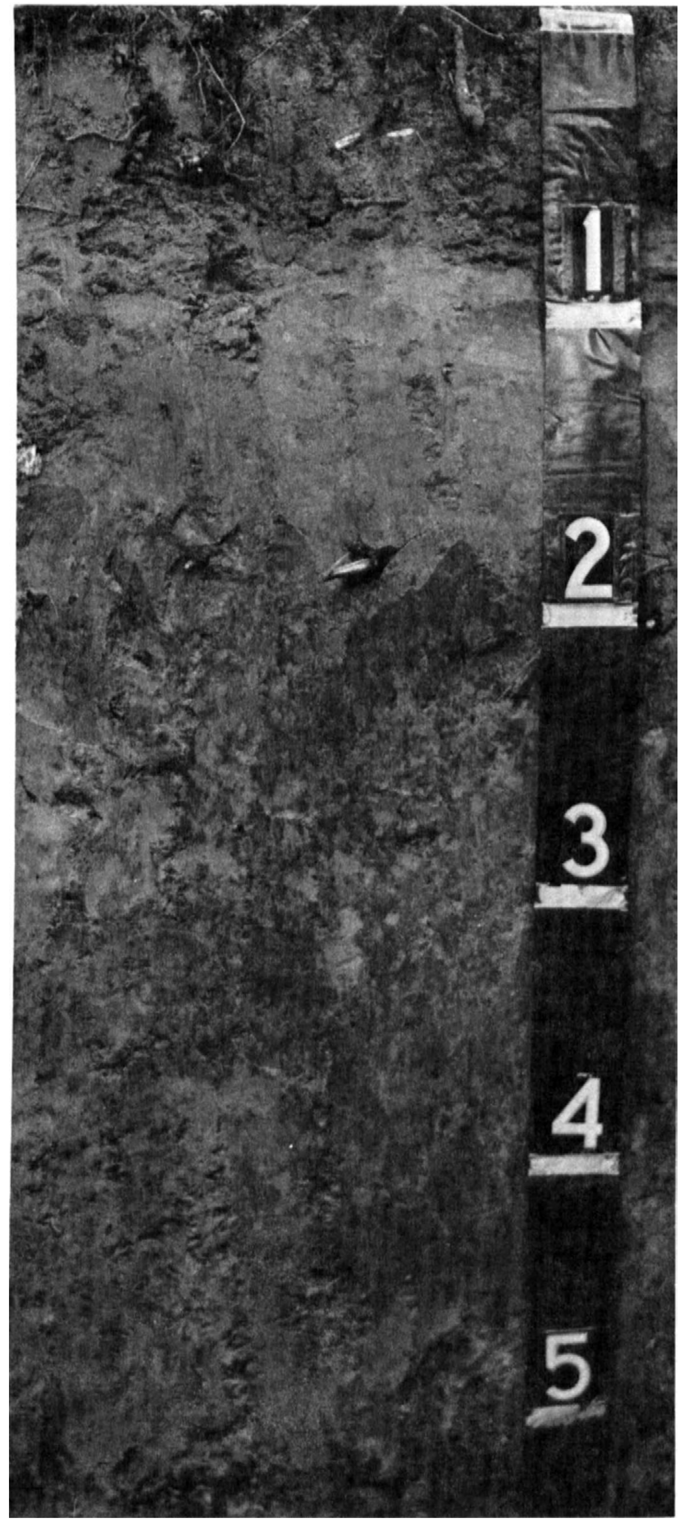


Figure 17.—Profile of Iuka fine sandy loam, frequently flooded. Stratification is faint to distinct. Scale is in feet.

Kirvin series

The Kirvin series consists of deep, loamy soils on uplands. These soils are well drained and moderately slowly permeable. They formed in stratified loamy and shaly sediments. Slopes range from 2 to 8 percent.

Typical pedon of Kirvin very fine sandy loam, 2 to 5 percent slopes; from the intersection of Texas Highway 155 and Farm Road 2685 south of Gilmer, 700 feet north on county road, 200 feet east, and 20 feet north in woodland:

A1—0 to 4 inches; dark brown (7.5YR 4/4) very fine sandy loam; weak fine granular structure; slightly hard, friable; many fine and medium roots; 5 percent by volume ironstone pebbles; strongly acid; gradual smooth boundary.

A2—4 to 12 inches; brown (7.5YR 5/4) very fine sandy loam; weak fine granular structure; slightly hard, friable; many fine and medium roots; 5 percent by volume ironstone pebbles; strongly acid; clear smooth boundary.

B21t—12 to 23 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; very hard, very firm; few fine roots; few fine pores; continuous clay films on faces of peds; few flakes of mica; very strongly acid; clear wavy boundary.

B22t—23 to 30 inches; red (2.5YR 4/6) clay; common fine distinct strong brown mottles; moderate medium subangular blocky and moderate medium platy structure; very hard, very firm; few fine roots; few fine pores; continuous clay films on faces of peds; few flakes of mica; few fine light brownish gray (10YR 6/2) horizontally oriented shale fragments; very strongly acid; clear wavy boundary.

B3—30 to 51 inches; red (2.5YR 4/6) clay; many medium distinct strong brown (7.5YR 5/8) mottles; moderate fine platy structure; firm, hard; few fine roots; few fine pores; dark red patchy clay films on faces of peds; few flakes of mica; common fine light brownish gray (10YR 6/2) horizontally oriented shale fragments; very strongly acid; clear wavy boundary.

C—51 to 61 inches; stratified layers of light brownish gray (10YR 6/2) shale, and red (2.5YR 4/6) and dark red (10R 3/6) sandy clay loam; few fine roots; weakly cemented, friable; common flakes of mica; very strongly acid.

The solum ranges from 40 to 60 inches thick. Content of ironstone pebbles ranges from 1 to 35 percent by volume in the surface horizon and 1 to 10 percent in the subsoil.

The A1 horizon is dark brown, brown, dark grayish brown, or reddish brown. The A2 horizon has a value 1 or 2 units greater than the A1 horizon. The A horizon is very fine sandy loam or gravelly fine sandy loam. It is strongly acid to slightly acid.

The B2t horizon is dark red, red, or yellowish red. Strong brown mottles occur in parts of this horizon. Thin, grayish, platy shale fragments are in some pedons. These horizons are extremely acid to medium acid. The upper part of the B2t horizon is clay, clay loam, or sandy clay with clay content ranging from 40 to 60 percent in the uppermost part. The lower part of the B2t horizon and the B3 horizon range from clay to clay loam.

The C horizon has stratified or interbedded shades of brown, gray, and red. Texture ranges from sandy loam to clay loam with some pedons containing weakly cemented shale and sandstone. Reaction is extremely acid to strongly acid.

Kullit series

The Kullit series consists of deep, loamy soils on uplands (fig. 18). These soils are moderately well drained and moderately slowly permeable. They formed in stratified loamy and clayey sediments. Slopes range from 1 to 3 percent.

Typical pedon of Kullit very fine sandy loam, 1 to 3 percent slopes; from the intersection of Texas Highway 154 and U.S. Highway 271 in Gilmer, 5.2 miles north on U.S. Highway 271, 0.3 mile west on old runway, and 600 feet south in pasture:

Ap—0 to 7 inches; brown (10YR 5/3) very fine sandy loam; weak fine granular structure; slightly hard, very friable; many fine roots; medium acid; clear wavy boundary.

B21t—7 to 18 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; hard, friable; many fine roots; many fine pores; very strongly acid; gradual wavy boundary.

B22t—18 to 28 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct strong brown (7.5YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; hard, friable; few fine roots; few fine pores; very strongly acid; gradual wavy boundary.

B23t—28 to 39 inches; yellowish brown (10YR 5/6) clay loam; many medium faint strong brown (7.5YR 5/6), common medium distinct light brownish gray (10YR 6/2), and few medium distinct yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; hard, friable; few fine roots; few fine pores; very strongly acid; gradual wavy boundary.

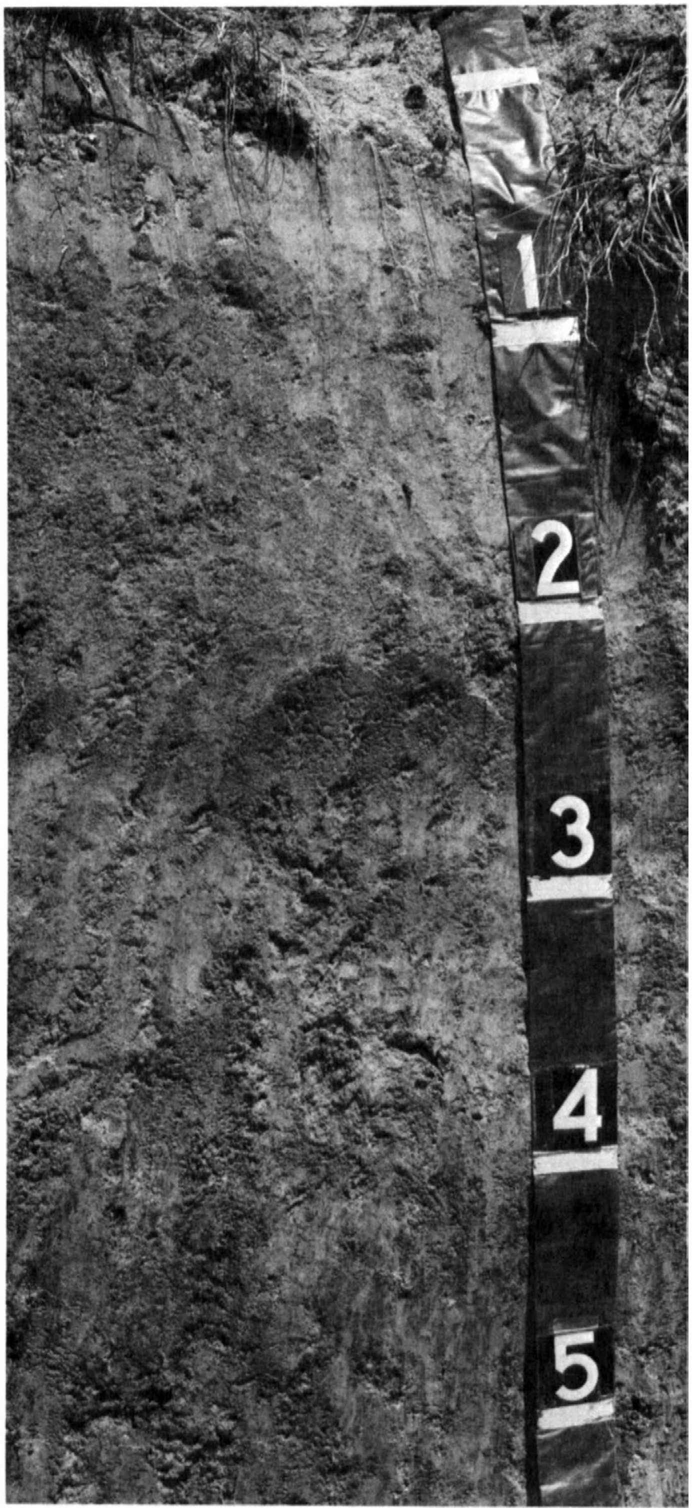


Figure 18.—Profile of Kullit very fine sandy loam, 1 to 3 percent slopes. Scale is in feet.

B24t—39 to 49 inches; yellowish brown (10YR 5/6) clay loam; many coarse faint strong brown (7.5YR 5/6), common medium distinct light brownish gray (10YR 6/2), and few medium distinct yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; hard, friable; few fine roots; few medium pores; patchy clay films; 10 to 15 percent by volume streaks and pockets of uncoated sand; few dark brown concretions up to 1 cm in diameter; 10 percent of mass slightly brittle; very strongly acid; gradual wavy boundary.

B25t—49 to 70 inches; mottled red (2.5YR 4/6), gray (10YR 5/1), and strong brown (7.5YR 5/6) clay; moderate fine and medium subangular blocky structure; very hard, very firm; few fine roots; few fine pores; continuous clay films on faces of peds; very strongly acid.

The solum is more than 60 inches thick. Base saturation is less than 35 percent at a depth of 50 inches below the surface of the argillic horizon.

The A1 or Ap horizon is dark grayish brown, grayish brown, or brown. Reaction in the A2 horizon, where present, is 1 or 2 units higher than in the A1 horizon.

The upper part of the B2t horizon is yellowish brown, strong brown, reddish yellow, or yellowish red. Reddish, brownish, and grayish mottles range from few to common. Texture is loam, sandy clay loam, or clay loam. The lower part of the B2t horizon is in shades of red, gray, and brown and is typically mottled with these colors. It is sandy clay or clay. Reaction in the B2t horizon is very strongly acid or strongly acid.

Latch series

The Latch series consists of deep, sandy soils on stream terraces of the Sabine River and other larger local streams. These soils are moderately well drained and moderately permeable. Slopes range from 0 to 1 percent.

Typical pedon of Latch loamy fine sand, 0 to 1 percent slopes; from the intersection of White Oak Road and Texas Highway 155 in Big Sandy, 1.2 miles east on White Oak Road, and 300 feet south in woodland:

A1—0 to 8 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; loose; many fine roots; very strongly acid; clear wavy boundary.

A21—8 to 16 inches; brown (10YR 5/3) loamy fine sand; single grained; loose; common fine roots; very strongly acid; gradual wavy boundary.

A22—16 to 32 inches; pale brown (10YR 6/3) loamy fine sand; common fine faint light brownish gray and few fine faint very pale brown mottles; single grained; loose; few fine roots; strongly acid; gradual wavy boundary.

A23—32 to 52 inches; pale brown (10YR 6/3) loamy fine sand; many medium faint light gray (10YR 7/2) and common medium distinct yellowish brown (10YR 5/6) mottles; single grained; loose; few fine roots; strongly acid; gradual wavy boundary.

B2t—52 to 62 inches; light brownish gray (10YR 6/2) sandy clay loam; many medium distinct strong brown (7.5YR 5/8) and common fine prominent red (2.5YR 4/6) mottles; weak fine subangular blocky structure; hard, friable; few fine roots; few clay films on surfaces of peds; few pockets and streaks of light gray (10YR 7/2) uncoated sand; very strongly acid; gradual wavy boundary.

C1—62 to 72 inches; light gray (10YR 7/2) fine sand, common medium distinct yellowish brown (10YR 5/8) mottles; single grained; loose; few fine roots; medium acid; gradual wavy boundary.

C2—72 to 80 inches; very pale brown (10YR 7/4) sand, common fine distinct yellowish red (5YR 5/8) mottles; single grained; loose; few fine roots; medium acid.

The solum ranges from 60 to 80 inches thick.

The A1 or Ap horizon is dark grayish brown, brown, or dark yellowish brown. The A2 horizon is brown, yellowish brown, pale brown, light yellowish brown, or brownish yellow. Grayish or brownish mottles range from few to many in the A2 horizon. Reaction is very strongly acid to slightly acid.

The B2t horizon is strong brown, yellowish brown, grayish brown, light brownish gray, or light gray. Mottles of these colors along with red range from common to many. Texture is fine sandy loam, loam, sandy clay loam, or clay loam. Clay content ranges from 18 to 35 percent. Reaction ranges from very strongly acid to medium acid.

The C horizon is in shades of gray or brown with few to common yellow or red mottles. This horizon is loamy fine sand, fine sand, or sand.

Lilbert series

The Lilbert series consists of deep, sandy soils on uplands. These soils are well drained and moderately slowly permeable. They formed in sandy and loamy sediments. Slopes range from 2 to 5 percent.

Typical pedon of Lilbert loamy fine sand, 2 to 5 percent slopes; from the intersection of U.S. Highway 80 and Farm Road 2685 west of Gladewater, 1 mile west to county road, 0.9 mile north on county road to Rocky Church, 0.6 mile west on county road to Camp Natowa Road, 0.1 mile north to powerline crossing, 100 feet west on powerline right-of-way, and 50 feet north in woodland:

A1—0 to 6 inches; brown (10YR 5/3) loamy fine sand; moderate fine granular structure; loose; many fine and medium roots; medium acid; gradual smooth boundary.

A2—6 to 30 inches; pale brown (10YR 6/3) loamy fine sand; massive; loose; few fine and medium roots; slightly acid; clear smooth boundary.

B21t—30 to 38 inches; yellowish brown (10YR 5/8) sandy clay loam, common fine distinct yellowish red (5YR 5/6) mottles; moderate medium subangular blocky structure; hard, friable; few fine roots; few fine pores; patchy clay films on faces of peds; few rounded ironstone pebbles; very strongly acid; gradual smooth boundary.

B22t—38 to 48 inches; yellowish brown (10YR 5/6) sandy clay loam, common medium distinct pale brown (10YR 6/3) and many coarse prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; hard, friable; few fine roots; patchy clay films on faces of peds; very strongly acid; gradual wavy boundary.

B23t—48 to 56 inches; mottled yellowish brown (10YR 5/6), red (2.5YR 4/8), light brownish gray (10YR 6/2), and pale brown (10YR 6/3) sandy clay loam; moderate medium subangular blocky structure; very hard, friable; few fine roots; few pores; 7 percent plinthite; patchy clay films on faces of peds; clay coating in pores and root channels; very strongly acid; gradual wavy boundary.

B3—56 to 72 inches; mottled red (2.5YR 4/8), light brownish gray (10YR 6/2), and strong brown (7.5YR 5/8) sandy clay loam; weak coarse blocky structure; very hard, friable; few roots; patchy clay films on faces of peds; most of red is brittle; very strongly acid.

The solum is more than 60 inches thick. Content of plinthite ranges from 5 to 20 percent at a depth of 40 to 60 inches.

The A horizon is 20 to 40 inches thick. The A1 horizon is dark grayish brown, brown, or grayish brown. It is strongly acid to slightly acid. The A2 horizon is pale brown, light yellowish brown, yellowish brown, or very pale brown. It is very strongly acid to slightly acid.

The upper part of the B2t horizon is strong brown, yellowish brown, brownish yellow, or reddish yellow and contains few to many red and yellowish red mottles. They are dominantly sandy clay loam, but range from loam to clay loam. The lower part of the B2t horizon has the same colors as the upper part of the B2t horizon and is mottled with red and light brownish gray or grayish brown. Plinthite makes up 5 to 10 percent of some horizons. These horizons are very strongly acid to medium acid.

Mantachie series

The Mantachie series consists of deep, loamy soils on flood plains (fig. 19). These soils are somewhat poorly drained and are moderately permeable. They formed in loamy alluvium on flood plains of local streams. Slopes range from 0 to 1 percent.

Typical pedon of Mantachie loam, frequently flooded; from the intersection of U.S. Highway 271 and Texas Highway 154 in Gilmer, 2.75 miles north on U.S. Highway 271, 500 feet west of highway along fence, and 200 feet southeast of fence in pasture:

A1—0 to 8 inches; brown (10YR 5/3) loam, many fine distinct dark yellowish brown mottles; weak fine subangular blocky structure; slightly hard, friable; many fine roots; few fine pores; very strongly acid; clear wavy boundary.

B21g—8 to 24 inches; dark grayish brown (10YR 4/2) clay loam, common fine distinct yellowish brown mottles; moderate fine subangular blocky structure; slightly hard, firm; many fine roots; very strongly acid; gradual wavy boundary.

B22g—24 to 34 inches; light brownish gray (10YR 6/2) clay loam; many medium distinct yellowish brown (10YR 5/8) and common medium prominent yellowish red (5YR 4/8) mottles; moderate medium subangular blocky structure; hard, firm; many fine roots; few black concretions; very strongly acid; gradual wavy boundary.

B23g—34 to 54 inches; grayish brown (10YR 5/2) clay loam; many medium prominent red (2.5YR 4/8) and few fine distinct yellowish brown mottles; moderate medium subangular blocky structure; hard, firm; few fine roots; few black concretions; very strongly acid; gradual wavy boundary.

B24g—54 to 65 inches; grayish brown (10YR 5/2) clay loam; many coarse prominent red (2.5YR 4/8) and few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm; few fine roots; few fine pores; few black concretions; very strongly acid; gradual wavy boundary.

The solum ranges from 30 to more than 65 inches thick. Some pedons contain about 5 percent ironstone and chert pebbles.

The A horizon is dark brown, dark grayish brown, brown, or yellowish brown, or it is mottled in colors of brown and gray. It is strongly or very strongly acid except where the soil has been limed.

The B2g horizon is strongly or very strongly acid. The upper part is dark grayish brown, grayish brown, brown, or yellowish brown with few to many grayish mottles, or it is mottled in shades of gray, brown, and yellow. The lower part is dark grayish brown, grayish brown, gray, light gray, or light brownish gray with few to many mottles in shades of brown and red. Texture is loam, silt loam, sandy clay loam, or clay loam. Clay content in the 10- to 40-inch control section ranges from 18 to 34 percent.

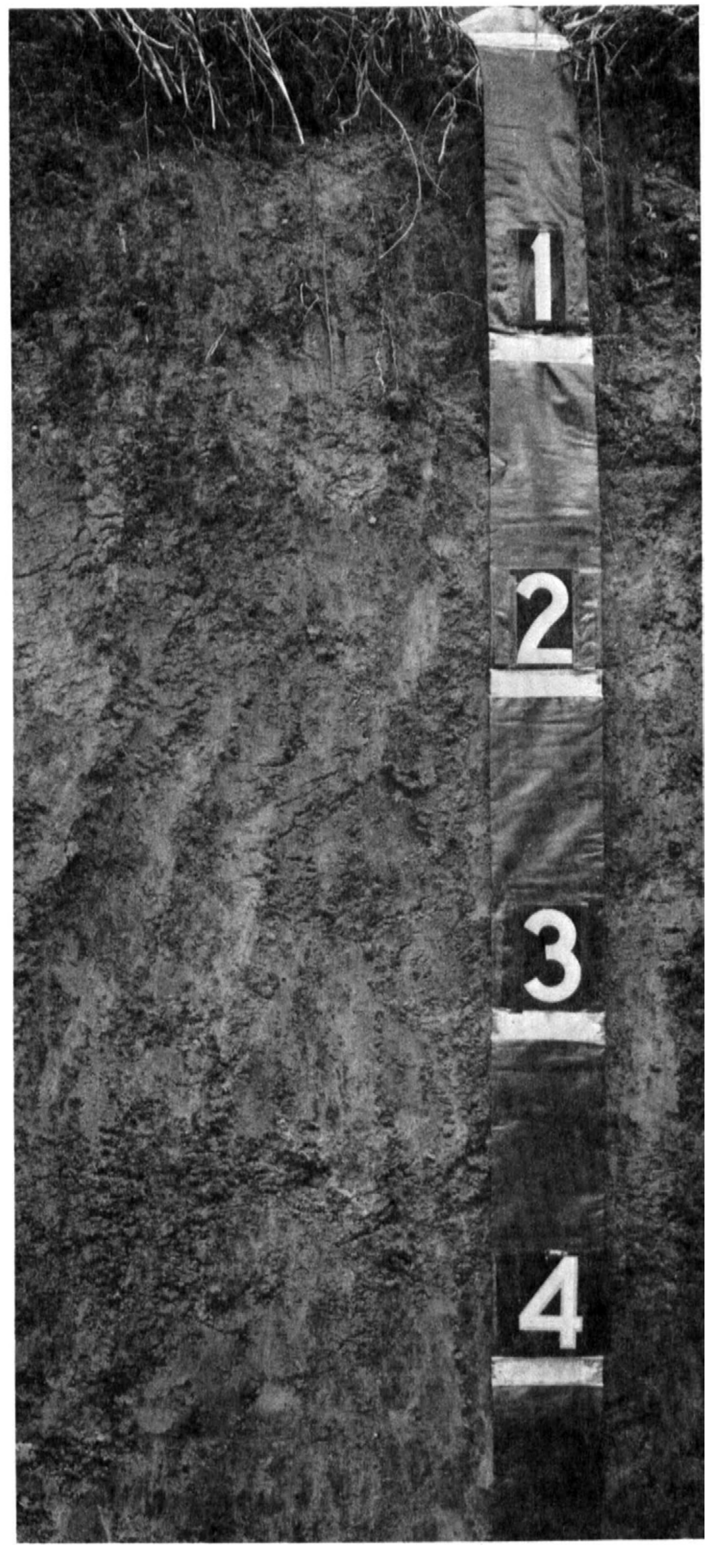


Figure 19.—Profile of Mantachie loam, frequently flooded. The water table is usually within about 2 feet of the surface. Scale is in feet.

Mollville series

The Mollville series consists of deep, loamy soils on stream terraces. These soils are poorly drained and slowly permeable. They formed in sandy and loamy alluvial sediments. Slopes range from 0 to 1 percent.

Typical pedon of Mollville very fine sandy loam, 0 to 1 percent slopes; 1.2 miles south of Big Sandy on city dump road to intersection, and 500 feet north across pipeline in woodland:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) very fine sandy loam; weak medium granular structure; slightly hard, very friable; many fine roots; very strongly acid; clear boundary.

A2g—3 to 8 inches; grayish brown (10YR 5/2) very fine sandy loam; weak medium subangular blocky structure; slightly hard, very friable; many fine roots; very strongly acid; clear boundary.

B21tg&A2g—8 to 15 inches; grayish brown (10YR 5/2) sandy clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; dark grayish brown (10YR 4/2) coatings on peds; 15 percent tongues and streaks of light gray (10YR 7/2) loam; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; common fine roots; very strongly acid; clear boundary.

B22tg—15 to 27 inches; grayish brown (10YR 5/2) sandy clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; few streaks of light gray (10YR 7/2) loam; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm; few fine roots; patchy clay films; strongly acid; gradual boundary.

B23tg—27 to 46 inches; light brownish gray (10YR 6/2) sandy clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm; few fine roots; patchy clay films; strongly acid; clear boundary.

B3g—46 to 55 inches; light gray (10YR 7/1) fine sandy loam; few fine distinct brownish yellow mottles; weak medium subangular blocky structure; slightly hard, very friable; few fine roots; slightly acid; clear boundary.

Cg—55 to 67 inches; light gray (10YR 7/1) loamy fine sand; moderate medium distinct brownish yellow (10YR 6/6) mottles; single grained; loose; few fine roots; slightly acid.

Solum thickness ranges from 40 to about 70 inches.

The A1 horizon is very dark grayish brown or grayish brown. The A2g horizon is grayish brown or light brownish gray. Reaction is very strongly acid to medium acid.

The B2tg horizon is gray, grayish brown, or light brownish gray. It is sandy clay loam or clay loam with mottles in shades of brown and red. The upper part contains vertical streaks and tongues of gray loam (A2 material). Reaction is very strongly acid to medium acid in the upper part and strongly acid to neutral in the lower part.

The C horizon is grayish, brownish, yellowish, or whitish loam, loamy fine sand, or fine sand. It is medium acid to mildly alkaline.

Raino series

The Raino series consists of deep, loamy soils on stream terraces. These soils are moderately well drained and very slowly permeable. They formed in clayey alluvial sediments of the Sabine River and other major streams. Slopes range from 0 to 1 percent.

Typical pedon of Raino loam, 0 to 1 percent slopes; from the intersection of U.S. Highway 80 and Texas Highway 155 (north) in Big Sandy, 2 miles east on U.S. Highway 80 to Burnett Farm, and 0.5 mile southwest in pasture:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam; weak fine subangular blocky structure; slightly hard, very friable; common fine roots; slightly acid; clear boundary.

B1—5 to 20 inches; yellowish brown (10YR 5/4) loam, many fine distinct light brownish gray mottles; weak fine subangular blocky structure; slightly hard, friable; common fine roots; strongly acid; gradual boundary.

B21t&A'2—20 to 32 inches; yellowish brown (10YR 5/6) sandy clay loam; many coarse distinct light brownish gray (10YR 6/2) and common medium prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; hard, firm; light yellowish brown (10YR 6/4) and light gray (10YR 7/2) uncoated sand and silt (A2) on faces of peds and as streaks and pockets 1/2 inch to 2 inches across and 2 to 5 inches long; A2 soil material makes up about 20 percent of the horizon; few fine roots; few patchy clay films; very strongly acid; gradual boundary.

B22t&A'2—32 to 41 inches; mottled yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and red (2.5YR 4/8) clay; moderate medium subangular blocky structure; very hard, very firm; light gray (10YR 7/2) uncoated sand and silt (A2) on faces of peds and as streaks and pockets that are 1/2 inch to 2 inches across and 1 inch to 3 inches long; A2 soil material makes up about 15 percent of the horizon; few fine roots; clay films on faces of peds; very strongly acid; clear boundary.

B23t—41 to 57 inches; grayish brown (10YR 5/2) clay; common coarse distinct brown (7.5YR 5/4) and common fine prominent red mottles; moderate medium subangular blocky structure; very hard, very firm; few shiny surfaces on faces of peds; few fine roots; very strongly acid; gradual boundary.

B24t—57 to 68 inches; mottled strong brown (7.5YR 5/6), grayish brown (10YR 5/2), gray (10YR 6/1), and red (2.5YR 4/8) clay; moderate medium subangular blocky structure; very hard, very firm; few shiny surfaces on faces of peds; few fine roots; very strongly acid; gradual boundary.

B3—68 to 80 inches; mottled gray (10YR 6/1), brown (7.5YR 5/4), strong brown (7.5YR 5/6), and yellowish red (5YR 5/8) sandy clay loam; weak medium subangular blocky structure; hard, firm; few fine roots; few black concretions; very strongly acid.

The solum is more than 60 inches thick.

The A1 horizon is dark grayish brown, brown, yellowish brown, or grayish brown. It is strongly acid to slightly acid.

The B1 horizon is strong brown, light brown, brown, yellowish brown, or light yellowish brown. It is very strongly acid to slightly acid.

The B21t&A'2 horizon is yellowish brown, brownish yellow, pale brown, or strong brown with mottles of these same colors and grayish brown, light grayish brown, gray, light gray, or red. Texture is loam or sandy clay loam. Uncoated sand or silt ranges from 10 to 30 percent in the upper part of the B2t horizon. It is very strongly acid to medium acid.

The B22t&A'2 horizon has the same colors as the B21t&A'2 horizon, and in addition, is also mottled with light gray, light brownish gray, grayish brown, yellowish brown, strong brown, red, or dark red. Texture is clay or clay loam. Uncoated sand or silt ranges from 10 to 30 percent in the upper part of the B2t horizon. This horizon is very strongly to strongly acid.

The B23t, B24t, and B3 horizons are light gray, gray, light brownish gray, grayish brown, yellowish brown, strong brown, yellowish red, or red with few to many mottles of these same colors, or the horizons are completely mottled in these colors. Texture is sandy clay loam, clay loam, or clay. Reaction is very strongly acid to strongly acid.

Redsprings series

The Redsprings series consists of deep, loamy soils on hilly uplands. These soils are well drained and moderately slowly permeable. They formed in glauconitic marine sediments. Slopes range from 15 to 40 percent.

Typical pedon of Redsprings gravelly loam; from the northeast intersection of Texas Highway 155 and U.S. Highway 271 in Gilmer, 6.5 miles north on Texas Highway 155 to Texas Forest Service fire tower, 400 feet west along road, and 100 feet north in woodland:

A1—0 to 7 inches; dark reddish brown (2.5YR 3/4) gravelly loam; moderate fine granular structure; slightly hard, very friable; common fine roots; about 30 percent ironstone pebbles and fragments 5 to 60 mm in size; medium acid; gradual smooth boundary.

B21t—7 to 16 inches; dark red (2.5YR 3/6) clay; moderate fine subangular blocky structure; very hard, firm; common fine roots; many continuous clay films on faces of peds; about 10 to 12 percent ironstone pebbles and fragments 5 to 50 mm in size; medium acid; gradual wavy boundary.

B22t—16 to 32 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; very hard, firm; few fine roots; continuous dark red (2.5YR 3/6) clay films on faces of peds; 5 to 10 percent ironstone pebbles and fragments of weathered glauconite; strongly acid; clear wavy boundary.

B&C—32 to 46 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; very hard, firm; few fine roots; 20 to 30 percent fragments of yellowish glauconite; contains layers of limonitic ironstone 1 to 3 cm thick; common fine pinkish gray spots; strongly acid; clear wavy boundary.

C—46 to 60 inches; yellowish brown (10YR 5/8) weathered glauconite; many fine white specks and streaks; massive; weakly cemented, friable; few fine roots; strongly acid.

The solum is 40 to 60 inches thick. Ironstone gravel is throughout the pedon and ranges from a few pebbles to 35 percent by volume.

The A horizon is dark reddish brown fine sandy loam, gravelly fine sandy loam, loam, or gravelly loam. Reaction ranges from medium acid to neutral.

The B2t horizon is red or dark red. It is clay or clay loam. Reaction ranges from very strongly acid to medium acid.

The B&C horizon is red or dark red clay or clay loam that is 10 to 30 percent fragments of yellowish weathered glauconite. Reaction is strongly acid to medium acid.

The underlying material is interbedded layers of glauconite, ironstone, and sandstone.

Rentzel series

The Rentzel series consists of deep, sandy soils on uplands. These soils are somewhat poorly drained and moderately slowly permeable. They formed in sandy and loamy sediments. Slopes range from 0 to 3 percent.

Typical pedon of Rentzel loamy fine sand, 0 to 3 percent slopes; from the intersection of Texas Highway 154 and U.S. Highway 271 in Gilmer, 4.3 miles west of Gilmer on Texas Highway 154 to county road, 1.2 miles west on county road to intersection, 0.8 mile north on county road to third pipeline crossing, and 1,200 feet north on pipeline in woodland:

Ap—0 to 6 inches; brown (10YR 5/3) loamy fine sand; weak granular structure; loose; common fine roots; medium acid; clear smooth boundary.

A21—6 to 16 inches; light yellowish brown (10YR 6/4) loamy fine sand, single grained; loose; common fine roots; strongly acid; gradual smooth boundary.

A22—16 to 28 inches; light yellowish brown (10YR 6/4) loamy fine sand; few coarse distinct strong brown (7.5YR 5/6) mottles; single grained; loose; common fine roots; strongly acid; clear smooth boundary.

B21t—28 to 34 inches; brownish yellow (10YR 6/6) sandy clay loam; many medium distinct light brownish gray (10YR 6/2) and common fine distinct red (2.5YR 4/8) mottles; weak subangular blocky structure; hard, friable; few fine roots; very strongly acid; gradual wavy boundary.

B22t—34 to 46 inches; mottled light brownish gray (10YR 6/2), yellowish brown (10YR 5/8), and red (2.5YR 4/8 and 10R 4/8) sandy clay loam; weak subangular blocky structure; hard, friable; few fine roots; 2 percent by volume plinthite; few thin shiny clay films; 2 percent ironstone pebbles; very strongly acid; gradual wavy boundary.

B23t—46 to 62 inches; mottled red (2.5YR 4/6), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/8) sandy clay loam; weak subangular blocky structure; hard, friable; few fine roots; 5 to 7 percent by volume nodular plinthite; few dark gray (10YR 4/1) clay flows; 2 percent ironstone pebbles; very strongly acid; gradual wavy boundary.

B24t—62 to 72 inches; reticulately mottled red (2.5YR 4/8), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/8) sandy clay loam; weak blocky structure; hard, friable; 5 to 7 percent by volume nodular plinthite; few dark gray (10YR 4/1) clay flows; 2 percent ironstone pebbles; very strongly acid.

The solum is more than 60 inches thick. Depth to horizons containing more than 5 percent nodular plinthite ranges from 36 to 58 inches.

The A horizon is 22 to 31 inches thick and is strongly acid or medium acid except where the soil has been limed. The A1 or Ap horizon is dark grayish brown, dark brown, and brown. The A2 horizon is pale brown or light yellowish brown. Mottles of light brownish gray, light gray, dark yellowish brown, yellowish brown, and strong brown occur in the lower part of some pedons.

The B2t horizon is yellowish brown or brownish yellow with mottles of gray, light brownish gray, light gray, red, yellowish red, and strong brown. Plinthite occurs as nodules and as masses within red mottles. It makes up 5 to 8 percent of the horizon. The texture of the B2t horizon is loam and sandy clay loam. It is extremely acid to strongly acid. A few ironstone pebbles are present throughout the B2t horizon of some pedons.

Ruston series

The Ruston series consists of deep, loamy soils on uplands. These soils are well drained and moderately permeable. They formed in loamy sediments. Slopes range from 3 to 5 percent.

Typical pedon of Ruston fine sandy loam; from the intersection of Texas Highway 155 (south) and U.S. Highway 80 in Big Sandy, 0.8 mile west on U.S. Highway 80, and 1,600 feet north in pasture:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium subangular blocky structure; slightly hard, very friable; many fine roots; slightly acid; clear smooth boundary.

A2—3 to 9 inches; brown (7.5YR 5/4) fine sandy loam; weak medium subangular blocky structure; slightly hard, very friable; many fine roots; medium acid; clear smooth boundary.

B21t—9 to 18 inches; red (2.5YR 4/6) sandy clay loam; moderate coarse subangular blocky structure parting to weak medium subangular blocky; slightly hard, friable; few fine roots; continuous dark red clay films on faces of peds; strongly acid; gradual boundary.

B22t—18 to 27 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; hard, friable; few fine roots; continuous dark red clay films on faces of peds; very strongly acid; gradual boundary.

B23t—27 to 46 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; hard, friable; few fine roots; few patchy clay films; very strongly acid; gradual boundary.

B24t&A'2—46 to 66 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; hard, friable; few fine roots; about 15 percent streaks and pockets of uncoated sand; few patchy clay films; very strongly acid.

The solum is more than 60 inches thick.

The A horizon is 8 to 16 inches thick and is strongly to slightly acid. The A1 horizon is dark grayish brown, dark brown, or brown. The A2 horizon is brown, strong brown, pale brown, or light yellowish brown.

The upper part of the B2t horizon is red or yellowish red with none to few brownish or yellowish mottles. The lower part of the horizon is reddish and some pedons have gray mottles. Pockets and streaks of uncoated sand make up 15 to 35 percent by volume of the lower part of the B2t horizon. Texture is loam or sandy clay loam, and reaction is very strongly acid to medium acid.

Sacul series

The Sacul series consists of deep, moderately well drained, slowly permeable loamy soils on uplands (fig. 20). These soils are moderately well drained and slowly permeable. They formed in stratified loamy and shaly sediments. Slopes range from 2 to 12 percent.

Typical pedon of Sacul fine sandy loam, 5 to 12 percent slopes; from the intersection of Farm Road 2206 and Texas Highway 42 west of Longview, 0.25 mile east on Farm Road 2206, 0.6 mile east on oil road, 0.25 mile south to property line, and 0.9 mile south to roadcut on west side of road in woodland:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; soft, very friable; many medium roots; strongly acid; clear smooth boundary.

A2—4 to 8 inches; brown (10YR 5/3) fine sandy loam; weak fine subangular blocky structure; soft, very friable; many medium roots; strongly acid; clear smooth boundary.

B21t—8 to 12 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; very hard, very firm; few fine roots; continuous clay films on faces of peds; very strongly acid; gradual smooth boundary.

B22t—12 to 30 inches; red (2.5YR 4/6) clay; common fine distinct light brownish gray and few fine distinct yellowish brown mottles; moderate fine subangular blocky structure; very hard, very firm; few fine roots; continuous clay films on faces of peds; very strongly acid; clear smooth boundary.

B23t—30 to 54 inches; light brownish gray (10YR 6/2) silty clay; common fine prominent red and common fine distinct yellowish brown mottles; moderate fine blocky structure; very hard, very firm; few fine roots; patchy clay films on ped faces; very strongly acid; gradual smooth boundary.

B3—54 to 64 inches; light gray (10YR 7/2) silty clay loam; common fine distinct strong brown mottles; few fragments of reddish brown (5YR 4/3) shale; weak medium blocky and platy structure; slightly hard, friable; few fine roots; very strongly acid.

The solum ranges from 40 to more than 68 inches in thickness.

The A1 horizon is very dark grayish brown, dark grayish brown, or dark brown. The A2 horizon is brown, pale brown, yellowish brown, or light yellowish brown. Reaction of the A horizon is strongly acid except where the soil has been limed.

The upper part of the B2t horizon is dark red, red, or yellowish red clay. Brownish and grayish mottles range from none to few. The lower part of the B2t horizon and the B3 horizon have similar colors and mottles range from few to many. The lower part of some pedons has a gray matrix with red mottles. Texture is clay or silty clay in the upper part and sandy clay loam or silty clay loam

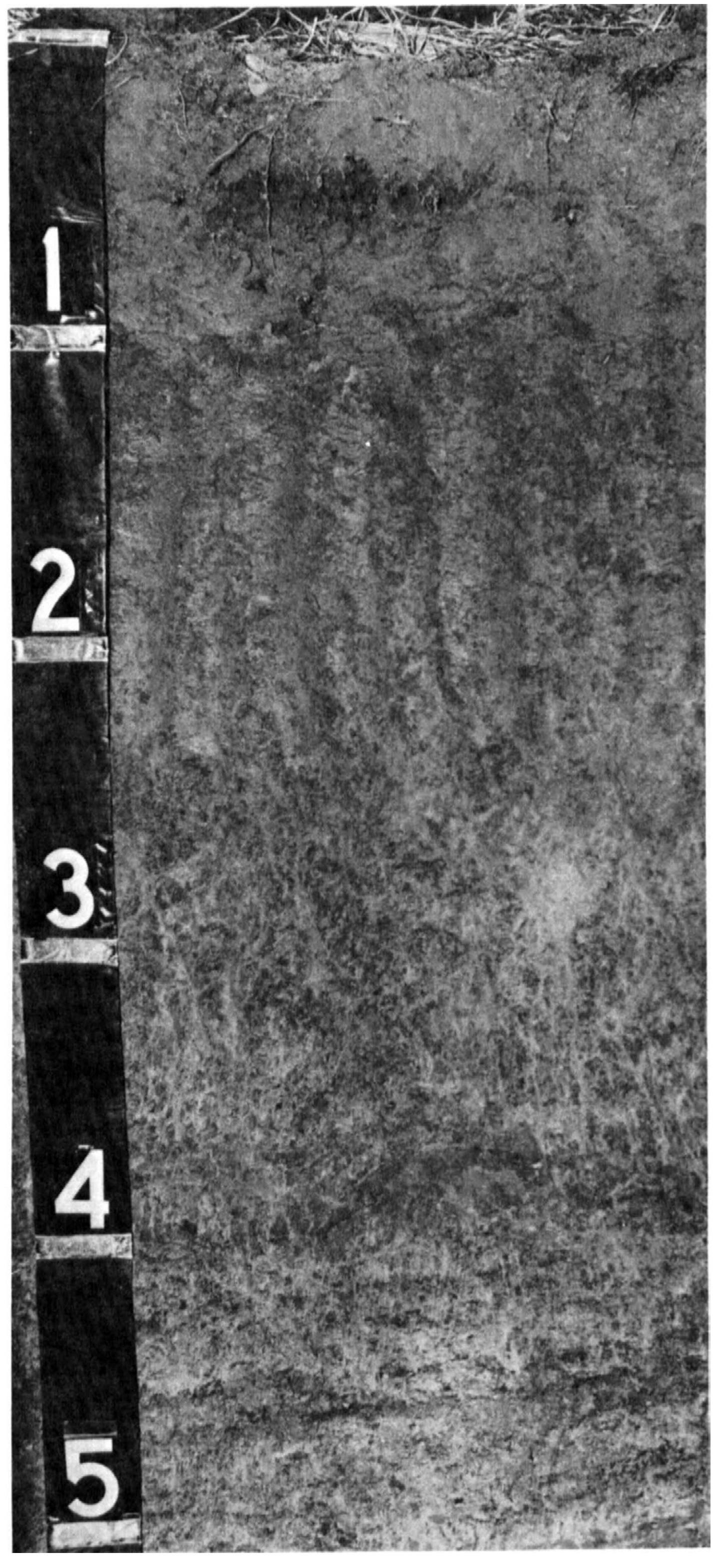


Figure 20.—Profile of Sacul fine sandy loam, 2 to 5 percent slopes. Mottling is throughout the subsoil. Scale is in feet.

in the lower part. Reaction is strongly to very strongly acid.

The C horizon, where present, is stratified red, yellow, and gray sandy loam, clay loam, weakly cemented sandstone, and shale. Thin layers of sandstone are present in some pedons.

Tenaha series

The Tenaha series consists of deep, well drained, moderately permeable loamy soils on uplands (fig. 21). These soils are well drained and moderately permeable. They formed in interbedded sandstone and shale sedimentary deposits. Slopes range from 8 to 20 percent.

Typical pedon of Tenaha loamy fine sand, 8 to 20 percent slopes; from the intersection of U.S. Highway 259 and Farm Road 449 about 2.5 miles north of Judson, 0.75 mile south on U.S. Highway 259, 1.4 miles west on Hamby Road, 0.35 mile north on Big Woods Road to roadcut on right in woodland:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; soft, loose; common fine roots; 2 percent by volume ironstone pebbles less than 1 inch across; strongly acid; clear smooth boundary.

A2—4 to 22 inches; brown (7.5YR 5/4) loamy fine sand; single grained; loose; common fine roots; 2 percent by volume ironstone pebbles less than 1 inch across; medium acid; gradual wavy boundary.

B1—22 to 29 inches; yellowish red (5YR 5/6) loamy fine sand; weak fine subangular blocky structure; slightly hard, very friable; few fine roots; few sand grains bridged with clay; 5 percent by volume ironstone fragments less than 3 inches across; medium acid; clear smooth boundary.

B21t—29 to 39 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; slightly hard, friable; few fine roots; continuous clay films on ped faces; very strongly acid; gradual wavy boundary.

B3—39 to 52 inches; red (2.5YR 4/8) loam; common medium prominent yellowish brown (10YR 5/8) mottles; moderate coarse platy structure; hard, firm; few fine roots; dark red patchy clay films on faces of peds; common mica flakes; very strongly acid; abrupt boundary.

C—52 to 64 inches; stratified red (2.5YR 4/8) and brownish yellow (10YR 6/6) weakly cemented sandstone and light gray (10YR 7/1) shaly clay; fractured discontinuous ironstone layer 4 to 5 cm thick in upper part of horizon; few fine roots; very strongly acid.

The solum ranges from 40 to 60 inches thick. The A horizon is strongly or medium acid except where the soil

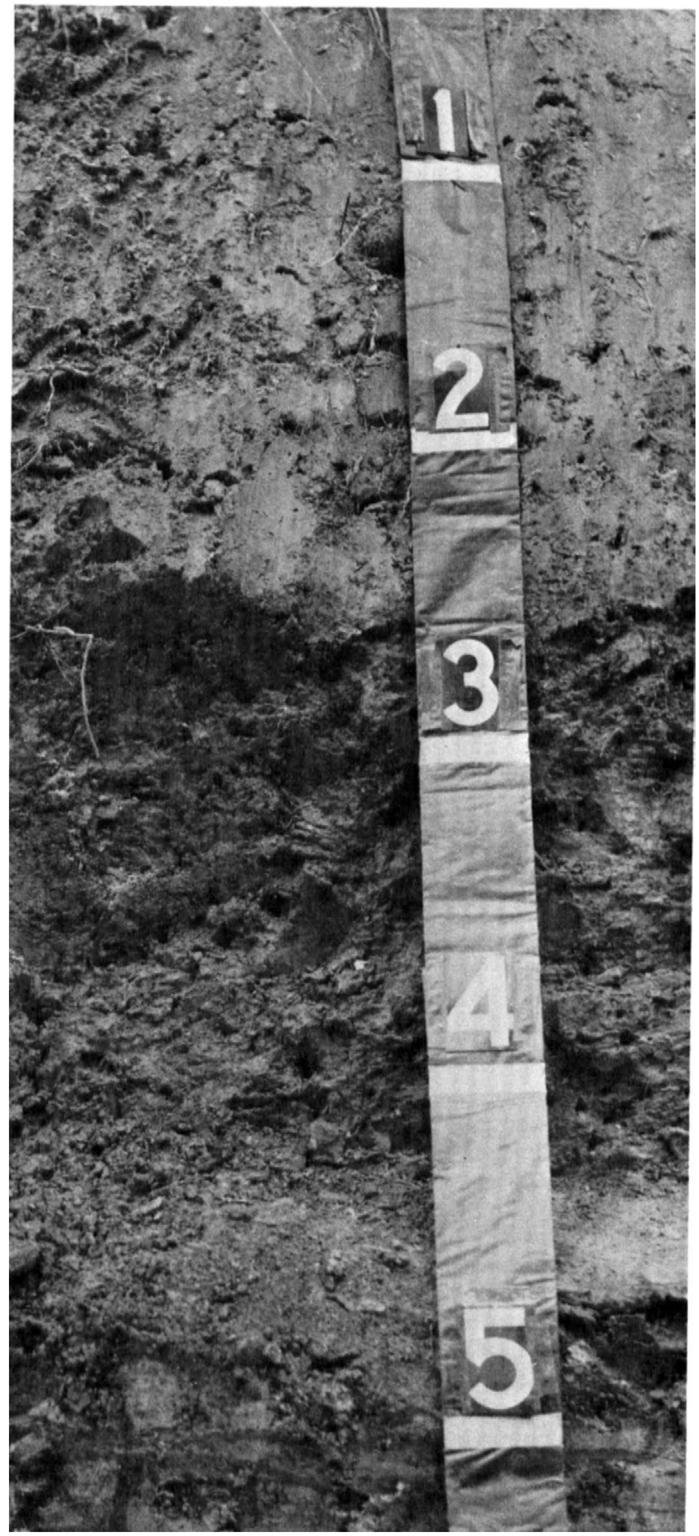


Figure 21.—Profile of Tenaha loamy fine sand, 8 to 20 percent slopes. Ferruginous sandstone and shale is at a depth of about 5 feet. Scale is in feet.

has been limed. The B2t horizon is very strongly or strongly acid.

The A horizon is 20 to 40 inches thick. The A1 horizon is very dark grayish brown, dark grayish brown, grayish brown, or brown. The A2 horizon is pale brown, brown, brownish yellow, or yellowish brown. Content of ironstone fragments in these horizons ranges from a few pebbles to 15 percent by volume.

The B2t horizon is red, yellowish red, yellowish brown, or strong brown, or it is mottled with these colors. Average clay content in the upper 20 inches is 22 to 35 percent. Gray mottles and common mica flakes are present in the lower part of some pedons.

The B3 horizon has reddish, yellowish, or brownish colors. Some pedons have common mica flakes and gray mottles. Texture is loam or fine sandy loam.

The C horizon is stratified layers of soft sandstone and shale or shaly clay. Intermittent and fractured layers of ironstone occur in some pedons.

Trep series

The Trep series consists of deep, moderately well drained, moderately slowly permeable, loamy soils on uplands. These soils are moderately well drained and moderately slowly permeable. They formed in sandy and loamy sediments. Slopes range from 1 to 8 percent.

Typical pedon of Trep loamy fine sand, 1 to 8 percent slopes; from the intersection of U.S. Highway 259 and Tryon Road north of Longview, 0.8 mile south on Tryon Road, 1.0 mile northeast on Adrian Road to intersection with Sam Page Road, and 400 feet south of intersection in woodland along west side of drain:

A1—0 to 6 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak granular structure; loose; many fine and medium roots; slightly acid; clear boundary.

A2—6 to 30 inches; pale brown (10YR 6/3) loamy fine sand; massive; loose; few fine and medium roots; medium acid; clear boundary.

B21t—30 to 40 inches; yellowish brown (10YR 5/8) sandy clay loam; common medium faint brownish yellow (10YR 6/6) and common fine prominent red mottles; weak subangular blocky structure; hard, friable; few fine roots; medium acid; gradual boundary.

B22t—40 to 48 inches; mottled yellowish brown (10YR 5/8), light brownish gray (10YR 6/2), and red (2.5YR 4/8) sandy clay loam; weak subangular blocky structure; hard, friable; few fine roots; very strongly acid; clear boundary.

B23t—48 to 64 inches; mottled red (10R 4/8), strong brown (7.5YR 5/8), and light brownish gray (10YR 6/2) sandy clay; weak subangular blocky structure; very hard, very firm; few fine roots; very strongly acid.

The A horizon is 20 to 40 inches thick. The A1 horizon is dark grayish brown, grayish brown, or brown. The A2 horizon is pale brown, brown, or light yellowish brown. Reaction ranges from strongly acid to slightly acid.

The upper B2t horizon is yellowish brown, light yellowish brown, or brownish yellow and contains red, yellowish red, or light brownish gray mottles. Texture is sandy clay loam or loam. The lower B2t horizon is mottled yellowish brown, brownish yellow, light brownish gray, gray, light gray, grayish brown, strong brown, dark red, or red. Texture is clay or sandy clay. Reaction of the B2t horizon is very strongly acid to medium acid.

Urbo series

The Urbo series consists of deep, clayey soils on flood plains (fig. 22). These soils are somewhat poorly drained and very slowly permeable. They formed in clayey alluvium deposits of the Sabine River. Slopes range from 0 to 1 percent.

Typical pedon of Urbo clay, frequently flooded; from intersection of Farm Road 2206 and Farm Road 1845, 1.6 miles west on Farm Road 2206, 1.5 miles south to pipeline, 0.4 mile southeast on pipeline, and 200 feet southwest in woodland:

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) clay; common fine distinct dark brown (10YR 4/3) mottles; moderate fine granular structure; very hard, very firm; many fine roots; strongly acid; clear smooth boundary.

B21g—4 to 18 inches; grayish brown (10YR 5/2) clay loam; many medium distinct dark yellowish brown (10YR 3/4) mottles; common fine subangular blocky structure; very hard, very firm; common fine roots; few black specks; very strongly acid; gradual wavy boundary.

B22g—18 to 36 inches; grayish brown (10YR 5/2) clay; many medium distinct yellowish brown (10YR 5/8) and common medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very hard, very firm; common fine roots; few black specks; very strongly acid; gradual wavy boundary.

B23g—36 to 56 inches; dark grayish brown (10YR 4/2) clay; few medium distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; very hard, very firm; few fine roots; very strongly acid; gradual wavy boundary.

B24g—56 to 70 inches; dark grayish brown (10YR 4/2) clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; hard, firm; few fine roots; few root channels coated with white; very strongly acid.

Thickness of the solum exceeds 60 inches. Soil reaction is very strongly or strongly acid. Clay content of

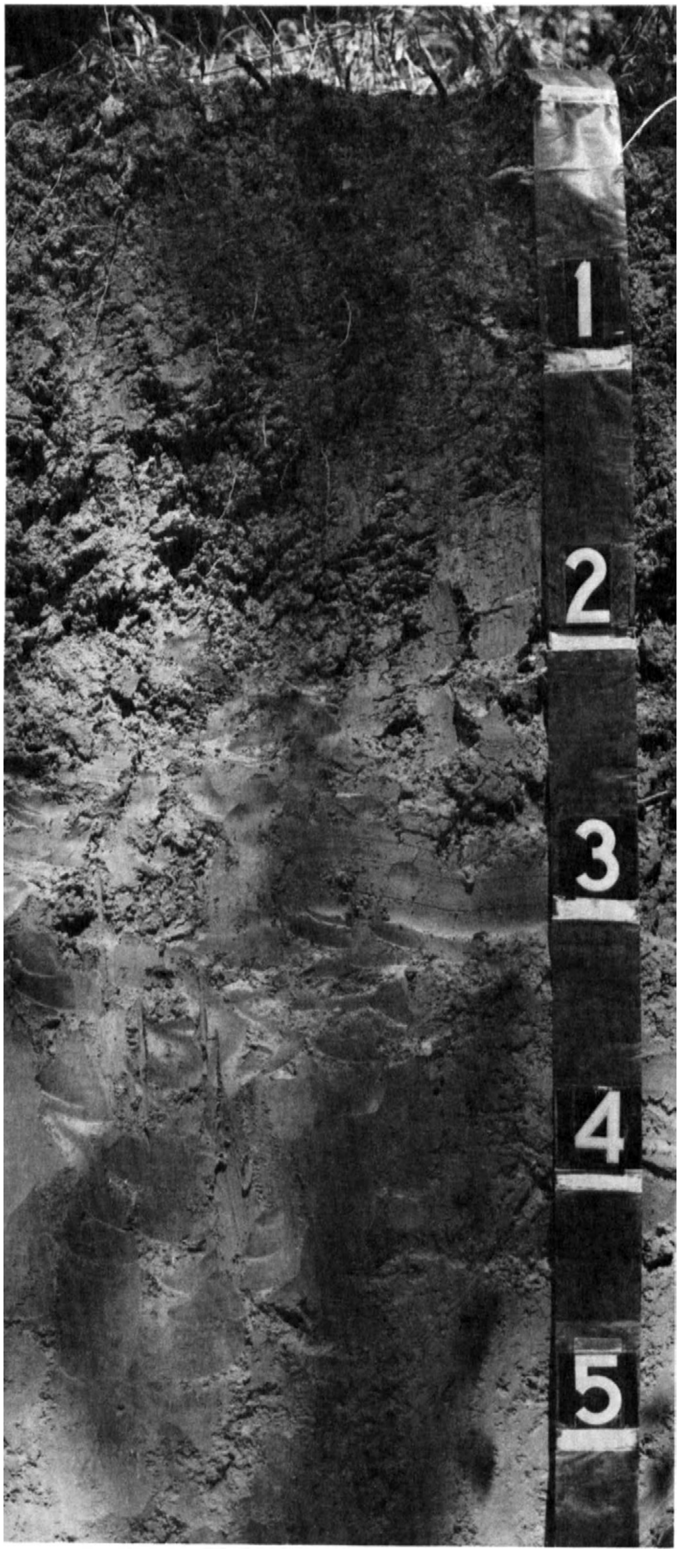


Figure 22.—Profile of Urbo clay, frequently flooded. The soil formed in clayey alluvial deposits along the Sabine River.

the 10- to 40-inch control section ranges from 35 to 55 percent.

The A horizon is very dark grayish brown, dark grayish brown, grayish brown, brown, or dark yellowish brown.

The B2g horizon is dark grayish brown or grayish brown; in addition, the lower part ranges to gray or light brownish gray. Brownish, grayish, and yellowish mottles occur throughout. Texture is silty clay loam, clay loam, silty clay, or clay. Some pedons have a few patches of oriented clay in pores or cracks. A few pressure faces or nonintersecting slickensides may be present in the lower part. Concretions of black or brown range from few to common in most pedons.

Wrightsville series

The Wrightsville series consists of deep, loamy soils on stream terraces. These soils are poorly drained and very slowly permeable. They formed in clayey alluvium of the Sabine River and some of the larger local streams. Slopes range from 0 to 1 percent.

Typical pedon of Wrightsville silt loam, 0 to 1 percent slopes; from the intersection of U.S. Highway 80 and Texas Highway 155 (north) in Big Sandy, 2 miles east on U.S. Highway 80 to Burnett Farm, and 0.5 mile southwest in pasture:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; slightly hard, friable; common fine roots; medium acid; clear boundary.

A2g—3 to 17 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct brownish yellow mottles; weak medium granular structure; slightly hard, friable; common fine roots; strongly acid; gradual boundary.

B21tg&A2g—17 to 29 inches; grayish brown (10YR 5/2) clay (B21tg); few fine distinct brownish yellow mottles; 20 percent tongues of light gray (10YR 7/1) silt loam (A2g); moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm; few fine roots; patchy clay films; very strongly acid; gradual boundary.

B22tg—29 to 48 inches; grayish brown (2.5Y 5/2) clay; few fine distinct dark yellowish brown mottles; moderate medium subangular blocky structure; very hard, very firm; few fine roots; patchy clay films; very strongly acid; gradual boundary.

B23tg—48 to 61 inches; light brownish gray (2.5Y 6/2) silty clay; common fine distinct dark yellowish brown mottles; moderate medium subangular blocky structure; very hard, very firm; few fine roots; patchy clay films; strongly acid; gradual boundary.

Cg—61 to 80 inches; light brownish gray (2.5Y 6/2) silty clay; common fine distinct yellowish brown mottles;

massive; very hard, very firm; few fine roots; few black concretions; strongly acid.

The solum ranges from 40 to over 72 inches thick.

The A1 horizon is very dark grayish brown, dark grayish brown, or grayish brown. The A2g horizon is gray, light gray, or light brownish gray. Reaction is very strongly acid and strongly acid except where the soil has been limed.

The B2tg horizon is grayish brown, light brownish gray, gray, or light gray. It is silty clay loam, silty clay, or clay with mottles in shades of yellow or brown. The B2tg&Ag horizon contains vertical streaks and pockets of gray silt loam A2 material. Reaction is very strongly acid to slightly acid.

The C horizon has similar colors and textures of the B2tg horizon.

formation of the soils

In this section the factors of soil formation are described as they relate to the soils in the survey area.

factors of soil formation

Soil is the product of soil-forming processes acting on geologic material. The characteristics of a soil at any given point are determined by (1) the physical and mineral composition of the *parent material,* (2) the *climate* under which the parent material accumulated and has existed since accumulation, (3) the *plant and animal life* on and in the soil, (4) the *relief,* or lay of the land, and (5) the length of *time* the forces of soil formation have acted on the soil material. All of these five factors are important in the formation of any soil, but the influence of each varies from place to place.

geology and parent material

Wendell F. Smith, geologist, Soil Conservation Service, helped prepare this section.

Upshur and Gregg Counties are in the West Gulf Coastal Plain physiographic province (*4*). Except on the relatively level flood plains of the principal streams, the terrain is gently rolling to hilly. Elevation ranges from about 680 feet on the Little Cypress-Sabine drainage divide to about 240 feet along the downstream reaches of the Sabine River. An elevation range of 350 to 450 feet is common throughout most of the survey area.

The major structural feature in the area is a troughlike depression, the long axis of which extends roughly from the northwest corner of Gregg County to the northeast corner of Upshur County. The land surface on either side of this axis dips toward it at about 15 feet per mile. The entire survey area is part of an extensive area of downwarping, which in its entirety is called the East Texas Embayment (*4*).

Formations of the Eocene Age are the principal outcrops in Upshur and Gregg Counties (*3*). These formations, in ascending order, include Carrizo Sand, Reklaw Formation, Queen City Sand, Weches Formation, and Sparta Sand. The Queen City Sand is the most extensive outcrop in the area. With some local exceptions, geologic formations under the Queen City Sand crop out in northeasterly trending belts that extend both north and south of Upshur and Gregg Counties. Eocene formations above the Queen City Sand are very limited in extent and occur mostly as erosional remnants across central parts of the survey area.

Carrizo Sand is the oldest formation exposed in the survey area. It crops out in small areas in northwestern Upshur County and in southern Gregg County. The Carrizo Sand is up to 150 feet thick and is composed of sand, silt, and clay with interbeds of indurated ironstone. This formation yields moderate to large quantities of fresh to slightly saline water to wells in Upshur and Gregg Counties (*6*). Loamy, sandy, and gravelly soils of the Bowie-Cuthbert-Kirvin, Lilbert, and Kullit-Sacul general soil map units formed in this outcrop.

The Reklaw Formation overlies the Carrizo Sand and crops out in small areas in northwestern Upshur County and in southern Gregg County. The formation has a maximum thickness of about 110 feet and typically consists of micaceous clay and minor amounts of sand. Also, the outcrop is characterized by ironstone seams and concretions at or near the land surface. The Reklaw Formation is not known to yield water to any wells in the survey area, but probably would yield small quantities in local areas where the formation is sandy (*6*). Soils of the Kullit-Sacul and Bowie-Cuthbert-Kirvin general soil map units are common in this outcrop area.

The Queen City Sand overlies the Reklaw Formation and crops out in 90 percent of Upshur and Gregg Counties. In contrast to the more gentle relief on the Reklaw Formation, relief on the Queen City Sand ranges from gently sloping to hilly. Queen City Sand has a maximum thickness of about 500 feet in the southwest corner of Upshur County. In general, wells in this formation are capable of furnishing small to moderate quantities of freshwater (*6*). Soils formed in this outcrop are the same as those formed in the Carrizo Sand and Reklaw Formation.

The Weches Formation and Sparta Sand have a very limited extent in the survey area. They occur as scattered erosional remnants of relatively sharp relief extending across central Upshur County from its southwest corner to its northeast boundary.

The Weches Formation is up to 75 feet thick and consists of interbedded glauconitic clay and sand. At shallow depths and in outcrops this formation contains enough secondary deposits of limonite to make it a durable caprock in local areas. Consequently, a very hilly terrain is characteristic of the Weches outcrop. The formation is not known to yield water to wells in the survey area (*6*). It has weathered to form the gravelly Redsprings soils of the Cuthbert-Redsprings general soil map unit.

The overlying Sparta Sand ranges to a thickness of 250 feet in the southwest corner of Upshur County and consists mostly of sand with interbeds of sandy clay. Although Sparta Sand yields only small quantities of freshwater to wells, water from springs at the base of the Sparta outcrop makes a significant contribution to the base flow of Big Sandy Creek (*6*). Soils of the sandy Darco and Lilbert general soil map units formed in this formation.

Quaternary sediments occur in and near flood plains of the principal streams. These deposits have a maximum thickness of about 60 feet and generally consist of clay, silt, sand, and minor amounts of gravel. Quaternary sediment includes fluviatile terrace deposits of the Pleistocene Age, which are remnants of old stream flood plains that are about 2 to 10 feet higher in the landscape than the present-day flood plains. Among the soils that formed the ancient alluvial deposits are those of the Mollville-Latch general soil map unit. Present-day alluvial sediments along the Sabine River are from west of the survey area. These deposits, which are clayey, are parent materials for soils of the Urbo general soil map unit. Soils of the Mantachie-luka general soil map unit formed on loamy and sandy deposits of present-day flood plains along the larger local stream courses. The alluvium in the survey area is not known to yield water to wells, but it likely is capable of yielding small amounts (*6*).

climate

Upshur and Gregg Counties have a warm, moist, humid, subtropical climate that is characterized by heavy rains. Summers are hot and humid. Winters are mild but well defined. Seasonal changes are gradual.

The climate under which the soils formed greatly influenced their development. The high humidity and rainfall caused most of the loamy soils on uplands to be strongly weathered, leached, and acidic. Therefore, most of the soils in the survey area are deep. Most of the differences between the soils, however, cannot be attributed to the climate because it has always been relatively uniform throughout the survey area.

plant and animal life

Plants, burrowing animals, earthworms, micro-organisms, and human civilization have directly influenced the formation of soils.

Soils that form under trees accumulate organic matter in the upper few inches. This is quickly destroyed, however, when the soils are cultivated, as has happened in most cultivated areas of Kullit very fine sandy loam, 1 to 3 percent slopes.

Earthworms, crayfish, and burrowing rodents help mix the material within the soil. Earthworms are numerous. They enhance the movement of air, water, and plant nutrients in these soils. Crayfish are most numerous in soils that have clayey layers and slow runoff. The crayfish bring soil material from the lower layers to the surface. Burrowing animals such as gophers help mix and aerate loamy soils such as the Bowie and Ruston soils.

relief

Relief affects the formation of soils by influencing drainage, infiltration, and plant cover. It strongly influences how much water percolates through the soil. For example, the strongly sloping to steep Cuthbert soils have a thinner solum than the nearby, gently sloping Bowie soils. This is because water runs off faster from the steeper slopes, less moisture infiltrates into the soil, and the plant cover is thinner.

Most of the soils are gently sloping to steep, but shallow soil development as a result of relief is not pronounced in Upshur and Gregg Counties. The abundant rainfall and long warm periods have overcome most of this effect, and nearly all the soils are deeply developed.

Relief also influences soil drainage. Soils on nearly level terraces have poor drainage. Mollville and Wrightsville soils formed in these areas.

time

The length of time that climate, living organisms, and relief act upon the parent material affects the kind of soil that forms. The effects of time are modified by the other four factors of soil formation. In general, however, soils with no definite horizons are young, or immature. Soils that have well-defined horizons are old, or mature.

In Upshur and Gregg Counties the soils range from young to old. luka, Mantachie, and Urbo soils are on flood plains and show faint horizons, if any. On the other hand, Bowie, Kirvin, and Cuthbert soils on the uplands are mature soils that have distinct horizons showing little resemblance to the original parent material.

references

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Barnes, Virgil E., project director. 1964. Geologic atlas of Texas, Tyler sheet. University of Texas, map and text.

(4) Fenneman, N.M. 1946. Physical division of the states. U.S. Dep. Inter., Geol. Surv., map.

(5) Texas Crop and Livestock Reporting Service. 1979. Texas county statistics. Tex. Dep. Agr.—USDA ESCS publ., 297 pp.

(6) Texas Water Development Board. 1969. Ground-water resources of Gregg and Upshur Counties. Tex. Dep. Water Resour., rep. 101, 76 pp., illus.

(7) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. (Supplements replacing pp. 173-188 issued May 1962)

(8) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

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

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

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

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

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

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

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

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

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

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.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

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. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

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

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

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

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the

surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

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

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.

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.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

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

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

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

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

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.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

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

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

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

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

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

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

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

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

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

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

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

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

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

Parent material. The unconsolidated organic and mineral material in which soil forms.

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, stoniness, and thickness.

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

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

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

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

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

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

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.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

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.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

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.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

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.

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 layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

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

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

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

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Based on data recorded in the period 1951-78 at Gilmer, Texas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	54.2	31.8	43.1	79	10	48	2.84	1.32	4.14	6	1.3
February---	59.4	35.8	47.6	81	15	98	3.39	1.72	4.89	6	.5
March------	66.7	42.5	54.7	86	23	219	3.82	1.86	5.52	6	.1
April------	75.6	52.2	63.9	89	32	417	5.91	2.40	8.87	7	.0
May--------	82.3	60.1	71.2	93	43	657	4.58	1.97	6.79	6	.0
June-------	89.1	67.1	78.1	99	53	843	3.75	.94	5.97	5	.0
July-------	93.7	70.5	82.1	103	59	995	2.84	.88	4.45	4	.0
August-----	94.0	69.5	81.8	104	57	986	2.39	.69	3.75	4	.0
September--	87.3	63.7	75.5	100	47	765	4.04	1.25	6.34	5	.0
October----	78.1	51.8	65.0	93	32	470	3.04	.90	4.77	4	.0
November---	66.5	41.6	54.1	84	21	180	4.05	1.95	5.85	5	.1
December---	58.2	34.8	46.5	79	15	54	3.93	1.60	5.89	6	.4
Yearly:											
Average--	75.4	51.8	63.6	---	---	---	---	---	---	---	---
Extreme--	---	---	---	104	9	---	---	---	---	---	---
Total----	---	---	---	---	---	5,732	44.58	34.57	56.18	64	2.4

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

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Based on data recorded in the period 1951-78 at Gilmer, Texas]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 20	March 27	April 6
2 years in 10 later than--	March 10	March 21	March 31
5 years in 10 later than--	February 20	March 8	March 19
First freezing temperature in fall:			
1 year in 10 earlier than--	November 7	October 29	October 19
2 years in 10 earlier than--	November 17	November 5	October 25
5 years in 10 earlier than--	December 6	November 19	November 5

TABLE 3.--GROWING SEASON LENGTH

[Based on data recorded in the period 1951-78 at Gilmer, Texas]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	248	224	203
8 years in 10	261	235	212
5 years in 10	286	255	231
2 years in 10	312	276	249
1 year in 10	328	286	258

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Upshur County	Gregg County	Total-- Area	Extent
		Acres	Acres	Acres	Pct
BeB	Bienville loamy fine sand, 0 to 3 percent slopes	2,351	1,513	3,864	0.6
BoC	Bowie fine sandy loam, 2 to 5 percent slopes	67,750	30,125	97,875	17.5
BuC	Bowie-Urban land complex, 2 to 5 percent slopes	1,303	11,643	12,946	2.3
ByC	Briley loamy fine sand, 2 to 5 percent slopes	8,285	1,234	9,519	1.7
CbE	Cuthbert fine sandy loam, 8 to 25 percent slopes	69,610	34,747	104,357	18.7
CcE	Cuthbert-Urban land complex, 8 to 25 percent slopes	136	742	878	0.2
CrF	Cuthbert and Redsprings soils, 15 to 40 percent slopes	8,625	0	8,625	1.5
DaC	Darco fine sand, 2 to 5 percent slopes	10,294	453	10,747	1.9
DaE	Darco fine sand, 8 to 15 percent slopes	4,048	9	4,057	0.7
ErC	Elrose fine sandy loam, 3 to 5 percent slopes	1,243	0	1,243	0.2
Iu	Iuka fine sandy loam, frequently flooded	25,560	7,571	33,131	5.9
KfC	Kirvin very fine sandy loam, 2 to 5 percent slopes	2,813	9,838	12,651	2.3
KgC	Kirvin gravelly fine sandy loam, 3 to 8 percent slopes	23,887	12,282	36,169	6.5
KrC	Kirvin-Urban land complex, 2 to 5 percent slopes	237	2,945	3,182	0.6
KsC	Kirvin soils, graded, 3 to 8 percent slopes	1,670	722	2,392	0.4
KtB	Kullit very fine sandy loam, 1 to 3 percent slopes	14,496	6,069	20,565	3.7
KuB	Kullit-Urban land complex, 1 to 3 percent slopes	402	1,387	1,789	0.3
LaA	Latch-Mollville complex, 0 to 1 percent slopes	3,604	4,419	8,023	1.4
LbC	Lilbert loamy fine sand, 2 to 5 percent slopes	51,273	12,336	63,609	11.4
LuC	Lilbert-Urban land complex, 2 to 5 percent slopes	552	657	1,209	0.2
Ma	Mantachie loam, frequently flooded	28,252	9,452	37,704	6.8
MoA	Mollville very fine sandy loam, 0 to 1 percent slopes	1,114	611	1,725	0.3
Ow	Oil wasteland	0	259	259	*
ReB	Rentzel loamy fine sand, 0 to 3 percent slopes	2,936	137	3,073	0.6
RuC	Ruston fine sandy loam, 3 to 5 percent slopes	2,699	3,219	5,918	1.1
SaC	Sacul fine sandy loam, 2 to 5 percent slopes	3,128	3,660	6,788	1.2
SaD	Sacul fine sandy loam, 5 to 12 percent slopes	8,094	3,172	11,266	2.0
SuC	Sacul-Urban land complex, 2 to 8 percent slopes	1,269	1,831	3,100	0.6
TeE	Tenaha loamy fine sand, 8 to 20 percent slopes	20,946	3,156	24,102	4.3
TrC	Trep loamy fine sand, 1 to 8 percent slopes	250	124	374	0.1
Ud	Udorthents, loamy and clayey	125	722	847	0.2
Ur	Urbo clay, frequently flooded	4,627	12,141	16,768	3.0
WrA	Wrightsville-Raino complex, 0 to 1 percent slopes	2,181	3,304	5,485	1.0
	Water	3,200	1,280	4,480	0.8
	Total	376,960	181,760	558,720	100.0

* Less than 0.1 percent.

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	Corn	Dry peas	Watermelons	Improved bermuda-grass	Common bermuda-grass	Bahiagrass	Oats
	Bu	Lb	Ton	AUM*	AUM*	AUM*	AUM*
BeB------------------------ Bienville	60	900	9.0	11.0	6.0	6.0	---
BoC------------------------ Bowie	70	1,300	8.0	12.0	8.0	9.0	6.0
BuC------------------------ Bowie-Urban land	---	---	---	---	---	---	---
ByC------------------------ Briley	50	1,000	10.0	9.0	4.0	4.0	5.0
CbE------------------------ Cuthbert	---	---	---	7.0	5.0	5.0	---
CcE------------------------ Cuthbert-Urban land	---	---	---	---	---	---	---
CrF------------------------ Cuthbert and Redsprings	---	---	---	---	---	4.0	---
DaC------------------------ Darco	45	900	9.0	7.0	---	---	---
DaE------------------------ Darco	---	---	---	5.5	---	---	---
ErC------------------------ Elrose	70	1,300	8.0	10.0	7.0	7.0	6.0
Iu------------------------- Iuka	---	---	---	10.0	8.0	9.0	---
KfC------------------------ Kirvin	45	1,000	---	9.0	8.0	8.0	5.0
KgC------------------------ Kirvin	40	900	---	8.0	7.0	7.0	---
KrC------------------------ Kirvin-Urban land	---	---	---	---	---	---	---
KsC------------------------ Kirvin	---	---	---	6.0	5.0	5.0	---
KtB------------------------ Kullit	65	1,300	---	12.0	8.0	9.0	5.5
KuB------------------------ Kullit-Urban land	---	---	---	---	---	---	---
LaA------------------------ Latch-Mollville	---	---	---	7.0	6.0	7.0	---
LbC------------------------ Lilbert	50	1,000	10.0	9.0	4.0	4.0	5.0
LuC------------------------ Lilbert-Urban land	---	---	---	---	---	---	---
Ma------------------------- Mantachie	---	---	---	---	6.0	8.0	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Dry peas	Watermelons	Improved bermuda-grass	Common bermuda-grass	Bahiagrass	Oats
	Bu	Lb	Ton	AUM*	AUM*	AUM*	AUM*
MoA------------------------ Mollville	---	---	---	---	6.0	8.0	---
Ow.** Oil wasteland							
ReB------------------------ Rentzel	---	---	---	9.0	6.0	8.0	5.0
RuC------------------------ Ruston	70	1,300	8.0	12.0	8.0	9.0	6.0
SaC------------------------ Sacul	45	1,000	---	---	6.5	7.5	5.0
SaD------------------------ Sacul	---	---	---	---	5.5	6.5	---
SuC------------------------ Sacul-Urban land	---	---	---	---	---	---	---
TeE------------------------ Tenaha	---	---	---	7.0	5.0	5.0	---
TrC------------------------ Trep	50	1,000	9.0	9.0	5.0	6.0	5.0
Ud.** Udorthents							
Ur------------------------- Urbo	---	---	---	---	6.0	8.0	---
WrA------------------------ Wrightsville-Raino	---	---	---	---	7.0	8.0	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
BeB: Bienville	2s	Slight	Moderate	Moderate	--------	Loblolly pine Longleaf pine Shortleaf pine	90 80 85	Loblolly pine, slash pine.
BoC: Bowie	2o	Slight	Slight	Slight	Slight	Loblolly pine Shortleaf pine	86 80	Loblolly pine, slash pine, shortleaf pine.
BuC:* Bowie	2o	Slight	Slight	Slight	Slight	Loblolly pine Shortleaf pine	86 80	Loblolly pine, slash pine, shortleaf pine.
Urban land.								
ByC: Briley	3s	Slight	Slight	Moderate	Moderate	Loblolly pine Shortleaf pine Slash pine	80 70 ---	Loblolly pine, slash pine.
CbE: Cuthbert	3c	Moderate	Moderate	Moderate	Slight	Loblolly pine Shortleaf pine	84 68	Loblolly pine.
CcE:* Cuthbert	3c	Moderate	Moderate	Moderate	Slight	Loblolly pine Shortleaf pine	84 68	Loblolly pine.
Urban land.								
CrF:* Cuthbert	4r	Severe	Severe	Moderate	Slight	Loblolly pine Shortleaf pine	70 60	Loblolly pine.
Redsprings	3c	Moderate	Moderate	Moderate	Slight	Loblolly pine Shortleaf pine	79 69	Loblolly pine.
DaC, DaE: Darco	3s	Slight	Moderate	Severe	Moderate	Loblolly pine Shortleaf pine	80 68	Loblolly pine, shortleaf pine.
ErC: Elrose	2o	Slight	Slight	Slight	Slight	Loblolly pine Shortleaf pine Sweetgum Southern red oak	89 85 90 ---	Loblolly pine, shortleaf pine.
Iu: Iuka	1w	Slight	Moderate	Moderate	Severe	Loblolly pine Sweetgum Eastern cottonwood Water oak	100 100 105 100	Loblolly pine, eastern cottonwood, yellow-poplar.
KfC: Kirvin	3o	Slight	Slight	Slight	Slight	Loblolly pine Shortleaf pine	85 72	Loblolly pine, slash pine.
KgC: Kirvin	4f	Moderate	Moderate	Slight	Slight	Loblolly pine Shortleaf pine	70 60	Loblolly pine.
KrC:* Kirvin	3o	Slight	Slight	Slight	Slight	Loblolly pine Shortleaf pine	85 72	Loblolly pine, slash pine.
Urban land.								
KsC*: Kirvin	4c	Moderate	Moderate	Moderate	Slight	Loblolly pine Shortleaf pine	70 60	Loblolly pine.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
KtB----------------- Kullit	2w	Slight	Moderate	Slight	Moderate	Loblolly pine--------	90	Loblolly pine, sweetgum, cherrybark oak.
						Southern red oak----	---	
						White oak-----------	---	
						Sweetgum------------	---	
KuB:*								
Kullit-------------	2w	Slight	Moderate	Slight	Moderate	Loblolly pine--------	90	Loblolly pine, sweetgum, cherrybark oak.
						Southern red oak----	---	
						White oak-----------	---	
						Sweetgum------------	---	
Urban land.								
LaA:*								
Latch--------------	1w	Slight	Moderate	Moderate	Moderate	Loblolly pine--------	98	Loblolly pine, water oak, southern red oak.
						Water oak-----------	---	
						Willow oak----------	---	
						Southern red oak----	---	
						Sweetgum------------	---	
						Post oak------------	---	
						Winged elm----------	---	
Mollville----------	3w	Slight	Severe	Moderate	Severe	Water oak-----------	80	Water oak, sweetgum, loblolly pine.
						Willow oak----------	80	
						Sweetgum------------	80	
						Loblolly pine--------	82	
LbC----------------- Lilbert	3s	Slight	Slight	Moderate	Moderate	Loblolly pine--------	80	Loblolly pine, slash pine.
						Shortleaf pine------	70	
						Longleaf pine-------	70	
						Sweetgum------------	---	
						Southern red oak----	---	
LuC:*								
Lilbert------------	3s	Slight	Slight	Moderate	Moderate	Loblolly pine--------	80	Loblolly pine, slash pine.
						Shortleaf pine------	70	
						Longleaf pine-------	70	
						Sweetgum------------	---	
						Southern red oak----	---	
Urban land.								
Ma------------------ Mantachie	1w	Slight	Severe	Severe	Severe	Green ash-----------	80	Green ash, eastern cottonwood, cherrybark oak, loblolly pine, sweetgum, yellow-poplar.
						Eastern cottonwood--	90	
						Cherrybark oak------	100	
						Loblolly pine--------	98	
						Sweetgum------------	95	
						Yellow-poplar-------	95	
MoA----------------- Mollville	3w	Slight	Severe	Moderate	Severe	Water oak-----------	80	Water oak, sweetgum, loblolly pine.
						Willow oak----------	80	
						Sweetgum------------	80	
						Loblolly pine--------	82	
ReB----------------- Rentzel	2w	Slight	Moderate	Moderate	Moderate	Loblolly pine--------	92	Loblolly pine.
						Shortleaf pine------	81	
RuC----------------- Ruston	2o	Slight	Slight	Slight	---------	Loblolly pine--------	91	Loblolly pine, slash pine, longleaf pine.
						Slash pine----------	91	
						Longleaf pine-------	76	
SaC, SaD------------ Sacul	3c	Moderate	Slight	Slight	---------	Loblolly pine--------	80	Loblolly pine, shortleaf pine.
						Shortleaf pine------	70	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
SuC:*								
Sacul	3c	Moderate	Slight	Slight	---------	Loblolly pine Shortleaf pine	80 70	Loblolly pine, shortleaf pine.
Urban land.								
TeE Tenaha	3s	Slight	Slight	Severe	Slight	Loblolly pine Shortleaf pine	80 70	Slash pine, loblolly pine.
TrC Trep	2s	Slight	Slight	Moderate	Moderate	Loblolly pine Shortleaf pine	90 80	Loblolly pine, shortleaf pine, slash pine.
Ur Urbo	1w	Slight	Severe	Moderate	---------	Green ash Eastern cottonwood Cherrybark oak Sweetgum	93 108 99 98	Eastern cottonwood, loblolly pine, sweetgum, American sycamore, yellow-poplar.
WrA:*								
Wrightsville	3w	Slight	Severe	Moderate	---------	Loblolly pine Sweetgum Water oak	80 80 80	Loblolly pine, sweetgum, water oak, willow oak.
Raino	2w	Slight	Moderate	Slight	Moderate	Loblolly pine Shortleaf pine Water oak	88 80 90	Loblolly pine, shortleaf pine.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION

[Only the soils suitable for production of commercial trees are listed]

Map symbol and soil name	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
BeB-----------------	Favorable	1,650	Pinehill bluestem	20
Bienville	Normal	1,350	Little bluestem	20
	Unfavorable	1,000	Panicum	20
			Longleaf uniola	10
			Threeawn	10
BoC-----------------	Favorable	3,500	Pinehill bluestem	50
Bowie	Normal	3,000	Pineywoods dropseed	10
	Unfavorable	2,000	Longleaf uniola	10
			Big bluestem	10
			Indiangrass	5
ByC-----------------	Favorable	1,500	Pinehill bluestem	50
Briley	Normal	1,200	Longleaf uniola	10
	Unfavorable	900	Fine-leaf bluestem	10
			Pineywoods dropseed	10
CbE-----------------	Favorable	2,300	Pinehill bluestem	50
Cuthbert	Normal	1,800	Big bluestem	10
	Unfavorable	1,300	Longleaf uniola	10
			Fine-leaf bluestem	10
			Pineywoods dropseed	5
			Cutover muhly	5
CrF:*				
Cuthbert-----------	Favorable	2,200	Pinehill bluestem	50
	Normal	1,700	Longleaf uniola	10
	Unfavorable	1,200	Fine-leaf bluestem	10
			Big bluestem	5
			Pineywoods dropseed	5
Redsprings---------	Favorable	2,300	Pinehill bluestem	50
	Normal	1,800	Fine-leaf bluestem	10
	Unfavorable	1,200	Longleaf uniola	10
			Big bluestem	10
			Pineywoods dropseed	5
			Indiangrass	5
			Cutover muhly	5
DaC, DaE------------	Favorable	1,650	Pinehill bluestem	50
Darco	Normal	1,350	Longleaf uniola	10
	Unfavorable	1,000	Indiangrass	5
			Fine-leaf bluestem	5
			Splitbeard bluestem	5
			Pineywoods dropseed	5
			Purple lovegrass	5
			Fringeleaf paspalum	5
ErC-----------------	Favorable	1,500	Pinehill bluestem	50
Elrose	Normal	1,200	Longleaf uniola	10
	Unfavorable	900	Pineywoods dropseed	10
			Big bluestem	10
Iu------------------	Favorable	1,800	Pinehill bluestem	50
Iuka	Normal	1,500	Beaked panicum	10
	Unfavorable	1,200	Spreading panicum	10
			Brownseed paspalum	10
			Longleaf uniola	10

See footnote at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Map symbol and soil name	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
KfC: Kirvin	Favorable	2,000	Pinehill bluestem	50
	Normal	1,300	Longleaf uniola	10
	Unfavorable	1,000	Pineywoods dropseed	5
			Indiangrass	5
			Brownseed paspalum	5
			American beautyberry	5
KgC: Kirvin	Favorable	2,400	Pinehill bluestem	50
	Normal	1,900	Longleaf uniola	10
	Unfavorable	1,500	American beautyberry	5
			Indiangrass	5
			Brownseed paspalum	5
			Fine-leaf bluestem	5
KsC*: Kirvin	Favorable	2,300	Pinehill bluestem	50
	Normal	1,800	Fine-leaf bluestem	10
	Unfavorable	1,200	Longleaf uniola	10
			Big bluestem	10
			Splitbeard bluestem	5
KtB: Kullit	Favorable	2,500	Beaked panicum	10
	Normal	2,000	Sedge	10
	Unfavorable	1,600	Switchgrass	5
			Canada wildrye	5
			Greenbrier	5
			Broadleaf uniola	5
LaA:*				
Latch	Favorable	1,800	Pinehill bluestem	50
	Normal	1,500	Brownseed paspalum	10
	Unfavorable	1,000	Longleaf uniola	10
			Beaked panicum	10
			Greenbrier	5
			Spreading panicum	5
			Southern bayberry	5
Mollville	Favorable	2,000	Pinehill bluestem	35
	Normal	1,750	Switchgrass	10
	Unfavorable	1,400	Longleaf uniola	10
			Cutover muhly	10
			Switchcane	5
			Beaked panicum	5
			Blackgum	5
			Spreading panicum	5
LbC: Lilbert	Favorable	1,500	Pinehill bluestem	50
	Normal	1,200	Fine-leaf bluestem	10
	Unfavorable	900	Longleaf uniola	10
			Pineywoods dropseed	10
			Indiangrass	5
Ma: Mantachie	Favorable	2,300	Longleaf uniola	35
	Normal	2,000	Pinehill bluestem	20
	Unfavorable	1,750	Sedges	5
MoA: Mollville	Favorable	2,000	Pinehill bluestem	35
	Normal	1,750	Switchgrass	10
	Unfavorable	1,400	Longleaf uniola	10
			Cutover muhly	10
			Switchcane	5
			Beaked panicum	5
			Blackgum	5
			Spreading panicum	5
ReB: Rentzel	Favorable	1,800	Pinehill bluestem	50
	Normal	1,400	Longleaf uniola	10
	Unfavorable	1,000	Beaked panicum	10
			Purpletop	5

See footnote at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Map symbol and soil name	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
RuC: Ruston	Favorable	1,500	Pinehill bluestem	50
	Normal	1,200	Longleaf uniola	10
	Unfavorable	900	Beaked panicum	10
			Panicum	10
SaC, SaD: Sacul	Favorable	3,000	Bluestem	25
	Normal	2,200	Beaked panicum	15
	Unfavorable	1,500	Uniola	10
			Pineywoods dropseed	10
			Panicum	5
			Sedge	5
TeE: Tenaha	Favorable	1,500	Pinehill bluestem	50
	Normal	1,200	Fine-leaf bluestem	10
	Unfavorable	900	Longleaf uniola	10
			Indiangrass	5
			Slender bluestem	5
			Pineywoods dropseed	5
			Dogwood	5
			Yaupon	5
TrC: Trep	Favorable	1,500	Pinehill bluestem	50
	Normal	1,200	Longleaf uniola	10
	Unfavorable	900	Indiangrass	10
			Purpletop	5
			Pineywoods dropseed	5
			Fine-leaf bluestem	5
			Purple lovegrass	5
Ur: Urbo	Favorable	1,300	Pinehill bluestem	35
	Normal	1,050	Switchcane	10
	Unfavorable	800	Beaked panicum	5
			Longleaf uniola	5
			Purpletop	5
			Sedges	5
WrA:*				
Wrightsville	Favorable	2,400	Switchgrass	10
	Normal	1,750	Beaked panicum	10
	Unfavorable	1,250	Uniola	10
			Paspalum	5
			Cutover muhly	5
			Low panicum	5
			Sedge	5
Raino	Favorable	2,000	Pinehill bluestem	25
	Normal	1,600	Beaked panicum	10
	Unfavorable	1,200	Longleaf uniola	10
			Spreading panicum	5
			Brownseed paspalum	5
			Cutover muhly	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
BeB: Bienville	Slight	Slight	Slight	Slight.
BoC: Bowie	Slight	Slight	Moderate: slope.	Slight.
BuC:*				
Bowie	Slight	Slight	Moderate: slope.	Slight.
Urban land.				
ByC: Briley	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
CbE: Cuthbert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
CcE:*				
Cuthbert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Urban land.				
CrF:*				
Cuthbert	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Redsprings	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.
DaC: Darco	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
DaE: Darco	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, slope.	Severe: too sandy.
ErC: Elrose	Slight	Slight	Moderate: slope.	Slight.
Iu: Iuka	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
KfC: Kirvin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.
KgC: Kirvin	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight.
KrC:*				
Kirvin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.
Urban land.				

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
KsC*: Kirvin	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
KtB: Kullit	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Severe: erodes easily.
KuB:*				
Kullit	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Severe: erodes easily.
Urban land.				
LaA:*				
Latch	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Mollville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
LbC: Lilbert	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.
LuC:*				
Lilbert	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.
Urban land.				
Ma: Mantachie	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
MoA: Mollville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ow.* Oil wasteland				
ReB: Rentzel	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.
RuC: Ruston	Slight	Slight	Moderate: slope, small stones.	Slight.
SaC: Sacul	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
SaD: Sacul	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
SuC:*				
Sacul	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
Urban land.				
TeE: Tenaha	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
TrC-------------------- Trep	Slight---------------	Slight---------------	Moderate: too sandy, slope.	Slight.
Ud.* Udorthents				
Ur--------------------- Urbo	Severe: flooding, wetness, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey, wetness, flooding.	Severe: too clayey.
WrA:*				
Wrightsville----------	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
Raino-----------------	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
BeB: Bienville	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
BoC: Bowie	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
ByC: Briley	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
CbE: Cuthbert	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CrF:*										
Cuthbert	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Redsprings	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
DaC: Darco	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
DaE: Darco	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ErC: Elrose	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Iu: Iuka	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
KfC: Kirvin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KgC: Kirvin	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KsC*: Kirvin	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
KtB: Kullit	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
LaA:*										
Latch	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Mollville	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
LbC: Lilbert	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Ma: Mantachie	Poor	Fair	Fair	Good	---	Fair	Fair	Fair	Good	Fair.
MoA: Mollville	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ow*: Oil wasteland	---	---	---	---	---	---	---	---	---	---
ReB: Rentzel	Poor	Fair	Good	Good	Good	Fair	Poor	Fair	Good	Poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--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	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
RuC: Ruston	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SaC: Sacul	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SaD: Sacul	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
TeE: Tenaha	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
TrC: Trep	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Ud*: Udorthents	---	---	---	---	---	---	---	---	---	---
Ur: Urbo	Poor	Fair	Fair	Good	---	Fair	Fair	Fair	Fair	Fair.
WrA:* Wrightsville	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Raino	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BeB---------------- Bienville	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty.
BoC---------------- Bowie	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
BuC:*						
Bowie-------------	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
Urban land.						
ByC---------------- Briley	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
CbE---------------- Cuthbert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Moderate: droughty.
CcE:*						
Cuthbert----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Moderate: droughty.
Urban land.						
CrF:*						
Cuthbert----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Redsprings--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
DaC---------------- Darco	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: too sandy.
DaE---------------- Darco	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: too sandy, slope.
ErC---------------- Elrose	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
Iu----------------- Iuka	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
KfC---------------- Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
KgC---------------- Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: small stones.
KrC:*						
Kirvin------------	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Urban land.						
KsC*--------------- Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: too clayey.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
KtB---------------- Kullit	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Slight.
KuB:*						
Kullit------------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Slight.
Urban land.						
LaA:*						
Latch-------------	Severe: cutbanks cave.	Slight----------	Moderate: wetness.	Slight----------	Slight----------	Moderate: droughty.
Mollville---------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
LbC---------------- Lilbert	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty.
LuC:*						
Lilbert-----------	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty.
Urban land.						
Ma----------------- Mantachie	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
MoA---------------- Mollville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ow.* Oil wasteland						
ReB---------------- Rentzel	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
RuC---------------- Ruston	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength.	Slight.
SaC---------------- Sacul	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
SaD---------------- Sacul	Moderate: too clayey, slope, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
SuC:*						
Sacul-------------	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Urban land.						
TeE---------------- Tenaha	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
TrC---------------- Trep	Severe: cutbanks cave.	Slight----------	Moderate: wetness.	Moderate: slope.	Moderate: low strength.	Slight.
Ud.* Udorthents						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ur----------------- Urbo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding.	Severe: flooding, too clayey.
WrA:*						
Wrightsville-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Raino------------	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness, shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: low strength, wetness, shrink-swell.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--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
BeB------------------ Bienville	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
BoC------------------ Bowie	Severe: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
BuC:*					
Bowie---------------	Severe: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
Urban land.					
ByC------------------ Briley	Slight-----------	Moderate: seepage, slope.	Slight-----------	Severe: seepage.	Good.
CbE------------------ Cuthbert	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
CcE:*					
Cuthbert------------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
Urban land.					
CrF:*					
Cuthbert------------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
Redsprings----------	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
DaC------------------ Darco	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
DaE------------------ Darco	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
ErC------------------ Elrose	Slight-----------	Moderate: seepage, slope.	Slight-----------	Slight-----------	Fair: too clayey.
Iu------------------- Iuka	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
KfC, KgC------------- Kirvin	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
KrC:*					
Kirvin--------------	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
KrC:*					
Urban land.					
KsC*: Kirvin	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
KtB: Kullit	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
KuB:*					
Kullit	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
Urban land.					
LaA:*					
Latch	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: too sandy, wetness.
Mollville	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
LbC: Lilbert	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Severe: seepage.	Good.
LuC:*					
Lilbert	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Severe: seepage.	Good.
Urban land.					
Ma: Mantachie	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
MoA: Mollville	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Ow.*					
Oil wasteland					
ReB: Rentzel	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
RuC: Ruston	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: too clayey.
SaC: Sacul	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
SaD: Sacul	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: too clayey.	Moderate: slope, wetness.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SuC:*					
Sacul	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Urban land.					
TeE Tenaha	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Severe: seepage.	Fair: too sandy, slope.
TrC Trep	Severe: percs slowly, wetness.	Moderate: seepage, wetness.	Moderate: wetness.	Slight	Poor: thin layer.
Ud.* Udorthents					
Ur Urbo	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
WrA:*					
Wrightsville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Raino	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Fair: thin layer, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
BeB: Bienville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
BoC: Bowie	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
BuC:*				
Bowie	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Urban land.				
ByC: Briley	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
CbE: Cuthbert	Fair: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
CcE:*				
Cuthbert	Fair: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Urban land.				
CrF:*				
Cuthbert	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Redsprings	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
DaC, DaE: Darco	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
ErC: Elrose	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Iu: Iuka	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
KfC, KgC: Kirvin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
KrC:*				
Kirvin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Urban land.				
KsC*: Kirvin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
KtB: Kullit	Fair: low strength, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
KuB:*				
Kullit	Fair: low strength, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Urban land.				
LaA:*				
Latch	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Mollville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
LbC Lilbert	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
LuC:*				
Lilbert	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Urban land.				
Ma Mantachie	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MoA Mollville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ow.* Oil wasteland				
ReB Rentzel	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
RuC Ruston	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
SaC, SaD Sacul	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
SuC:*				
Sacul	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Urban land.				
TeE Tenaha	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, slope.
TrC Trep	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Ud.* Udorthents				
Ur Urbo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
WrA:*				
Wrightsville	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
WrA:*				
Raino	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
BeB---------------- Bienville	Severe: seepage.	Severe: piping.	Deep to water----	Favorable--------	Droughty.
BoC---------------- Bowie	Moderate: seepage.	Moderate: piping.	Deep to water----	Favorable--------	Favorable.
BuC:*					
Bowie-------------	Moderate: seepage.	Moderate: piping.	Deep to water----	Favorable--------	Favorable.
Urban land.					
ByC---------------- Briley	Moderate: seepage.	Moderate: piping.	Deep to water----	Favorable--------	Droughty.
CbE---------------- Cuthbert	Severe: slope.	Moderate: piping.	Deep to water----	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
CcE:*					
Cuthbert----------	Severe: slope.	Moderate: piping.	Deep to water----	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
Urban land.					
CrF:*					
Cuthbert----------	Severe: slope.	Moderate: piping.	Deep to water----	Slope------------	Slope, droughty.
Redsprings--------	Severe: slope.	Moderate: hard to pack.	Deep to water----	Slope------------	Slope.
DaC---------------- Darco	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Too sandy--------	Droughty.
DaE---------------- Darco	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water----	Too sandy, slope.	Droughty, slope.
ErC---------------- Elrose	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water----	Favorable--------	Favorable.
Iu----------------- Iuka	Moderate: seepage.	Severe: piping, wetness.	Flooding---------	Wetness----------	Wetness.
KfC---------------- Kirvin	Moderate: slope.	Severe: hard to pack.	Deep to water----	Erodes easily----	Erodes easily.
KgC---------------- Kirvin	Moderate: slope.	Severe: hard to pack.	Deep to water----	Favorable--------	Favorable.
KrC:*					
Kirvin------------	Moderate: slope.	Severe: hard to pack.	Deep to water----	Erodes easily----	Erodes easily.
Urban land.					
KsC*--------------- Kirvin	Slight------------	Severe: hard to pack.	Deep to water----	Favorable--------	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
KtB: Kullit	Moderate: seepage.	Moderate: piping, wetness.	Favorable	Erodes easily, wetness.	Erodes easily.
KuB:* Kullit	Moderate: seepage.	Moderate: piping, wetness.	Favorable	Erodes easily, wetness.	Erodes easily.
Urban land.					
LaA:* Latch	Severe: seepage.	Severe: piping, seepage.	Deep to water	Wetness, too sandy.	Droughty.
Mollville	Moderate: seepage.	Severe: piping, ponding.	Percs slowly, ponding.	Ponding, percs slowly.	Wetness, percs slowly.
LbC: Lilbert	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Droughty.
LuC:* Lilbert	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Droughty.
Urban land.					
Ma: Mantachie	Moderate: seepage.	Severe: piping, wetness.	Flooding	Wetness	Wetness.
MoA: Mollville	Moderate: seepage.	Severe: piping, ponding.	Percs slowly, ponding.	Ponding, percs slowly.	Wetness, percs slowly.
Ow.* Oil wasteland					
ReB: Rentzel	Severe: seepage.	Severe: wetness.	Cutbanks cave	Wetness	Favorable.
RuC: Ruston	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Favorable	Favorable.
SaC: Sacul	Slight	Severe: hard to pack.	Deep to water	Percs slowly, wetness.	Percs slowly.
SaD: Sacul	Slight	Severe: hard to pack.	Deep to water	Slope, percs slowly, wetness.	Slope, percs slowly.
SuC:* Sacul	Slight	Severe: hard to pack.	Deep to water	Percs slowly, wetness.	Percs slowly.
Urban land.					
TeE: Tenaha	Moderate: seepage.	Moderate: piping.	Deep to water	Slope	Droughty, slope.
TrC: Trep	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable.
Ud.* Udorthents					

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Ur----------------- Urbo	Slight------------	Severe: wetness.	Percs slowly, flooding.	Wetness, percs slowly.	Wetness, percs slowly.
WrA:*					
Wrightsville-----	Slight------------	Severe: hard to pack, wetness.	Percs slowly-----	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Raino------------	Slight------------	Severe: hard to pack.	Percs slowly-----	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
BeB-------------- Bienville	0-50	Loamy fine sand	SM	A-2-4, A-4	0	100	100	90-100	17-50	<25	NP-3
	50-80	Loamy fine sand, fine sandy loam, fine sand.	SM, ML	A-2-4, A-4	0	100	100	90-100	16-55	<25	NP-3
BoC-------------- Bowie	0-12	Fine sandy loam	SM, SM-SC, ML	A-2-4, A-4	0	98-100	98-100	95-100	30-55	<25	NP-6
	12-72	Sandy clay loam, clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	90-100	90-100	85-100	40-77	20-48	8-30
BuC:*											
Bowie-----------	0-12	Fine sandy loam	SM, SM-SC, ML	A-2-4, A-4	0	98-100	98-100	95-100	30-55	<25	NP-6
	12-72	Sandy clay loam, clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	90-100	90-100	85-100	40-77	20-48	8-30
Urban land.											
ByC-------------- Briley	0-26	Loamy fine sand	SM, ML	A-2-4, A-4	0	97-100	95-100	80-100	17-51	<25	NP-4
	26-80	Fine sandy loam, sandy clay loam.	SC, CL	A-4, A-6	0	95-100	95-100	85-100	36-65	22-39	8-22
CbE-------------- Cuthbert	0-8	Fine sandy loam	SM, SM-SC, ML	A-2-4, A-4	0-1	83-100	78-100	73-98	20-55	<30	NP-6
	8-36	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0-1	95-100	90-100	80-100	45-98	37-63	20-40
	36-60	Stratified fine sandy loam and shale.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-3	89-100	85-100	80-100	28-84	29-45	11-26
CcE:*											
Cuthbert---------	0-8	Fine sandy loam	SM, SM-SC, ML	A-2-4, A-4	0-1	83-100	78-100	73-98	20-55	<30	NP-6
	8-36	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0-1	95-100	90-100	80-100	45-98	37-63	20-40
	36-60	Stratified fine sandy loam and shale.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-3	89-100	85-100	80-100	28-84	29-45	11-26
Urban land.											
CrF:*											
Cuthbert---------	0-16	Gravelly fine sandy loam.	SM, GM	A-1-B, A-2-4, A-4	0-5	55-78	50-78	35-73	20-49	<25	NP-4
	16-38	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0-1	95-100	90-100	80-100	45-98	37-63	20-40
	38-60	Stratified fine sandy loam and shaly clay.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-3	89-100	85-100	80-100	28-84	29-45	11-26
Redsprings-------	0-7	Gravelly loam----	SC, SM-SC	A-2-4, A-4, A-6, A-2-6	0-7	70-80	65-80	55-70	20-45	20-40	4-20
	7-32	Clay loam, clay	CL, CH	A-7-6	0-7	70-100	70-98	65-85	51-75	41-60	18-35
	32-46	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7-6	0-7	95-100	90-100	75-100	51-90	32-56	16-30
	46-60	Weathered glauconite.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
DaC--------------- Darco	0-62	Fine sand--------	SM	A-2	0-5	95-100	95-100	60-90	15-30	<30	NP-4
	62-80	Sandy clay loam, sandy loam.	SC, SM-SC	A-2, A-4, A-6	0	100	95-100	75-90	25-50	20-40	5-18
DaE--------------- Darco	0-65	Fine sand--------	SM	A-2	0-5	95-100	95-100	60-90	15-30	<30	NP-4
	65-80	Sandy clay loam, sandy loam.	SC, SM-SC	A-2, A-4, A-6	0	100	95-100	75-90	25-50	20-40	5-18
ErC--------------- Elrose	0-8	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	85-100	75-95	70-85	30-45	<25	NP-7
	8-80	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	90-100	85-95	80-90	36-55	20-38	8-20
Iu---------------- Iuka	0-12	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2	0	95-100	90-100	70-100	30-60	<20	NP-7
	12-22	Fine sandy loam, loam, sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	85-100	65-100	36-75	<30	NP-7
	22-60	Sandy loam, fine sandy loam, loam.	SM, ML	A-2, A-4	0	95-100	90-100	70-100	25-60	<30	NP-7
KfC--------------- Kirvin	0-12	Very fine sandy loam.	SM, ML	A-4	0-2	85-100	78-98	70-95	36-70	<25	NP-4
	12-51	Clay loam, sandy clay, clay.	CL, CH	A-7	0-1	95-100	95-100	85-100	75-95	45-67	25-43
	51-61	Stratified sandy clay loam and shale.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32
KgC--------------- Kirvin	0-10	Gravelly fine sandy loam.	SM, GM	A-1-b, A-2-4, A-4	0-5	55-80	50-78	35-70	25-49	<25	NP-4
	10-42	Clay loam, sandy clay, clay.	CL, CH	A-7	0-1	95-100	95-100	85-100	75-95	45-67	25-43
	42-57	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7	0-1	95-100	90-100	75-100	51-90	32-52	16-32
	57-65	Stratified sandy clay loam to very shaly clay.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32
KrC:* Kirvin-----------	0-12	Very fine sandy loam.	SM, ML	A-4	0-2	85-100	78-98	70-95	36-70	<25	NP-4
	12-51	Clay loam, sandy clay, clay.	CL, CH	A-7	0-1	95-100	95-100	85-100	75-95	45-67	25-43
	51-61	Stratified sandy clay loam and shale.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32
Urban land.											
KsC*-------------- Kirvin	0-40	Sandy clay--------	CL, CH	A-7	0-2	95-100	95-100	85-99	75-95	45-67	25-43
	40-60	Stratified sandstone and shale.	---	---	---	---	---	---	---	---	---
KtB--------------- Kullit	0-7	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	94-100	51-75	<28	NP-7
	7-49	Loam, sandy clay loam, clay loam.	CL	A-4, A-6	0	100	98-100	90-100	55-85	25-40	8-18
	49-70	Sandy clay, clay	CL, CH	A-7	0	100	92-100	85-95	55-90	43-53	20-27
KuB:* Kullit-----------	0-7	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	94-100	51-75	<28	NP-7
	7-49	Loam, sandy clay loam, clay loam.	CL	A-4, A-6	0	100	98-100	90-100	55-85	25-40	8-18
	49-70	Sandy clay, clay	CL, CH	A-7	0	100	92-100	85-95	55-90	43-53	20-27

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
KuB:* Urban land.											
LaA:* Latch-----------	0-52	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	95-100	95-100	80-100	15-40	<25	NP-6
	52-62	Sandy clay loam, loam, fine sandy loam.	SC, CL	A-4, A-6	0	95-100	95-100	80-100	40-55	23-39	8-20
	62-80	Loamy fine sand, fine sand, sand.	SM, SM-SC	A-3, A-2-4	0	95-100	95-100	65-95	5-25	<25	NP-6
Mollville--------	0-9	Very fine sandy loam.	ML, SM, SM-SC, CL	A-4	0	100	100	85-97	40-65	<30	NP-8
	9-47	Sandy clay loam, loam.	CL, SC	A-6, A-4	0	100	100	90-100	45-75	25-40	8-22
	47-77	Loamy fine sand, fine sandy loam, sandy clay loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	0	95-100	95-100	60-80	20-80	<25	NP-8
LbC--------------- Lilbert	0-30	Loamy fine sand	SM	A-2-4, A-4	0	95-100	95-100	80-98	17-40	<25	NP-4
	30-48	Sandy clay loam	SC, CL	A-6, A-4	0	95-100	95-100	85-100	36-55	25-39	8-22
	48-72	Sandy clay loam	SC, CL	A-6, A-4, A-2-4, A-2-6	0	90-100	90-100	85-100	30-55	25-39	8-20
LuC:* Lilbert----------	0-30	Loamy fine sand	SM	A-2-4, A-4	0	95-100	95-100	80-98	17-40	<25	NP-4
	30-48	Sandy clay loam	SC, CL	A-6, A-4	0	95-100	95-100	85-100	36-55	25-39	8-22
	48-72	Sandy clay loam	SC, CL	A-6, A-4, A-2-4, A-2-6	0	90-100	90-100	85-100	30-55	25-39	8-20
Urban land.											
Ma---------------- Mantachie	0-8	Loam-------------	CL-ML, SM-SC, SM, ML	A-4	0-5	95-100	90-100	60-85	40-60	<20	NP-5
	8-65	Loam, clay loam, sandy clay loam.	CL, SC, SM-SC, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	45-80	20-40	5-15
MoA--------------- Mollville	0-8	Very fine sandy loam.	ML, SM, CL-ML, SM-SC	A-4	0	100	100	85-97	40-65	<30	NP-8
	8-55	Sandy clay loam, loam.	CL, SC	A-6, A-4	0	100	100	90-100	45-75	25-40	8-22
	55-67	Loamy fine sand, fine sandy loam, sandy clay loam.	SM, ML, SM-SC, CL-ML	A-2, A-4	0	95-100	95-100	60-80	20-80	<25	NP-8
Ow.* Oil wasteland											
ReB--------------- Rentzel	0-28	Loamy fine sand	SM	A-2-4, A-4	0	97-100	95-100	75-98	15-40	<30	NP-4
	28-72	Sandy clay loam, fine sandy loam.	SC, CL, SM-SC, CL-ML	A-6, A-4, A-7	0	95-100	90-100	75-98	36-55	20-43	4-22
RuC--------------- Ruston	0-9	Fine sandy loam	SM, ML	A-4, A-2-4	0	85-100	78-100	65-100	30-75	<20	NP-3
	9-66	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	85-100	78-100	70-100	36-75	30-40	11-20

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--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	
SaC--------------- Sacul	0-9	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	80-100	40-65	<22	NP-3
	9-44	Clay, silty clay	CH, CL	A-7	0	95-100	90-100	85-96	79-90	45-70	20-40
	44-65	Silty clay loam, clay loam, stratified shale.	CL, CH, SC	A-6, A-7, A-4	0	95-100	90-100	85-100	40-90	25-55	8-32
SaD--------------- Sacul	0-8	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	80-100	40-65	<22	NP-3
	8-54	Clay, silty clay	CH, CL	A-7	0	95-100	90-100	85-96	79-90	45-70	20-40
	54-64	Silty clay loam, clay loam.	CL, CH, SC	A-6, A-7, A-4	0	95-100	90-100	85-100	40-90	25-55	8-32
SuC:*											
Sacul-----------	0-9	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	80-100	40-65	<22	NP-3
	9-44	Clay, silty clay	CH, CL	A-7	0	95-100	90-100	85-96	79-90	45-70	20-40
	44-65	Silty clay loam, clay loam, stratified shale.	CL, CH, SC	A-6, A-7, A-4	0	95-100	90-100	85-100	40-90	25-55	8-32
Urban land.											
TeE--------------- Tenaha	0-29	Loamy fine sand	SM	A-2-4	0	95-100	95-100	70-85	15-34	<25	NP
	29-52	Sandy clay loam, loam.	SC, CL	A-6, A-4	0	95-100	95-100	80-100	36-55	25-35	8-15
	52-64	Stratified fine sandy loam to very shaly clay.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-3	89-100	85-100	80-100	28-60	25-45	11-26
TrC--------------- Trep	0-30	Loamy fine sand	SM	A-2-4	0	100	95-100	90-95	15-30	<25	NP
	30-48	Sandy clay loam, loam.	SC, CL	A-6	0	100	95-100	80-90	40-70	25-40	11-20
	48-64	Sandy clay, clay	CL	A-6, A-7	0	100	95-100	85-95	55-75	25-45	11-27
Ud.* Udorthents											
Ur---------------- Urbo	0-70	Clay, clay loam	CL, CH	A-7, A-6	0	100	100	95-100	80-98	34-62	20-36
WrA:*											
Wrightsville----	0-17	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	75-100	<31	NP-10
	17-61	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	90-100	41-65	22-40
	61-80	Silty clay loam, silty clay, silt loam.	CL, CH	A-7, A-6	0	100	95-100	95-100	90-100	35-55	16-30
Raino-----------	0-20	Loam-------------	ML, CL	A-4	0	95-100	95-100	80-100	51-80	<30	NP-10
	20-32	Loam, sandy clay loam, clay loam.	CL, SC, SM-SC, CL-ML	A-6, A-4	0	95-100	95-100	80-100	40-70	20-40	5-20
	32-68	Clay, sandy clay, silty clay.	CH, CL	A-7	0	95-100	95-100	80-100	55-90	46-74	24-45
	68-80	Sandy clay loam, clay loam, clay.	CL, CH	A-7	0	95-100	95-100	80-100	55-90	41-60	18-35

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that the data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
BeB Bienville	0-50	5-15	1.35-1.60	2.0-6.0	0.08-0.11	4.5-6.5	Low	0.20	5	.5-2
	50-80	5-20	1.35-1.80	2.0-6.0	0.08-0.13	4.5-6.0	Low	0.20		
BoC Bowie	0-12	5-15	1.40-1.60	2.0-6.0	0.10-0.15	5.1-6.5	Low	0.32	5	<1
	12-72	18-35	1.60-1.75	0.6-2.0	0.15-0.20	4.5-5.5	Low	0.32		
BuC:*										
Bowie	0-12	5-15	1.40-1.60	2.0-6.0	0.10-0.15	5.1-6.5	Low	0.32	5	<1
	12-72	18-35	1.60-1.75	0.6-2.0	0.15-0.20	4.5-5.5	Low	0.32		
Urban land.										
ByC Briley	0-26	5-18	1.50-1.65	6.0-20	0.07-0.11	4.5-6.5	Low	0.20	5	<1
	26-80	15-35	1.55-1.69	0.6-2.0	0.13-0.17	4.5-6.0	Low	0.24		
CbE Cuthbert	0-8	2-15	---	2.0-6.0	0.11-0.15	4.5-6.5	Low	0.37	3	<1
	8-36	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	36-60	20-45	1.40-1.65	0.06-0.6	0.08-0.15	3.6-5.0	Moderate	0.32		
CcE:*										
Cuthbert	0-8	2-15	---	2.0-6.0	0.11-0.15	4.5-6.5	Low	0.37	3	<1
	8-36	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	36-60	20-45	1.40-1.65	0.06-0.6	0.08-0.15	3.6-5.0	Moderate	0.32		
Urban land.										
CrF:*										
Cuthbert	0-16	2-15	---	2.0-6.0	0.10-0.14	4.5-6.5	Low	0.20	3	<1
	16-38	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	38-60	20-45	1.40-1.65	0.06-0.6	0.08-0.15	3.6-5.0	Moderate	0.32		
Redsprings	0-7	2-15	1.35-1.55	0.6-2.0	0.08-0.12	5.6-7.3	Low	0.20	4	<1
	7-32	35-60	1.30-1.45	0.2-0.6	0.12-0.18	4.5-6.5	Moderate	0.32		
	32-46	25-55	1.30-1.50	0.2-0.6	0.12-0.17	4.5-6.0	Moderate	0.32		
	46-60	---	---	---	---	---	---	---	---	---
DaC Darco	0-62	3-15	1.50-1.65	6.0-20	0.07-0.11	4.5-6.5	Low	0.17	5	<1
	62-80	12-35	1.55-1.75	0.6-2.0	0.11-0.16	4.5-6.5	Low	0.24		
DaE Darco	0-65	3-15	1.50-1.65	6.0-20	0.07-0.11	4.5-6.5	Low	0.17	5	<1
	65-80	12-35	1.55-1.75	0.6-2.0	0.11-0.16	4.5-6.5	Low	0.24		
ErC Elrose	0-8	3-15	1.30-1.60	2.0-6.0	0.10-0.15	5.1-6.5	Low	0.24	5	.5-2
	8-80	20-35	1.35-1.65	0.6-2.0	0.13-0.18	4.5-6.5	Low	0.32		
Iu Iuka	0-12	6-15	1.40-1.60	2.0-6.0	0.10-0.15	5.1-6.0	Low	0.24	5	.5-2
	12-22	8-18	1.40-1.60	0.6-2.0	0.10-0.20	4.5-5.5	Low	0.28		
	22-60	5-15	1.45-1.65	0.6-2.0	0.10-0.20	4.5-5.5	Low	0.20		
KfC Kirvin	0-12	2-15	---	2.0-6.0	0.11-0.16	5.1-7.3	Low	0.37	4	<2
	12-51	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	51-61	20-45	1.40-1.65	0.06-0.2	0.08-0.16	3.6-5.0	Moderate	0.32		
KgC Kirvin	0-10	2-15	---	2.0-6.0	0.08-0.12	5.1-7.3	Low	0.20	4	<2
	10-42	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	42-57	25-50	1.35-1.60	0.2-0.6	0.10-0.16	3.6-5.0	Moderate	0.32		
	57-65	20-45	1.40-1.65	0.06-0.2	0.08-0.16	3.6-5.0	Moderate	0.32		
KrC:*										
Kirvin	0-12	2-15	---	2.0-6.0	0.11-0.16	5.1-7.3	Low	0.37	4	<2
	12-51	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	Moderate	0.32		
	51-61	20-45	1.40-1.65	0.06-0.2	0.08-0.16	3.6-5.0	Moderate	0.32		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
KrC:*										
Urban land.										
KsC*-------------- Kirvin	0-40	35-60	1.30-1.45	0.2-0.6	0.12-0.18	3.6-5.5	Moderate-----	0.32	4	<.5
	40-60	---	---	---	---	---	-------------	----	---	---
KtB-------------- Kullit	0-7	10-18	1.35-1.60	0.6-2.0	0.13-0.20	5.1-6.5	Low----------	0.37	5	.5-1
	7-49	18-35	1.40-1.65	0.6-2.0	0.11-0.15	4.5-5.5	Low----------	0.28		
	49-70	35-42	1.40-1.70	0.2-0.6	0.11-0.15	4.5-5.0	Moderate-----	0.32		
KuB:*										
Kullit----------	0-7	10-18	1.35-1.60	0.6-2.0	0.13-0.20	5.1-6.5	Low----------	0.37	5	.5-1
	7-49	18-35	1.40-1.65	0.6-2.0	0.11-0.15	4.5-5.5	Low----------	0.28		
	49-70	35-42	1.40-1.70	0.2-0.6	0.11-0.15	4.5-5.0	Moderate-----	0.32		
Urban land.										
LaA:*										
Latch-----------	0-52	3-12	1.50-1.65	6.0-20.0	0.05-0.11	4.5-6.5	Low----------	0.17	5	<1
	52-62	18-35	1.55-1.70	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.24		
	62-80	2-10	1.50-1.70	6.0-20.0	0.05-0.11	5.1-6.5	Low----------	0.17		
Mollville-------	0-9	5-18	1.40-1.65	0.6-2.0	0.10-0.17	4.5-6.0	Low----------	0.32	5	.5-1
	9-47	22-35	1.50-1.69	0.06-0.2	0.12-0.17	4.5-6.0	Moderate-----	0.32		
	47-77	5-35	1.50-1.65	0.6-2.0	0.07-0.11	5.6-7.8	Low----------	0.32		
LbC-------------- Lilbert	0-30	3-15	1.50-1.65	6.0-20	0.07-0.11	4.5-6.5	Low----------	0.20	5	<1
	30-48	20-35	1.55-1.69	0.6-2.0	0.13-0.17	4.5-6.0	Low----------	0.24		
	48-72	20-35	1.60-1.75	0.2-0.6	0.10-0.15	4.5-6.0	Low----------	0.24		
LuC:*										
Lilbert---------	0-30	3-15	1.50-1.65	6.0-20	0.07-0.11	4.5-6.5	Low----------	0.20	5	<1
	30-48	20-35	1.55-1.69	0.6-2.0	0.13-0.17	4.5-6.0	Low----------	0.24		
	48-72	20-35	1.60-1.75	0.2-0.6	0.10-0.15	4.5-6.0	Low----------	0.24		
Urban land.										
Ma--------------- Mantachie	0-8	8-20	1.50-1.60	0.6-2.0	0.16-0.20	4.5-5.5	Low----------	0.28	5	1-3
	8-65	18-34	1.50-1.60	0.6-2.0	0.14-0.20	4.5-5.5	Low----------	0.28		
MoA-------------- Mollville	0-8	5-18	1.40-1.65	0.6-2.0	0.10-0.17	4.5-6.0	Low----------	0.32	5	.5-1
	8-55	22-35	1.50-1.69	0.06-0.2	0.12-0.17	4.5-6.0	Moderate-----	0.32		
	55-67	5-35	1.50-1.65	0.6-2.0	0.07-0.11	5.6-7.8	Low----------	0.32		
Ow.* Oil wasteland										
ReB-------------- Rentzel	0-28	5-15	1.50-1.65	6.0-20	0.07-0.11	5.1-6.5	Low----------	0.17	5	<1
	28-72	15-35	1.55-1.70	0.2-0.6	0.12-0.17	3.6-5.5	Low----------	0.32		
RuC-------------- Ruston	0-9	5-20	1.30-1.70	0.6-2.0	0.09-0.16	4.5-6.5	Low----------	0.32	5	.5-2
	9-66	18-35	1.40-1.80	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.28		
SaC-------------- Sacul	0-9	5-25	1.30-1.50	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.32	3	.5-2
	9-44	35-60	1.20-1.35	0.06-0.2	0.12-0.18	4.5-5.5	High---------	0.32		
	44-65	20-40	1.25-1.45	0.2-0.6	0.16-0.24	4.5-5.5	Moderate-----	0.37		
SaD-------------- Sacul	0-8	5-25	1.30-1.50	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.32	3	.5-2
	8-54	35-60	1.20-1.35	0.06-0.2	0.12-0.18	4.5-5.5	High---------	0.32		
	54-64	20-40	1.25-1.45	0.2-0.6	0.16-0.24	4.5-5.5	Moderate-----	0.37		
SuC:*										
Sacul-----------	0-9	5-25	1.30-1.50	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.32	3	.5-2
	9-44	35-60	1.20-1.35	0.06-0.2	0.12-0.18	4.5-5.5	High---------	0.32		
	44-65	20-40	1.25-1.45	0.2-0.6	0.16-0.24	4.5-5.5	Moderate-----	0.37		
Urban land.										

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
TeE---------------Tenaha	0-29	3-15	1.50-1.65	6.0-20	0.07-0.11	5.1-6.5	Low-----------	0.17	3	<1
	29-52	20-35	1.55-1.69	0.6-2.0	0.12-0.17	4.5-5.5	Low-----------	0.24		
	52-64	10-30	1.60-1.75	0.2-0.6	0.08-0.12	4.5-5.5	Low-----------	0.24		
TrC--------------Trep	0-30	4-12	1.50-1.65	6.0-20	0.05-0.11	5.1-6.5	Low-----------	0.17	5	<1
	30-48	18-35	1.55-1.75	0.6-2.0	0.11-0.16	4.5-6.0	Low-----------	0.24		
	48-64	35-50	1.60-1.75	0.2-0.6	0.12-0.18	4.5-5.5	Moderate------	0.24		
Ud.* Udorthents										
Ur---------------Urbo	0-70	28-55	1.45-1.55	<0.06	0.18-0.20	4.5-5.5	Moderate------	0.28	5	1-3
WrA:*										
Wrightsville----	0-17	10-25	1.25-1.50	0.2-0.6	0.16-0.24	3.6-5.5	Low-----------	0.49	5	.5-2
	17-61	35-55	1.20-1.45	<0.06	0.14-0.22	3.6-6.0	High----------	0.37		
	61-80	20-45	1.20-1.50	<0.06	0.14-0.22	3.6-8.4	High----------	0.43		
Raino-----------	0-20	10-20	1.40-1.60	0.6-2.0	0.11-0.20	4.5-6.5	Low-----------	0.43	5	.5-2
	20-32	18-30	1.45-1.65	0.6-2.0	0.15-0.20	4.5-5.5	Moderate------	0.43		
	32-68	40-60	1.45-1.65	<0.06	0.12-0.18	4.5-6.5	High----------	0.32		
	68-80	25-50	1.50-1.70	0.06-0.2	0.12-0.18	4.5-6.5	High----------	0.32		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[See text for definition of terms. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
BeB: Bienville	A	None	---	---	4.0-6.0	Apparent	Jan-Apr	Low	Moderate.
BoC: Bowie	B	None	---	---	>6.0	---	---	Moderate	High.
BuC:*									
Bowie	B	None	---	---	>6.0	---	---	Moderate	High.
Urban land.									
ByC: Briley	B	None	---	---	>6.0	---	---	Moderate	High.
CbE: Cuthbert	C	None	---	---	>6.0	---	---	High	High.
CcE:*									
Cuthbert	C	None	---	---	>6.0	---	---	High	High.
Urban land.									
CrF:*									
Cuthbert	C	None	---	---	>6.0	---	---	High	High.
Redsprings	B	None	---	---	>6.0	---	---	High	High.
DaC, DaE: Darco	A	None	---	---	>6.0	---	---	Low	Moderate.
ErC: Elrose	B	None	---	---	>6.0	---	---	Moderate	Moderate.
Iu: Iuka	C	Frequent	Very brief to brief.	Nov-May	1.0-3.0	Apparent	Nov-May	Moderate	High.
KfC, KgC: Kirvin	C	None	---	---	>6.0	---	---	High	High.
KrC:*									
Kirvin	C	None	---	---	>6.0	---	---	High	High.
Urban land.									
KsC*: Kirvin	D	None	---	---	>6.0	---	---	High	High.
KtB: Kullit	B	None	---	---	2.0-3.0	Perched	Dec-May	High	High.
KuB:*									
Kullit	B	None	---	---	2.0-3.0	Perched	Dec-May	High	High.
Urban land.									
LaA:*									
Latch	A	None	---	---	2.5-4.0	Perched	Dec-Apr	Moderate	High.
Mollville	D	None	---	---	+.5-1.0	Perched	Nov-Jun	High	High.
LbC: Lilbert	B	None	---	---	>6.0	---	---	Moderate	High.

See footnote at end of table.

TABLE 16.--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				
LuC:*									
Lilbert----------	B	None--------	---	---	>6.0	---	---	Moderate	High.
Urban land.									
Ma---------------- Mantachie	C	Frequent----	Brief-----	Nov-May	1.0-1.5	Apparent	Nov-Jun	High-----	High.
MoA--------------- Mollville	D	None--------	---	---	+.5-1.0	Perched	Nov-Jun	High-----	High.
Ow.* Oil wasteland									
ReB--------------- Rentzel	C	None--------	---	---	1.5-2.5	Perched	Jan-Mar	High-----	High.
RuC--------------- Ruston	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
SaC, SaD---------- Sacul	C	None--------	---	---	2.0-4.0	Apparent	Dec-Apr	High-----	Moderate.
SuC:*									
Sacul------------	C	None--------	---	---	2.0-4.0	Apparent	Dec-Apr	High-----	Moderate.
Urban land.									
TeE--------------- Tenaha	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
TrC--------------- Trep	B	None--------	---	---	3.5-5.0	Perched	Nov-May	High-----	High.
Ud.* Udorthents									
Ur---------------- Urbo	D	Frequent----	Brief to long.	Nov-Jun	1.0-2.0	Apparent	Nov-Jun	High-----	High.
WrA:*									
Wrightsville-----	D	None--------	---	---	+.5-1.5	Perched	Nov-Jun	High-----	High.
Raino------------	D	None--------	---	---	2.0-3.5	Perched	Dec-May	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution[1]									Liquid limit[2]	Plasticity index[2]	Specific gravity	Shrinkage		
			Percentage passing sieve--						Percentage smaller than--								
	AASHTO	Unified	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm				Limit	Linear	Ratio
												Pct		G/cc	Pct	Pct	Pct
Bienville loamy fine sand:[3,4] (S77TX-183-002)																	
A22---------------27-44	A-2-4 (0)	SM	100	100	100	100	96	17	13	3	2	19	1	2.66	15.0	0.8	1.80
A&B---------------44-60	A-2-4 (0)	SM	100	100	100	100	97	16	12	4	2	18	1	2.64	16.0	0.8	1.75
B2t---------------60-80	A-2-4 (0)	SM	100	100	100	100	96	17	14	5	2	19	2	2.66	16.0	1.1	1.76
Bowie fine sandy loam:[5] (S77TX-183-001)																	
A21-----------------3-7	A-4 (2)	ML	100	100	100	99	97	51	34	5	2	20	1	2.64	19.0	0	1.70
B22t--------------22-36	A-6 (15)	CL	100	100	100	99	98	73	65	39	34	40	24	2.69	15.0	12.3	1.90
B23t--------------36-47	A-6 (14)	CL	100	100	99	98	98	73	64	39	37	38	22	2.70	15.0	11.3	1.89
B24t--------------47-65	A-7-6(21)	CL	100	100	100	99	99	77	69	48	43	48	30	2.73	16.0	14.7	1.89
Briley loamy fine sand:[3,6] (S77TX-183-005)																	
A2-----------------9-25	A-4 (2)	ML	100	100	100	100	100	51	39	6	4	17	2	2.65	15.0	1.0	1.84
B21t--------------25-46	A-6 (7)	CL	100	100	100	100	100	61	53	26	24	31	16	2.67	15.0	8.4	1.88
Cuthbert fine sandy loam:[7] (S77TX-183-007)																	
A2-----------------3-7	A-2-4 (0)	SM-SC	89	88	83	78	73	33	26	10	6	23	4	2.66	18.0	2.3	1.76
B23t--------------21-31	A-7-6(26)	CH	100	100	99	98	97	92	89	65	54	59	32	2.72	19.0	16.2	1.78
Elrose fine sandy loam:[3] (S78TX-459-003)																	
Ap-----------------0-4	A-2-4 (0)	SM	95	94	86	75	70	33	15	3	2	21	2	2.64	18.0	1.2	1.66
B22t--------------21-42	A-6 (7)	CL	100	99	93	87	83	54	46	30	27	38	18	2.71	20.0	8.8	1.73
Iuka fine sandy loam:[3] (S77TX-459-002)																	
C3----------------35-60	A-4 (3)	ML	100	100	100	100	100	54	42	10	8	21	3	2.64	18.0	1.7	1.78
Kirvin very fine sandy loam:[3] (S77TX-459-005)																	
A2-----------------4-12	A-4 (4)	SM	97	96	94	91	87	66	50	12	8	23	3	2.65	20.0	1.6	1.73
B3----------------30-51	A-7-6(28)	CL	100	100	100	100	100	94	87	48	43	48	28	2.68	18.0	13.5	1.80
Kirvin gravelly fine sandy loam:[8] (S77TX-183-004)																	
Ap-----------------0-5	A-2-4 (0)	SM	91	88	80	70	65	31	24	4	3	21	2	2.65	18.0	1.3	1.76
B21t--------------10-22	A-7-6(37)	CH	100	100	100	98	97	87	84	70	66	66	38	2.76	21.0	17.5	1.72
Kullit very fine sandy loam:[3] (S77TX-459-004)																	
Ap-----------------0-7	A-4 (4)	ML-CL	100	100	100	100	100	68	48	8	3	23	4	2.63	18.0	2.0	1.72
B22t--------------18-28	A-6 (9)	CL	100	100	100	99	99	78	67	36	30	31	17	2.66	15.0	8.7	1.91
B25t--------------49-70	A-7-6(15)	CL	100	100	96	92	90	68	62	45	41	43	24	2.73	17.0	12.3	1.83

See footnotes at end of table.

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution[1]									Liquid limit[2]	Plasticity index[2]	Specific gravity	Shrinkage		
			Percentage passing sieve--						Percentage smaller than--								
	AASHTO	Unified	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm				Limit	Linear	Ratio
												Pct		G/cc	Pct	Pct	Pct
Latch loamy fine sand:[3] (S78TX-459-001)																	
A21----------------8-16	A-2-4 (0)	SM	100	100	100	100	98	35	--	--	--	19	2	--	14.0	1.2	1.78
A22---------------16-32	A-4 (2)	SM	100	100	100	100	98	37	--	--	--	19	3	--	17.0	1.2	1.77
B2t---------------52-62	A-4 (4)	SC	100	100	100	100	98	41	36	21	18	23	8	2.65	15.0	4.3	1.85
C1----------------62-72	A-2-4 (0)	SM-SC	100	100	100	100	94	15	11	3	2	22	6	2.62	16.0	3.2	1.76
Lilbert loamy fine sand:[3] (S77TX-459-001)																	
A2-----------------6-30	A-2-4 (0)	SM	96	96	96	95	95	23	18	7	3	19	1	2.66	15.0	0.5	1.76
B22t--------------38-48	A-6 (5)	SC	100	100	100	99	99	46	45	37	35	38	21	2.70	18.0	9.7	1.78
B3----------------56-72	A-6 (0)	SC	100	100	100	100	100	31	31	26	26	34	12	2.68	22.0	5.8	1.68
Mollville very fine sandy loam:[3] (S78TX-459-002)																	
A------------------0-4	A-4 (3)	CL	100	100	100	100	97	51	40	15	10	27	8	2.62	19.0	4.1	1.70
B22t&A2g----------17-34	A-6 (8)	CL	100	100	100	100	98	58	53	28	26	34	21	2.67	12.0	11.2	1.95
C2g---------------67-77	A-4 (2)	SM	100	100	99	98	75	68	14	12	12	21	3	2.64	19.0	1.2	1.66
Sacul fine sandy loam:[9] (S77TX-183-006)																	
A2-----------------5-13	A-4 (1)	SM	100	99	96	90	85	44	34	7	4	22	2	2.66	20.0	1.5	1.70
B21t--------------13-25	A-7-6(30)	CH	100	100	99	97	96	79	75	58	55	59	36	2.72	17.0	17.5	1.82
B22t--------------25-37	A-7-6(20)	CH	100	100	100	100	99	77	71	56	52	53	29	2.75	18.0	14.7	1.78
Urbo clay:[3,10] (S77TX-183-003)																	
B21g---------------4-16	A-7-6(20)	CL	100	100	100	100	95	84	79	47	36	41	24	2.64	15.0	12.3	1.84
B22g--------------16-37	A-7-6(30)	CL	100	100	100	100	98	89	84	57	48	47	30	2.66	13.0	15.6	1.94
B23g--------------37-54	A-7-6(31)	CL	100	100	100	100	100	90	85	57	46	46	30	2.65	13.0	14.8	1.94
B24g--------------54-70	A-6 (16)	CL	100	100	100	100	100	81	62	38	31	34	20	2.66	17.0	8.7	1.83

[1]For grain size larger than 3/8 inch, square mesh wire sieves were used that are slightly larger than equivalent round sieves, but these differences do not seriously affect the data.

[2]Liquid limit and plasticity index values were determined by the AASHTO-89 and AASHTO-90 methods except that soil was added to water.

[3]Location of pedon sample is the same as the pedon given as typical for series in "Soil series and their morphology."

[4]This pedon is a taxadjunct to the Bienville series because it has less clay throughout than typical for this series.

[5]Bowie fine sandy loam: from intersection of Cherokee Street and Farm Road 2206 in Greggton, 0.8 mile south on Cherokee Street and 50 feet east. This pedon is a taxadjunct to the Bowie series because it has slightly more clay in the B24t horizon than typical for this series.

[6]This pedon is a taxadjunct to the Briley series because it has slightly more silt in the A horizon than typical for this series.

[7]Cuthbert fine sandy loam: from intersection of Farm Road 2204 and Texas Highway 322, 2,100 feet west on Farm Road 2204 and 150 feet north.

[8]Kirvin gravelly fine sandy loam: from intersection of Farm Road 349 and U.S. Highway 259 in Kilgore, 0.7 mile east, 1.0 mile northeast, and 50 feet east. This pedon is a taxadjunct to the Kirvin series because it has slightly more clay in the Bt horizon than typical for this series.

[9]Sacul fine sandy loam: from Loop 281 at Longview, 0.5 mile north on U.S. Highway 259 and 250 feet east.

[10]This pedon is a taxadjunct to the Urbo series because it has less clay in the substratum than typical for this series.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Bienville	Sandy, siliceous, thermic Psammentic Paleudalfs
Bowie	Fine-loamy, siliceous, thermic Plinthic Paleudults
Briley	Loamy, siliceous, thermic Arenic Paleudults
Cuthbert	Clayey, mixed, thermic Typic Hapludults
Darco	Loamy, siliceous, thermic Grossarenic Paleudults
Elrose	Fine-loamy, siliceous, thermic Typic Paleudalfs
Iuka	Coarse-loamy, siliceous, acid, thermic Aquic Udifluvents
Kirvin	Clayey, mixed, thermic Typic Hapludults
Kullit	Fine-loamy, siliceous, thermic Aquic Paleudults
Latch	Loamy, siliceous, thermic Grossarenic Paleudalfs
Lilbert	Loamy, siliceous, thermic Arenic Plinthic Paleudults
Mantachie	Fine-loamy, siliceous, acid, thermic Aeric Fluvaquents
Mollville	Fine-loamy, mixed, thermic Typic Glossaqualfs
Raino	Fine-loamy over clayey, siliceous, thermic Aquic Glossudalfs
Redsprings	Fine, kaolinitic, thermic Ultic Hapludalfs
Rentzel	Loamy, siliceous, thermic Arenic Plinthaquic Paleudults
Ruston	Fine-loamy, siliceous, thermic Typic Paleudults
Sacul	Clayey, mixed, thermic Aquic Hapludults
Tenaha	Loamy, siliceous, thermic Arenic Hapludults
Trep	Loamy, siliceous, thermic Arenic Paleudults
Urbo	Fine, mixed, acid, thermic Aeric Haplaquepts
Wrightsville	Fine, mixed, thermic Typic Glossaqualfs

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