Series 1958, No. 3

Issued May 1961

SOIL SURVEY

Washington County Mississippi

OUR SOIL ★ OUR STRENGTH

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
MISSISSIPPI AGRICULTURAL EXPERIMENT STATION

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of Washington County, Miss., is designed to serve several groups of readers. It will help farmers in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, ponds, and other structures; aid foresters in managing woodlands; and add to the soil scientist's fund of knowledge.

In making this survey, soil scientists walked over the fields and woodlands. They dug holes and examined surface soils and subsoils; measured slopes with a hand level; noticed differences in growth of crops, weeds, and brush; and, in fact, recorded all the things about the soils that they believed might affect their suitability for farming, engineering, and related uses. They plotted the boundaries of the soils on aerial photographs. Then, cartographers prepared the detailed soil map in the back of this report.

Locating Soils

Use the index to map sheets to locate areas on the large map. The index is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located. When the correct sheet of the large map has been located, it will be seen that boundaries of the soils are outlined and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map. The symbol will be inside the area if there is enough room; otherwise, it will be outside the area and a pointer will show where the symbol belongs.

Finding Information

Few readers will be interested in all of the soil report, for it has special sections for different groups, as well as some sections of value to all. The section, Additional Facts About the County, will be of interest mainly to those not familiar with the county.

Farmers and those who work with farmers will be interested in the section, Soils of the County, and in the section, Use and Management of Soils. Study of these sections will aid them in identifying soils on a farm, in learning ways the soils can be managed, and in judging what yields can be expected. The guide to mapping units at the back of the report will simplify use of the map and the report. This guide gives the map symbol for each soil, the name of the soil, the page on which the soil is described, the capability unit in which the soil has been placed, and the page where the capability unit is described.

Engineers will want to refer to the subsection, Engineering Properties of Soils. Tables in that section show characteristics of the soils that affect engineering.

Soil scientists will find information about how the soils were formed and how they were classified in the section, Genesis, Morphology, and Classification of Soils.

Students, teachers, and other users will find information about soils and their management in various parts of the report, depending on their particular interest.

This survey was made cooperatively by the United States Department of Agriculture and the Mississippi Agricultural Experiment Station. It is part of the technical assistance furnished to the Washington County Soil Conservation District. In 1945 residents of the county voted a tax appropriation to pay for part of the cost of the survey. Fieldwork on the survey was completed in 1958.

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SOIL SURVEY OF WASHINGTON COUNTY, MISSISSIPPI

FIELDWORK BY W. P. EASON AND G. E. ROGERS, MISSISSIPPI AGRICULTURAL EXPERIMENT STATION, AND W. M. MORRIS, H. L. MARTIN, F. T. SCOTT, L. B. WALTON, H. C. WILLIAMS, AND A. H. WYNN JR., SOIL SURVEY, UNITED STATES DEPARTMENT OF AGRICULTURE

REPORT BY W. M. MORRIS, SOIL SURVEY, UNITED STATES DEPARTMENT OF AGRICULTURE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE MISSISSIPPI AGRICULTURAL EXPERIMENT STATION

AGRICULTURE is the main industry in Washington County although other industries contribute to the economy. Cotton is the principal crop on most farms, but livestock, corn, soybeans, and rice are also important.

The county lies mostly in the south Mississippi River Delta, in the extreme west-central part of Mississippi (fig. 1). It is bounded on the north by Bolivar County, on the east by Sunflower and Humphreys Counties, and on the south by Issaquena and Sharkey Counties. The Mississippi River forms its entire western boundary and separates it from the State of Arkansas. Greenville is the county seat. The county has a land area of 728 square miles. It is about 36 miles long and ranges from 12 to 28 miles in width.

General Soil Map

In mapping a county or other large tract, it is fairly easy to see definite changes as one travels from place to place. There are many obvious changes, among them changes in shape, gradient, and length of slopes; in the course, depth, and speed of streams; in the width of bordering valleys or levees; in kinds of native plants; and even in kinds of agriculture. With these more obvious changes there are less easily noticed changes in the pattern of soils. The soils change along with the other parts of the environment.

By drawing lines around the different patterns of soils on a soil map, one may obtain a map of the general soil areas or, as they are sometimes called, soil associations. Such a map is useful to those who want only a general idea of the soils, who want to compare different parts of a county, or who want to locate large areas suitable for some particular kind of agriculture or other broad land use. The map, of course, is at too small a scale to be used in planning management for any individual farm.

The five main soil areas, or kinds of soil patterns, in Washington County are shown on the colored map at the back of this report.

1. Unclassified alluvial soils: Alluvial land

This general soil area lies between the Mississippi River and its levees. It consists of mainly nearly level, poorly drained to excessively drained soils that are forested and periodically overflowed.

The main soils are of the Commerce, Crevasse, Robinsonville, Mhoon, Sharkey, and Tunica series. The soils, however, were mapped together and are shown on the detailed map as one unit—Alluvial land.

The texture of the surface soils ranges from loamy sand to clay. Though the soils are mostly nearly level,

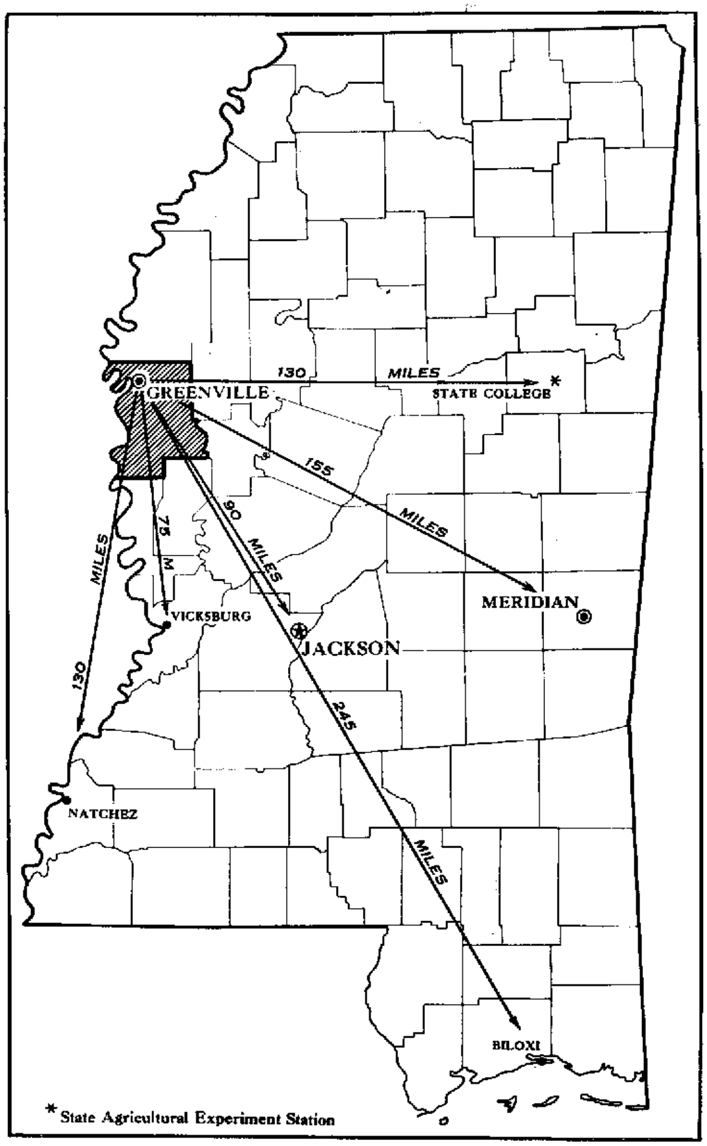

Figure 1.—Location of Washington County in Mississippi.

there are more strongly sloping areas along stream escarpments. Overflows frequently cover the soils for long periods in spring and early in summer.

More than 95 percent of this general soil area is wooded, mainly with oak, gum, cottonwood, cypress, pecan, and willow. The few cleared areas are used for pasture, cotton, and soybeans.

2. Nearly level, poorly drained to excessively drained silt loams and loamy sands of recent natural levees: Commerce-Robinsonville-Dowling-Crevasse

Soils in this general area formed on recent natural levees, which are at higher elevations than the depressions and slack-water areas. They are dominantly nearly level, but some areas having steeper slopes are in small bands along deep depressions and streams. Narrow depressions occur throughout the acreage.

The somewhat poorly drained to moderately well drained Commerce soils occupy about 70 percent of the general soil area. They formed from medium-textured sediments deposited by the Mississippi River. Generally, they are at lower elevations than the Robinsonville and Crevasse soils.

Robinsonville soils occupy about 15 percent of the acreage. These moderately well drained to well drained soils formed in moderately coarse textured sediments. They are on high, recent natural levees along the Mississippi River and along smaller streams.

The poorly drained, depressional Dowling soils, which occupy about 10 percent of the acreage, formed from moderately fine textured to fine textured material washed from higher elevations.

The excessively drained Crevasse soils, which make up about 5 percent of the acreage, formed on recent natural levees from coarse-textured sediments deposited by the Mississippi River. Included in the general soil area are small acreages of fine-textured, poorly drained Mhoon soils.

This general soil area is good for farms. Most of it has been cleared and is used for cotton, corn, small grains, and pasture. Generally, the farms are large.

3. Nearly level, somewhat poorly drained to somewhat excessively drained silt loams and sandy loams of old natural levees: Dundee-Bosket-Beulah-Souva

Soils in this general area formed on old natural levees at elevations higher than the depressions and slack-water clay areas. They are dominantly nearly level, but some areas that have steeper slopes are in small bands along streambanks and old runs. Narrow depressions occur throughout the acreage.

The somewhat poorly drained to moderately well drained Dundee soils occupy about 52 percent of this general soil area. They formed in medium- and fine-textured sediments from the Mississippi River. Dundee soils are at lower elevations than the Bosket and Beulah soils.

Bosket soils occupy about 39 percent of the area. These well drained to somewhat excessively drained soils formed in medium-textured sediments deposited by the Mississippi River. They occupy high positions along streambanks.

The somewhat excessively drained Beulah soils, which make up about 8 percent of the acreage, formed in moderately coarse textured sediments. They are along streambanks and on ridges within sharp bends of streams.

The depressional Souva soils, which occupy about 1 percent of the acreage, are somewhat poorly drained soils formed in medium- and fine-textured material washed from higher lying areas. Included in this general soil area are small acreages of excessively drained Crevasse and of well-drained Dubbs soils.

This is one of the best areas in the county for farming, and generally the farms are large. Most of the acreage has been cleared and is used principally for cotton, corn, and small grains.

4. Nearly level, somewhat poorly drained and poorly drained silt loams to clays of low terraces and slack-water positions: Forestdale-Alligator-Dowling

This general soil area is on low terraces and in slack-water positions. The soils are dominantly nearly level, but some that have steeper slopes occur as small bands along streambanks. In the slack-water areas, some of the soils are level and there are numerous depressions.

The poorly drained to somewhat poorly drained Forestdale soils occupy about 50 percent of the general soil area. They formed in moderately fine textured and fine textured sediments deposited by the Mississippi River and are on low terraces below the Dundee and Bosket soils.

The poorly drained Alligator soils occupy about 40 percent of the acreage. These soils formed in slack-water clay areas from fine-textured, back-water sediments washed from the Mississippi River.

The poorly drained, depressional Dowling soils, which occupy about 10 percent of the acreage, formed from fine-textured material washed from higher elevations. Included in this general soil area are small acreages of moderately well drained Pearson soils.

Soils in this area are best suited to small grains, rice, and pasture. Row crops are not suited. About one-third of the acreage is in forest; the rest has been cleared and is used principally for cotton, corn, small grains, rice, and pasture. The average size farm has about 400 acres.

5. Nearly level, moderately well drained to poorly drained silty clay loams and clays, chiefly in slack-water positions: Sharkey-Tunica-Dowling-Bowdre

Soils in this general soil area are in slack-water positions. They are dominantly nearly level, but some broad areas in low places are level, and small acreages along streambanks are fairly steep. Depressions are numerous.

The poorly drained Sharkey soils occupy about 80 percent of this general soil area. They formed from fine-textured sediments along the Mississippi River and other streams.

The Tunica soils, which occupy about 10 percent of the general soil area, are at higher elevations in slack-water areas. They are somewhat poorly drained and have a clayey layer, 20 to 30 inches thick, that is underlain by coarser textured material.

The poorly drained, depressional Dowling soils formed from fine-textured material that washed from higher elevations; they occupy about 8 percent of the acreage. The Bowdre soils, which occur in about 2 percent of the general soil area, ordinarily are between the slack-water areas and the low terraces. They have thin (10- to 20-inch), clayey layers underlain by coarser textured material.

This general soil area is good for small grains and pasture. About one-third of the acreage is in forest; the rest has been cleared and is used principally for small grains, cotton, soybeans, rice, and pasture. Farms average about 200 acres in size.

Use and Management of Soils

This section has four major parts. In the first, the system the Soil Conservation Service uses in grouping soils is explained; the soils are placed in capability units and their limitations, capabilities, and management requirements are stated; and estimated yields are given for each soil at two levels of management. In the second part, some general suggestions for management of pasture are given; and in the third part, some general principles for management of land in hardwood timber. The fourth part provides information useful to engineers and others who need to know the suitability of soils as sites for roads, ponds, and other structures.

Capability Grouping

Capability grouping is a system of classification used to show the relative suitability of soils for crops, grazing, forestry, or wildlife. It is a practical grouping based on the needs and limitations of the soils, the risks of damage to them, and their response to management.

The capability unit, which can also be called a management group, is the lowest level of the capability classification. A capability unit is made up of soils that are similar in kind of management needed, in risk of damage, and in general suitability for use.

The next broader grouping, the capability subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" means that the main limiting factor is risk of erosion if a plant cover is not maintained. The symbol "w" means that excess water retards plant growth or interferes with cultivation. The symbol "s" means that the soils are shallow, stony, droughty, or low in fertility. The symbol "c" means that the climate is so hazardous that it limits the use of the soil. No soils in Washington County are in subclass "c".

The broadest grouping, the class, is identified by Roman numerals. All of the soils in one class have limitations and management problems of about the same degree, but of different kinds, as shown by the subclass. All of the classes except class I may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation of annual or short-lived crops.

Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly, but they do not have quite so wide a range of suitability as soils of class I. Some class II soils are gently sloping. Consequently, they need moderate care to prevent erosion. Other soils in class II may be slightly droughty, slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly, but they have a narrower range of use than those in class II. They need even more careful management.

Class IV soils should be cultivated only occasionally or only under very careful management.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops but that can be used for pasture. They can also be used as woodland, as parts of watersheds, or to provide shelter and food for wildlife.

Class V soils are nearly level to gently sloping, but they are droughty, wet, low in fertility, or otherwise unsuitable for cultivation. No class V soils occur in this county.

Class VI soils are not suitable for crops, because they are steep, stony, droughty, or otherwise limited. Nevertheless, pastures on these soils give fair yields of forage, and forests give fair to high yields of forest products. Some soils in class VI can, without damage, be cultivated enough so that forest trees can be set out or pasture crops seeded. There are no class VI soils in Washington County.

Class VII soils provide only poor to fair yields of forage. Yields of forest products may be fair to high. The soils have characteristics that severely limit their use for pasture and, in some places, for trees. No class VII soils occur in this county.

In class VIII are soils that have practically no agricultural use. Some areas have value as watersheds, as habitats for wildlife, or as recreation areas. Class VIII soils do not occur in this county.

The following list shows briefly the capability classes, subclasses, and units of Washington County.

Class I.—Soils that have few limitations that restrict their use.
- Unit I(I-1): Nearly level, mostly moderately well drained to somewhat poorly drained, loamy soils on old or recent natural levees.
- Unit 2(I-2): Nearly level, well-drained to somewhat excessively drained very fine sandy loams on old or recent natural levees.
- Unit 3(I-3): Nearly level, somewhat poorly drained to moderately well drained, loamy soils over clay on old or recent natural levees.

Class II.—Soils that have some limitations that reduce the choice of plants or that require moderate conservation practices.
- Subclass IIe: Gently sloping soils that have moderate risk of erosion if not protected.
  - Unit 4(IIe-1): Gently sloping, somewhat poorly drained to moderately well drained, loamy soils on old or recent natural levees.
  - Unit 5(IIe-2): Gently sloping, well-drained sandy loam on old natural levees.
  - Unit 6(IIe-4): Gently sloping, somewhat poorly drained to moderately well drained silty clay loam on old natural levees.

Subclass IIs: Soils somewhat limited by available moisture capacity.

Unit 7(IIs–1): Nearly level to gently sloping, slightly droughty soils on old natural levees.

Unit 8(IIs–2): Nearly level, mostly somewhat poorly drained, clayey soils on old natural levees or in slack-water areas.

Unit 9(IIs–3): Nearly level, "cold-natured," somewhat poorly drained to poorly drained silt loam on old natural levees.

Unit 10(IIs–4): Nearly level, "cold-natured," somewhat poorly drained to poorly drained silty clay loams.

Unit 11(IIs–5): Nearly level, shallow, "cold-natured," poorly drained very fine sandy loam in low bottoms.

Unit 12(IIs–6): Nearly level, somewhat poorly drained to moderately well drained silty clay loams on recent or old natural levees and in low bottoms.

Subclass IIw: Moderately wet soils.

Unit 13(IIw–3): Somewhat poorly drained silt loam in depressions.

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

Subclass IIIe: Sloping soils that have a high risk of erosion if tilled.

Unit 14(IIIe–3): Sloping, somewhat poorly drained to moderately well drained silty clay loam on old natural levees.

Unit 15(IIIe–5): Gently sloping, "cold-natured," somewhat poorly drained to poorly drained silty clay loam.

Unit 16(IIIs–2): Gently sloping, somewhat poorly drained, clayey soils in low bottoms and on old natural levees.

Sublass IIIs: Soils limited by moisture capacity or low fertility.

Unit 17(IIIs–4): Nearly level to gently sloping, poorly drained, clayey soils on old natural levees and in low bottoms.

Subclass IIIw: Wet soils that require artificial drainage if they are tilled.

Unit 18(IIIw–5): Level, poorly drained silty clay loam in low bottoms.

Unit 19(IIIw–11): Level, poorly drained, clayey soils in low bottoms.

Unit 20(IIIw–13): Poorly drained soils in depressions.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, or that require very careful management, or both.

Subclass IVw: Soils very severely limited by excess water; poorly drained and difficult to manage under cultivation.

Unit 21(IVw–1): Poorly drained, clayey soil in depressions.

Subclass IVs: Soils very severely limited by low moisture capacity.

Unit 22(IVs–1): Sandy loams and loamy sands on natural levees.

Capability units

The soils of Washington County have been placed in 22 capability units. The soils in one unit have about the same limitations, need essentially the same management, and respond to management in approximately the same way. Additional information about management of each soil is furnished in the subsection, Descriptions of Soils.

CAPABILITY UNIT 1(I–1)

Nearly level, mostly moderately well drained to somewhat poorly drained, loamy soils on old or recent natural levees:

Commerce silt loam, nearly level phase.
Commerce very fine sandy loam, moderately shallow phase.
Commerce very fine sandy loam.
Dubbs very fine sandy loam, nearly level phase.
Dubbs silt loam, nearly level phase.
Dundee silt loam, nearly level phase.
Dundee very fine sandy loam, nearly level phase.
Dundee very fine sandy loam, nearly level moderately shallow phase.
Pearson silt loam, nearly level phase.

These soils are easy to till. They have surface layers of silt loam or very fine sandy loam that are mostly at least 7 inches thick. The subsoils, for the most part, are silty clays or silt loams that overlie sandier material. Because the slopes range from ½ to 2 percent, surface runoff is no problem. Although drainage ranges from somewhat poor to good, it is predominantly moderately good. Movement of water through the soils is fairly good, and, with the improved drainage that can be expected from levee protection, soil moisture is near optimum for all commonly grown crops. If plowsoles have not formed, the available moisture-holding capacity is high. The content of organic matter is low; the natural fertility is moderate. The Commerce soils are neutral to mildly alkaline; the other soils are mainly strongly acid to neutral.

These are some of the best agricultural soils in the county. They are suited to many cultivated crops and sod crops. Cotton, corn, soybeans, sorghum, and small grains are well suited (fig. 2). The soils produce good permanent pasture of bermudagrass, dallisgrass, johnsongrass, whiteclover, vetch, and wild winter peas. Vetch and wild winter peas are also good for winter cover crops or for growing with small grains. Sudangrass and other summer grasses do well. The soils are only fairly well suited to annual lespedeza, alfalfa, red clover, and tall fescue. Trees that grow well on these soils are sweetgum, water oak, white oak, red oak, and other hardwoods.

Suitable crop rotations are (1) 6 years of row crops and 3 years of sod crops; (2) 1 year of row crops and 1 year of oats seeded with vetch; and (3) 1 year of row crops and 1 year of soybeans.

These soils are easy to work within a wide range of moisture content. If they are left bare, they tend to crust and pack after rains. The silt loams crust so hard at times that stands of crops are poor. It is best to prepare the soils early in spring.

Hard, compact layers, or plowsoles, may form just under the surface layer. These can be shattered by subsoiling late in fall when the soil is dry. Row arrangement

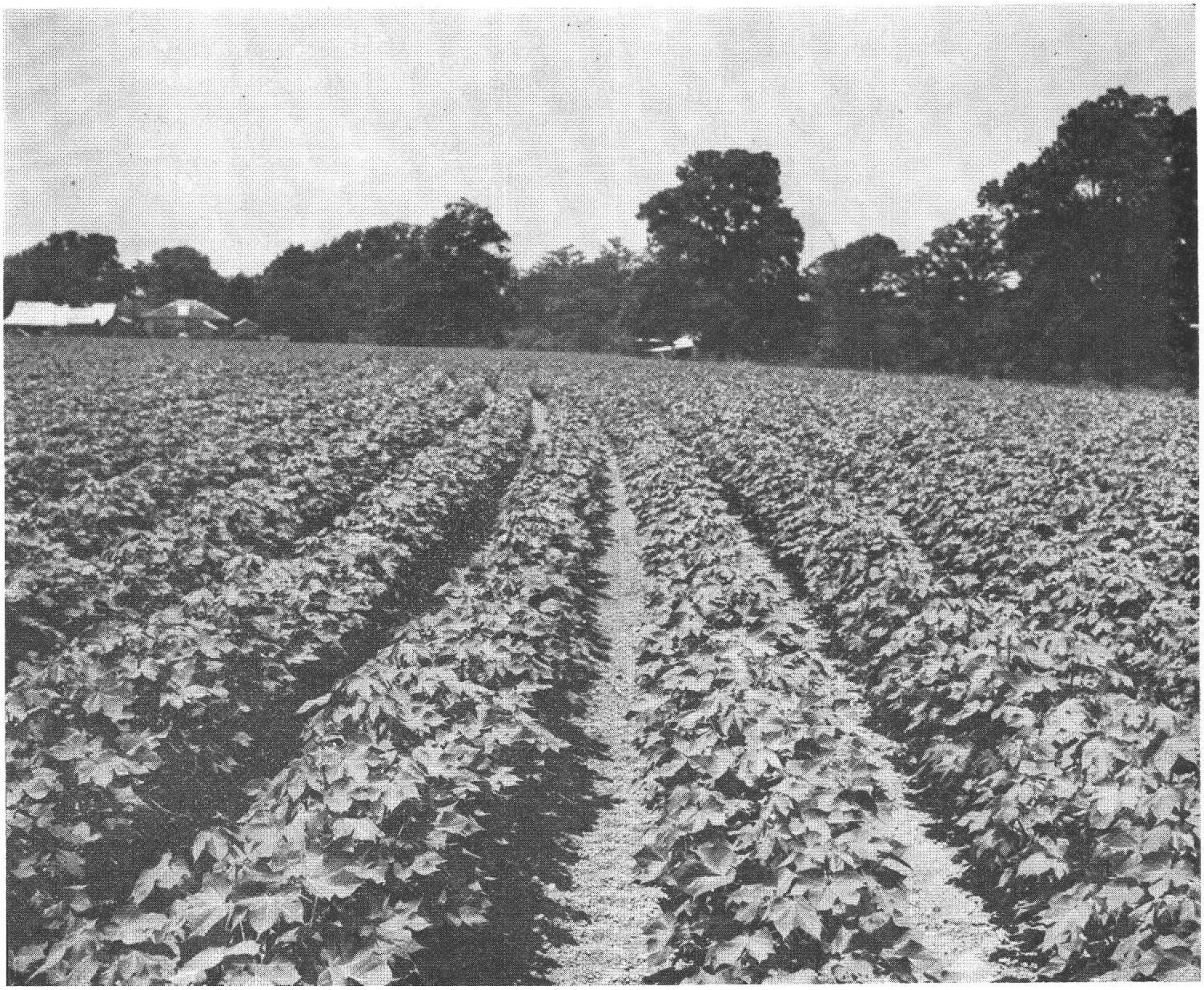

Figure 2.—**Cotton on Dundee very fine sandy loam, nearly level phase.**

and W-type ditches are necessary for the removal of surface water (fig. 3).

The content of organic matter can be increased by turning under crop residues, by using a suitable sod in the rotation, and by growing winter legumes after clean-tilled crops. Generally, the acidity of the soils must be corrected for best yields of alfalfa and other legumes. Nonlegume crops respond to applications of nitrogen.

CAPABILITY UNIT 2(I–2)

Nearly level, well-drained to somewhat excessively drained very fine sandy loams on old or recent natural levees:

Beulah very fine sandy loam, nearly level moderately shallow phase.
Bosket very fine sandy loam, nearly level moderately shallow phase.
Bosket very fine sandy loam, nearly level phase.
Robinsonville very fine sandy loam.

The surface soils are easily tilled and, in most places, are at least 6 inches thick. The subsoils range from silty clay loam to fine sandy loam. Slopes range from ½ to 2 percent. Moisture content is favorable, except that during dry periods the soils are slightly droughty. Surface runoff is no problem. Water movement through the soils is good, unless restricted by plowsoles, and the available water-holding capacity is moderate. The content of organic matter is low, and natural fertility is moderate to high. The soils are strongly acid to mildly alkaline.

Soils of this unit are well suited to cotton, early truck crops, and small grains. Early corn, vetch, and wild winter peas are fairly well suited.

Because moisture is limited, late corn, soybeans, sorghum, millet, and sudangrass are risky crops. These soils produce good permanent pasture of bermudagrass, johnsongrass, and crimson clover. White clover, vetch,

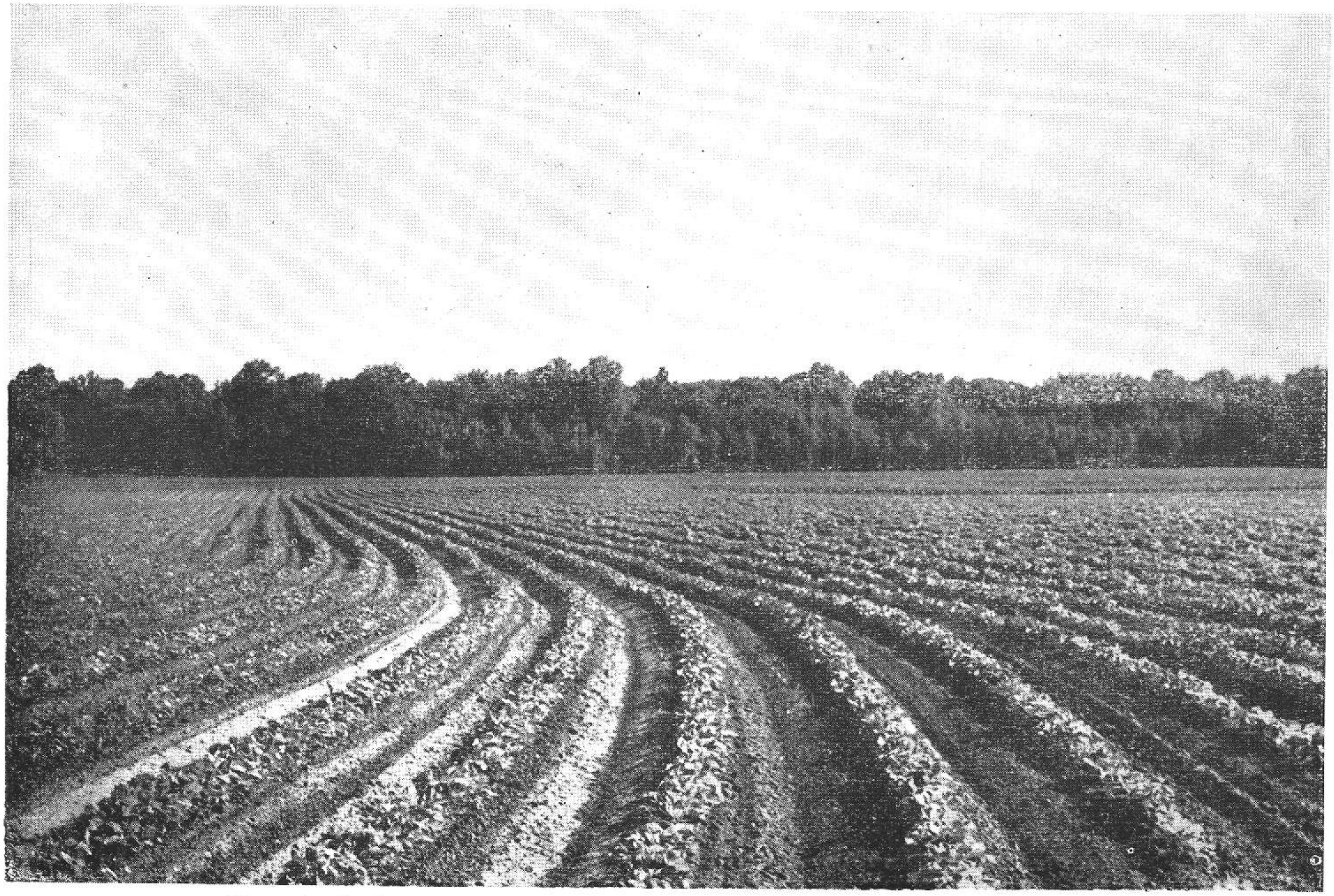

***Figure 3.*—Good row arrangement on Dundee very fine sandy loam, nearly level phase.**

and wild winter peas are fairly well suited. Tall fescue, alfalfa, dallisgrass, annual lespedeza, and the summer grasses are poorly suited. Sweetgum, water oak, and other hardwoods grow well.

Suitable crop rotations are (1) 3 years of row crops and 3 years of sod crops; (2) an early truck crop or early corn, fallow, and oats and vetch seeded in the fall; and (3) 2 years of cotton and 3 years of oats seeded with vetch.

These soils are easy to work within a wide range of moisture content. If left bare, they tend to crust and pack after rains. Hard, compact layers, or plowsoles several inches thick, tend to form under the plow layer. These should be broken by subsoiling, preferably in fall when the soil is dry. Otherwise, the growth of plant roots, the internal movement of water, and the available moisture are restricted to the surface layer. Row arrangement and W-type ditches are needed to conserve water and to remove excess surface water.

The addition of organic matter will improve the soil structure, water-holding capacity, and infiltration. Bacterial activity will increase, and crusting of the soils will be reduced. Organic matter can be increased by turning under crop residues, by using a suitable sod crop in the rotation, and by growing winter legumes after clean-tilled crops. In most areas of these soils, nitrogen is the only fertilizer required.

CAPABILITY UNIT 3(I–3)

Nearly level, somewhat poorly drained to moderately well drained, loamy soils over clay on old or recent natural levees:

Commerce silt loam, nearly level shallow phase.
Dundee very fine sandy loam, nearly level shallow phase.

The surface soils are easily tilled silt loam and very fine sandy loam, at least 6 inches thick. The subsoils, silt loam to silty clay loam, overlie a clay layer at depths of 10 to 20 inches. Slopes range from ½ to 2 percent. Surface runoff is no problem. Drainage is somewhat poor to moderately good. Water movement through the soils is fairly good in the upper subsoil and slow in the clayey layer. The available moisture-holding capacity is high. The content of organic matter is low; natural fertility is moderate. The soils are strongly acid to neutral.

Cotton, sorghum, small grains, millet, sudangrass, vetch, and wild winter peas are well suited. Corn and soybeans are fairly well suited. These soils produce good permanent pasture of bermudagrass, johnsongrass, and white clover. Tall fescue, dallisgrass, and red clover are fairly well suited. Trees that grow well are sweetgum, water oak, white oak, red oak, and other hardwoods.

Suitable crop rotations are (1) 2 years of sod crops and 3 or 4 years of row crops; or (2) in each year, cotton in spring followed by legumes and small grains in fall.

These soils are easy to work within a wide range of moisture content. When bare, rains pack or seal the surface layer and decrease infiltration. Then, when the soils dry after such a wetting, the surface is so crusted during seed germination and early plant growth that poor stands result. It is best to prepare these soils early in spring. Hard, compact layers, or plowsoles, may form just under the plow layer. They can be shattered by subsoiling late in fall when the soil is dry. Row arrangement and W-type ditches are necessary for the removal of surface water.

The organic-matter content can be increased by using a suitable sod in the rotation, by turning under crop residues, and by planting winter legumes after clean-tilled crops. Nonlegume crops respond to applications of nitrogen.

CAPABILITY UNIT 4 (IIe–1)

Gently sloping, somewhat poorly drained to moderately well drained, loamy soils on old or recent natural levees:

Dundee silt loam, gently sloping phase.
Dundee very fine sandy loam, gently sloping phase.

The surface soils are easily tilled silt loam and very fine sandy loam, about 6 or 7 inches thick. The subsoils are silty clay to silt loam layers that overlie sandier material in most places. These soils occur in narrow, fairly long bands on slopes of 2 to 5 percent. The moisture content of the soils is favorable, but, because of surface runoff, erosion should be controlled. Drainage is predominantly moderately good, but in places it is somewhat poor. The internal movement of water is moderate to moderately slow, and, if no plowsoles have formed, the available moisture-holding capacity is moderate. The supply of organic matter is low; natural fertility is moderate. The soils are strongly acid to neutral.

Soils of this unit are well suited to cotton, corn, soybeans, small grains, millet, and sudangrass. Vetch and wild winter peas are good winter cover crops, or they can be planted with small grains. These soils produce good permanent pasture of bermudagrass, johnsongrass, dallisgrass, white clover, winter legumes, and summer grasses. Annual lespedeza, tall fescue, alfalfa, and red clover are fairly well suited. The trees that grow well on these soils are sweetgum, water oak, white oak, red oak, and other hardwoods.

Suitable crop rotations are (1) 3 years of row crops and 3 years of sod crops; and (2) 1 year of a row crop and 1 year of oats seeded with vetch.

These soils are easy to work within a wide range of moisture content. If left bare, they tend to crust and pack after rains. The silt loam crusts so hard at times as to cause poor stands of crops. The slopes of these soils are strong enough to cause slight to moderate erosion if clean-tilled crops are grown continuously. To prevent further erosion and to conserve moisture, arrange rows on the contour and provide W-type ditches and grassed waterways for row outlets.

The supply of organic matter can be increased by turning under crop residues, by using a suitable sod in the rotation, and by growing winter legumes after clean-tilled crops. In most places, the acidity of the soils must be corrected for best yields of alfalfa. Nonlegume crops respond to nitrogen fertilizer.

CAPABILITY UNIT 5 (IIe–2)

Gently sloping, well-drained sandy loam on old natural levees:

The only soil in this unit is Bosket very fine sandy loam, gently sloping phase. It occurs in long, narrow bands on slopes of 2 to 5 percent along channels of former or present streams. The surface soil is easily tilled very fine sandy loam, about 4 to 8 inches thick. The subsoil layers range from silty clay loam to silt loam. The moisture content is generally favorable, but during dry periods the soil is slightly droughty. Control of surface runoff is necessary. The movement of water through the soil is good, except where restricted by plowpans. The available moisture-holding capacity is moderate. The content of organic matter is low; the natural fertility is moderate. The soil is medium acid to mildly alkaline.

Crops best suited to this soil are cotton, small grains, and winter legumes. Early corn and vetch are fairly well suited. Suitable pasture plants are bermudagrass, johnsongrass, and crimson clover. Whiteclover is fairly well suited. Tall fescue, dallisgrass, and annual lespedeza are not suited to this soil. Suitable trees are sweetgum, water oak, white oak, red oak, and other hardwoods.

Suitable crop rotations are (1) 2 years of row crops followed by 4 years of sod crops; and (2) 1 year of cotton followed by 2 years of oats and vetch.

This soil is easily tilled within a wide range of moisture content. If left bare, it will crust and erode after rains. For the removal of surface water with a minimum of soil loss, provide good row arrangement and V-type and W-type ditches. Vegetated waterways may be needed for soil protection.

The addition of organic matter will help to improve soil structure, will increase the available moisture-holding capacity and infiltration, and will reduce crusting. The organic-matter content can be increased by turning under crop residues, by using a sod in the rotation, and by planting winter legumes after clean-tilled crops. Nitrogen is the only fertilizer required.

CAPABILITY UNIT 6 (IIe–4)

Gently sloping, somewhat poorly drained to moderately well drained silty clay loam on old natural levees:

Dundee silty clay loam, gently sloping phase, is the only soil in this unit. It has a silty clay loam surface layer. The silty clay subsoil overlies coarser material at a depth of about 26 inches. Slopes range from 2 to 5 percent, and erosion is a hazard if the soil is used for row crops. When the soil is wet, the internal movement of water is moderate to moderately slow. The available moisture-holding capacity is high. The organic-matter conttent is low; natural fertility is moderate. This is a strongly acid to neutral soil.

Cotton, soybeans, sorghum, small grains, vetch, and wild winter peas are well suited to the soil. Corn and annual lespedeza are fairly well suited. Suitable pasture plants are dallisgrass, bermudagrass, johnsongrass, and whiteclover. Trees that grow well are sweetgum, water oak, white oak, red oak, and other hardwoods.

Suitable crop rotations are (1) 2 or 3 years of row crops followed by 3 years of sod crops; and (2) 2 years of row crops, 1 year of oats and soybeans, and oats and fallow the fourth year.

Because of the silty clay loam texture of the surface layer, this soil is somewhat difficult to work. Excess moisture delays planting and cultivation of crops after rains. If used continuously for clean-tilled crops, the soil is steep enough to erode. Row arrangement to reduce erosion and runoff and V-type and W-type ditches to take water from the rows are necessary.

The content of organic matter can be increased by using sod crops in the rotation, by returning crop residues to the soil, and by growing winter legumes. Nitrogen is the only fertilizer needed.

CAPABILITY UNIT 7 (IIs–1)

Nearly level to gently sloping, slightly droughty soils on old natural levees:

Beulah very fine sandy loam, nearly level phase.
Beulah very fine sandy loam, gently sloping phase.

The surface soils are easily tilled very fine sandy loam, at least 6 inches thick. The subsoils range from very fine sandy loam to sandy loam. Surface runoff requires some erosion control, as the slopes range from ½ to 5 percent. Movement of water through the soils is moderately rapid, and the available moisture-holding capacity is low. The organic-matter content is low; natural fertility is low to moderate. Soils in this group are strongly acid to mildly alkaline.

Several crops do well on these soils during periods of normally abundant moisture in winter and early in spring. Few crops grow well during the dry periods of summer. Early truck crops, small grains for pasture, and vetch are the crops best suited. Cotton, early corn, and wild winter peas are fairly well suited. Planting to soybeans, late corn, sudangrass, and millet is risky. Bermudagrass, johnsongrass, and crimson clover are well suited sod crops. Dallisgrass, annual lespedeza, white clover, tall fescue, and red clover are not suited. Trees that grow well are sweetgum, water oak, white oak, red oak, hackberry, elm, ash, and cottonwood.

Suitable crop rotations are (1) 2 years of row crops followed by 4 years of a grass-and-legume sod; and (2) 1 year of a row crop, 1 year of oats or ryegrass with vetch left on the ground, and 1 year of volunteer vetch and native grasses.

These soils are easy to work within a wide range of moisture content. It is best to prepare them early in spring. For maximum water conservation and safe removal of excess water, arrange rows and provide V-type and W-type ditches as row outlets.

The content of organic matter can be increased by turning under crop residues, by using a suitable sod in the rotation, and by growing winter legumes after clean-tilled crops. Most nonlegume crops respond to applications of nitrogen.

CAPABILITY UNIT 8 (IIs–2)

Nearly level, mostly somewhat poorly drained, clayey soils on old natural levees or in slack-water areas:

Bowdre silty clay, nearly level phase.
Dundee silty clay, nearly level phase.
Tunica clay, nearly level phase.

These soils have mainly clayey surface soils and clayey subsoils, which overlie coarser textured material at depths of 10 to 24 inches. Slopes range from ½ to 2 percent, and moisture relations are only fair. Because drainage ranges from somewhat poor to moderately good, removal of surface water is a problem. Movement of water in the soils is very slow when they are wet, and the available moisture-holding capacity is high. The organic-matter content is low; natural fertility is moderate. These soils are strongly acid to mildly alkaline.

These soils are well suited to pasture and hay, but they are not entirely safe for row crops. Cotton, sorghum, soybeans, small grains, rice, vetch, and wild winter peas are well suited. Corn, annual lespedeza, millet, and sudangrass are fairly well suited. Suitable sod crops are tall fescue, johnsongrass, dallisgrass, alfalfa, white and red clovers, and winter legumes. The summer grasses and annual lespedeza are fairly well suited. Sweetgum, water oak, hackberry, elm, and ash are the best suited trees.

Suitable crop rotations are (1) 2 years of row crops followed by 4 years of sod crops; (2) first and second years, row crops; third year, in spring soybeans followed by red clover and oats in fall; fourth year, harvest oats and follow with fallow; (3) 1 year of cotton followed by 2 years of winter legumes for seed.

The texture and consistence of these soils make it difficult to maintain good tilth. When they are dry, the soils crack; when wet, they are very sticky. To prevent ponding and to remove excess water, row arrangement and V-type and W-type ditches as row outlets are needed. Deep tillage late in fall or early in winter helps to prevent clodding at planting time. Elevated seedbeds will assist in drainage and aeration of the soils.

The organic-matter content can be increased by turning under crop residues and by using a suitable sod crop in the rotation. Nitrogen is the only fertilizer needed.

CAPABILITY UNIT 9 (IIs–3)

Nearly level, "cold-natured," somewhat poorly drained to poorly drained silt loam on old natural levees:

Forestdale silt loam, nearly level phase, is the only soil in this unit. It occurs in small to large areas on slopes of ½ to 2 percent. The surface soil is an easily tilled silt loam, mostly about 6 inches thick. Small areas with a very fine sandy loam surface soil also occur. The subsoil, a thick silty clay, overlies coarser textured material at a depth of about 24 inches. Surface runoff is too slow in some of the more nearly level areas. Movement of water through the soil is slow, and the moisture-holding capacity is high. The organic-matter content is low; natural fertility is moderate. The soil is medium acid to strongly acid.

Well suited to this soil are soybeans, sorghum, small grains, vetch, wild winter peas, bermudagrass, johnsongrass, and winter legumes. Corn, cotton, rice, sudangrass, millet, tall fescue, dallisgrass, white and red clovers, annual lespedeza, and the summer grasses are fairly well suited. Suitable trees are sweetgum, water oak, hackberry, elm, and ash.

Suitable crop rotations are (1) 2 years of row crops followed by 3 years of sod crops; and (2) 2 years of nonlegume row crops followed by soybeans the third and fourth years; oats and winter legumes are seeded in fall of the fourth year, and the soils are fallowed the fifth year, after the oats are harvested.

This soil is easily tilled, but, if left bare, rain will cause it to pack, crust, puddle, and erode. Crusting is so severe at times that stands of crops are poor. Because of the slow internal drainage, tillage may be delayed for several days after rains. Hard, compact layers, or plowsoles several inches thick, tend to form just under the plow layer. These can be shattered by subsoiling during the dry months late in fall. Row arrangement and V-type or W-type ditches are needed to remove excess surface water.

To improve soil structure and infiltration and to reduce puddling, crusting, and packing, the content of organic matter should be increased. This can be done by turning under crop residues, by using a suitable sod in the rotation, and by growing winter legumes after clean-tilled crops. Nonlegume crops respond to nitrogen fertilizer.

CAPABILITY UNIT 10(IIs–4)

Nearly level, "cold-natured," somewhat poorly drained to poorly drained silty clay loams:

Alligator silty clay loam, nearly level phase.
Dundee silty clay loam, nearly level shallow phase.
Forestdale silty clay loam, nearly level phase.
Mhoon silty clay loam.
Sharkey silty clay loam, nearly level phase.

These soils occur in small to large areas on old natural levees, on recent levees, and in slack-water clay areas. They have slopes of ½ to 2 percent. The subsoils are thick silty clay or clay for all soils except the Mhoon, which has variable texture. Surface runoff is slow in some of the more nearly level areas. Movement of water through the soils is slow. The available moisture-holding capacity is high. The organic-matter content is low; natural fertility is moderate. Soils in this unit are medium acid to strongly acid. Because they crack when dry and are plastic when wet, these soils are difficult to till.

Soybeans, annual lespedeza, rice, small grains, vetch, wild winter peas, and sorghum are well suited. Cotton, sudangrass, and millet are fairly well suited. Ordinarily, corn and alfalfa are not suited. Suitable pasture plants are bermudagrass, johnsongrass, and winter legumes. Tall fescue, dallisgrass, white and red clovers, and the summer grasses are only fairly well suited. Suitable trees are sweetgum, water oak, and other hardwoods.

Suitable crop rotations are (1) 2 years of row crops followed by 3 years of sod crops; (2) 2 years of cotton, soybeans the third and fourth years, oats seeded in fall the fourth year, and the soil fallowed the fifth year after the oats are harvested in spring; (3) 1 year of cotton followed by 2 years of winter legumes for seed.

Proper row arrangement with adequate ditch outlets is a practical means of removing excess surface water. Deep cultivation and the use of elevated seedbeds will improve drainage and aeration.

The addition of organic matter will improve infiltration, soil structure, and tilth. Organic matter will increase bacterial activity in the soils and help reduce surface crusting. The use of crop residues and of suitable sod crops in the rotation will add humus. Ordinarily, nitrogen is the only fertilizer needed.

CAPABILITY UNIT 11(IIs–5)

Nearly level, shallow, "cold-natured," poorly drained very fine sandy loam in low bottoms:

Sharkey very fine sandy loam, nearly level overwash phase, is the only soil in this unit. It occurs in slack-water clay areas that have been covered with an overwash of very fine sandy loam, 6 to 10 inches deep. Slopes range from ½ to 2 percent. Surface runoff is very slow. The rate of infiltration is slow in the surface layer, and movement of water in the underlying horizons is very slow. The available water-holding capacity is very high. The organic-matter content is low; natural fertility is moderate. This soil is medium acid to neutral.

The following crops are well suited: Soybeans, small grains, rice, sorghum, tall fescue, bermudagrass, johnsongrass, dallisgrass, white clover, and wild winter peas. Cotton, corn, sudangrass, millet, annual lespedeza, red clover, vetch, and alfalfa are fairly well suited. Trees that are well suited are sweetgum, water oak, hackberry, elm, and ash.

Suitable crop rotations are (1) 2 years of row crops followed by 3 years of sod and (2) 2 years of nonlegume row crops, and soybeans the third and fourth years. In the rotation last mentioned, oats and winter legumes are seeded in fall of the fourth year, and the soil is fallowed the fifth year after the oat crop is harvested in spring.

This soil is easily tilled, but, if left bare, it crusts, puddles, and packs after rains. It is late to warm up in spring and remains wet longer than the other sandy loam soils in the county.

To remove excess surface water, carefully lay out rows and provide V-type and W-type ditches and adequate outlets. It is necessary to improve aeration of the soil by deep tilling and by frequent cultivation. Generally, nitrogen is the only fertilizer needed.

The addition of organic matter will improve soil structure and infiltration, reduce crusting and puddling, and increase bacterial activity. Plowing under of crop residues, using a suitable sod in the rotation, and growing winter legumes after clean-tilled crops will improve tilth.

CAPABILITY UNIT 12(IIs–6)

Nearly level, somewhat poorly drained to moderately well drained silty clay loams on recent or old natural levees and in low bottoms:

Bosket silty clay loam, nearly level phase.
Bowdre silty clay loam, nearly level phase.
Commerce silty clay loam, nearly level phase.
Dundee silty clay loam, nearly level phase.
Tunica silty clay loam, nearly level phase.

The surface soils are silty clay loam, mostly about 6 inches thick. The subsoils are clay to silty clay loam, but in places they are coarser textured. Surface runoff is no problem, as slopes range from ½ to 2 percent. The movement of water through the soils is very slow to fairly good, and the available moisture-holding capacity is moderate to high. The organic-matter content is low; natural fertility is moderate. The soils are strongly acid to mildly alkaline.

Cotton, soybeans, small grains, sorghum, tall fescue, bermudagrass, johnsongrass, dallisgrass, whiteclover, and wild winter peas are well suited. Corn, sudangrass, annual lespedeza, and rice are fairly well suited. Suitable trees are sweetgum, water oak, hackberry, elm, and ash.

Suitable crop rotations are (1) 4 years of row crops followed by 2 years of sod and (2) 3 years of row crops followed by 2 years of a small grain.

These soils should not be worked when wet, because clods form and make tillage somewhat difficult. Arrange crop rows to carry water to W-type ditches.

The content of organic matter can be increased by turning under crop residues, by using a suitable sod in the rotation, and by growing winter legumes after clean-tilled crops. Most nonlegume crops respond to nitrogen fertilizer.

CAPABILITY UNIT 13(IIw-3)

Somewhat poorly drained silt loam in depressions:

Souva silt loam—the only soil in this unit—periodically receives small additions of local alluvium from surrounding areas. Although dominantly silt loam, the surface layer ranges from silty clay loam to very fine sandy loam. This surface layer is 6 to 14 inches thick. The subsoil, a silty clay loam, is underlain in places by gleyed silty clay. Surface runoff is very slow to ponded; water movement in the soil is fairly slow. The available moisture-holding capacity is high. In both organic-matter content and natural fertility, the soil is moderate. It is medium acid to neutral.

If it is drained, this soil is suited to many cultivated crops and sod crops. Cotton, corn, soybeans, millet, sudangrass, and sorghum are suitable. Bermudagrass, dallisgrass, johnsongrass, white clover, vetch, and wild winter peas are well-suited pasture plants. Tall fescue, annual lespedeza, alfalfa, and red clover are fairly well suited. Trees that grow well on this soil are sweetgum, water oak, hackberry, elm, and ash.

Suitable crop rotations are (1) 6 years of row crops followed by 3 years of sod and (2) 1 year of cotton or corn followed by 1 year of soybeans.

This soil is easily tilled if adequately drained. Tillage, however, may be delayed for several days after rains. Arrange crop rows so that water will move to V-type and W-type ditches that have adequate outlets. This will help to prevent ponding when water collects from adjacent fields.

Apply nitrogen fertilizer carefully as too much will result in excessive plant growth. The content of organic matter is greater than in the adjacent, higher lying soils.

CAPABILITY UNIT 14(IIIe-3)

Sloping, somewhat poorly drained to moderately well drained silty clay loam on old natural levees:

Dundee silty clay loam, sloping phase, is the only soil in this unit. It has a silty clay loam surface layer. The subsoil, a silt loam, silty clay, or silty clay loam, is underlain by coarser textured material. Slopes range from 5 to 8 percent. Surface runoff requires control, as some areas already are moderately eroded. Movement of water in the soil is moderate to moderately slow, and the available moisture-holding capacity is high. The organic-matter content is low; natural fertility is moderate. The soil is strongly acid to neutral.

This soil is well suited to all the crops ordinarily grown. Most of the perennial and summer grasses common to the area grow well on this soil, and so do perennial and annual legumes. Trees that grow well are sweetgum, water oak, white oak, red oak, and other hardwoods.

Suitable crop rotations are (1) 2 years of row crops followed by 4 years of sod and (2) 1 year of a row crop followed by 2 years of oats and soybeans. In the rotation mentioned last, oats are seeded in fall and harvested in spring; soybeans are seeded after the oats are harvested.

Clods form if this soil is cultivated when wet. For safe removal of excess surface water, arrange crop rows to carry runoff to W-type ditches and, in some areas, provide vegetated waterways for the row outlets.

The low content of organic matter can be increased by growing a suitable sod crop in the rotation and by turning under crop residues. Nitrogen is the only fertilizer needed.

CAPABILITY UNIT 15(IIIe-5)

Gently sloping, "cold-natured," somewhat poorly drained to poorly drained silty clay loam:

Forestdale silty clay loam, gently sloping phase, the only soil in this capability unit, occurs as narrow bands on old natural levees. It has slopes of 2 to 5 percent. The subsoil, a thick silty clay, is underlain by coarser textured materials at a depth of about 24 inches. In some areas, moderate erosion has resulted from surface runoff. Movement of water through the soil is slow; the available moisture-holding capacity is high. The organic-matter content is low; natural fertility is moderate. This soil is medium acid to strongly acid.

Perennial vegetation, small grains, and legumes are best suited. Row crops are not entirely safe. Cotton and soybeans are fairly well suited. Bermudagrass, johnsongrass, and winter legumes are well-suited pasture plants. Tall fescue, dallisgrass, white and red clovers, and the summer annual grasses are only fairly well suited. Sweetgum, water oak, white oak, red oak, and other hardwoods are suitable.

Suitable crop rotations are (1) 2 years of row crops followed by 4 years of sod crops and (2) 1 year of cotton followed by 2 years of soybeans, or small grains and legumes.

Because of the texture of the surface layer and the poor internal drainage, this soil is difficult to till. It cracks when dry and is plastic when wet. It should not be cultivated when wet. For safe removal of excess surface water, arrange crop rows and provide W-type ditches and, in some areas, vegetated waterways for row outlets. Areas of this soil are not uniform, and the rows are hard to arrange for efficient operation of mechanical equipment. Deep tillage and the use of elevated seedbeds will improve row drainage and aeration.

The low content of organic matter can be increased by turning under crop residues, by growing a suitable sod crop in the rotation, and by growing winter legumes after clean-tilled crops. Generally, nitrogen is the only fertilizer needed.

CAPABILITY UNIT 16 (IIIs-2)

Gently sloping, somewhat poorly drained, clayey soils in low bottoms and on old natural levees:

Dundee silty clay, gently sloping phase.
Tunica clay, gently sloping phase.

Ordinarily, these soils are in long, narrow bands on slopes of 2 to 5 percent. The surface soils are silty clay or clay; the subsoils are clay. Coarser textured material is at depths of 20 to 30 inches. Surface runoff requires control. Water movement in the soils is very slow; the available moisture-holding capacity is high. The organic-matter content is low; natural fertility is moderate. These soils are slightly acid to mildly alkaline.

Suited to these soils are cotton, soybeans, small grains, vetch, and wild winter peas. Suitable pasture plants are tall fescue, dallisgrass, bermudagrass, johnsongrass, alfalfa, and white and red clovers. Annual lespedeza, millet, and sudangrass are fairly well suited. Corn and sorghum are risky crops. Sweetgum, water oak, hackberry, elm, and ash are the better suited trees.

Suitable crop rotations are (1) 2 or 3 years of row crops followed by 4 to 6 years of sod crops and (2) 1 year of a row crop and 2 or 3 years of oats and vetch.

These soils are difficult to till because they are very plastic when wet. They are very hard and have numerous cracks when dry. Because of the erosion hazard, preparation of seedbeds for row crops should be delayed as long as possible in winter or spring.

Elevated seedbeds will improve drainage and aeration. Rows should be carefully arranged to prevent erosion, and W-type ditches and vegetated outlets are needed to remove excess surface water.

The organic-matter content can be increased by turning under crop residues and by using a sod crop in the rotation. Ordinarily, nitrogen is the only fertilizer needed.

CAPABILITY UNIT 17 (IIIs-4)

Nearly level to gently sloping, poorly drained, clayey soils on old natural levees and in low bottoms:

Alligator clay, nearly level phase.
Alligator clay, gently sloping phase.
Forestdale silty clay, nearly level phase.
Forestdale silty clay, gently sloping phase.
Sharkey clay, nearly level phase.
Sharkey clay, gently sloping phase.

These soils are in small to large tracts, mostly in slack-water areas. They have slopes of ½ to 5 percent. The surface soils are clay or silty clay. The subsoils are thick and consist of clay that restricts movement of water and air. Roots of most plants can penetrate to only shallow depths.

These soils are difficult to manage. Because the soils swell and seal over when wet and crack severely when dry, crops are uncertain. Surface runoff is very slow, and excess water collects in the more nearly level areas after heavy rains. Water movement into and through the soils is very slow; the available moisture-holding capacity is very high. In many places, the water table is near the surface during long, wet periods. The organic-matter content is fairly high when the soils are first cleared but commonly disappears rapidly under tillage. The natural fertility of these soils is moderate. They are medium acid to neutral.

Small grains, rice, soybeans, vetch, and wild winter peas are well suited to these soils. Cotton, sudangrass, millet, and annual lespedeza are fairly well suited. Corn is an uncertain crop. Well-suited pasture plants are bermudagrass, dallisgrass, johnsongrass, tall fescue, and white and red clovers. Sweetgum and water oak grow well.

Suitable crop rotations are (1) 2 years of row crops followed by 4 years of sod (fig. 4); (2) 1 year of cotton and 2 years of small grains or soybeans; (3) 2 or 3 years of rice followed by 3 years of pasture, or 3 years of small grains and vetch, or 3 years of soybeans; and (4) 1 year of cotton followed by 2 years of winter legumes grown for seed.

These soils can be cultivated within only a narrow range of moisture content. They are too plastic when wet, and, when dry, they become too hard and crack severely. Where erosion is not a problem, deep cultivation should be done in fall. If the wet soils are broken in spring, they clod and may remain cloddy throughout the growing season. Rows can be arranged to give maximum drainage with the least erosion. Many V-type and W-type ditches are needed to remove excess surface water.

***Figure 4.*—Four-year stand of fescue sod turned under on Sharkey clay, nearly level phase. This fescue is grown in rotation with row crops.**

The content of organic matter can be increased by using a suitable sod crop in the rotation and by returning crop residues to the soils. Generally, nitrogen is the only fertilizer needed.

CAPABILITY UNIT 18(IIIw–5)

Level, poorly drained silty clay loam in low bottoms:

Alligator silty clay loam, level phase, is the only soil in this unit. It occurs in slack-water areas on slopes of 0 to ½ percent. The surface soil, a silty clay loam, is mostly about 6 inches thick; the subsoil is clay. Moisture relations are poor. Surface runoff and water movement in the soil are very slow; the available moisture-holding capacity is very high. The organic-matter content is low; natural fertility is moderate. This soil is medium acid to strongly acid.

Well suited to this soil are soybeans, rice, small grains, vetch, wild winter peas, sorghum, bermudagrass, johnsongrass, and winter legumes. Tall fescue, dallisgrass, white and red clovers, sudangrass, millet, and the summer grasses are only fairly well suited. Cotton, corn, and alfalfa are uncertain crops. Sweetgum, water oak, white oak, and red oak trees grow well.

Suitable crop rotations are (1) 2 years of row crops followed by 3 years of sod crops; (2) 2 years of cotton, 2 years of soybeans, oats seeded in fall the fourth year, and fallow the fifth year after the oat crop is harvested; and (3) 1 year of cotton followed by 2 years of winter legumes for seed.

This soil is difficult to till. It is plastic when wet; when dry, it becomes very hard and forms numerous cracks. Deep cultivation and elevated seedbeds will improve drainage and aeration. Runoff from higher lying areas is a problem and often delays planting and cultivating. Proper row arrangment with adequate ditch outlets is a practical means of removing excess surface water.

The content of organic matter can be increased by turning under crop residues and by using a sod crop in the rotation. Generally, nitrogen is the only fertilizer needed.

CAPABILITY UNIT 19(IIIw–11)

Level, poorly drained, clayey soils in low bottoms:

Alligator clay, level phase.
Sharkey clay, level phase.

These soils are in broad, slack-water flats on slopes of 0 to ½ percent. The surface soils are clay, 5 to 6 inches thick. The subsoils are thick clay that restricts the movement of water and air. Roots of most plants cannot penetrate very deeply.

These soils are very difficult to manage. Surface runoff and movement of water into and through them are very slow. The water table is ordinarily near the surface during wet seasons, and the available moisture-holding capacity is very high to high. The organic-matter content is medium; natural fertility is moderate. These soils are medium acid to neutral.

Wetness, poor tilth, and the possibility of local flooding limit the use of these soils for crops. Rice, soybeans, and sorghum are best suited. Unless drained extensively, these soils are not suited to small grains, vetch, wild winter peas, cotton, and corn. Suitable pasture plants are bermudagrass, dallisgrass, johnsongrass, tall fescue, and white clover. Sudangrass, millet, red clover, and annual lespedeza are only fairly well suited. Forest trees that grow well are sweetgum, water oak, hackberry, elm, and ash.

Suitable crop rotations are (1) 2 years of row crops followed by 4 years of sod crops; (2) 2 or 3 years of rice followed by 3 years of pasture, small grains, or soybeans; (3) 1 year of a row crop followed by 2 years of small grains or soybeans; and (4) 1 year of a row crop followed by 2 years of winter legumes grown for seed.

These soils do not produce good stands of crops. They swell, seal over, and puddle when wet; when dry, they crack severely and are very hard. Most of the time they are either too wet or too dry to cultivate. Deep cultivation should be done in fall. If worked in spring, the soils form clods that make tillage difficult throughout the growing season. Very slow surface runoff and the collecting and ponding of water from adjacent, higher lying soils is a serious problem. Surface drainage is essential for crop production, and proper layout of rows to lead water to ditches is generally adequate.

The content of organic matter can be increased by using a suitable sod crop in the rotation. Generally, nitrogen is the only fertilizer needed.

CAPABILITY UNIT 20(IIIw–13)

Poorly drained soils in depressions:

Dowling soils, an undifferentiated mapping unit, is the only one in this group. It occupies long, narrow, nearly level depressions in which soil material from the surrounding higher lying soils is deposited periodically. The texture of the surface layer ranges from clay to very fine sandy loam. The subsoil is clay, with lenses of coarser material. Surface runoff is very slow to ponded, and the movement of water into and through the soils is very slow. The available moisture-holding capacity is high. During wet seasons, the water table is at the surface. The organic-matter content is higher than in the surrounding soils; natural fertility is fairly high. Dowling soils are medium acid to neutral.

The use of these soils for crops is limited by low position, local flooding, poor drainage, and poor tilth. If adequately drained, they are suited to rice and sorghum. Soybeans, corn, wheat, vetch, and wild winter peas are fairly well suited. Tall fescue, bermudagrass, dallisgrass, sudangrass, white clover, and millet are fairly well suited as pasture crops. Barley, oats, and cotton are risky because of the frequent floods. Johnsongrass and red clover do not grow well. Sweetgum, water oak, hackberry, elm, ash, overcup oak, and bitter pecan are suitable trees.

Suitable cropping systems are (1) 2 years of row crops followed by 4 years of sod crops and (2) permanent meadow.

Tilth is poor, and the soils are difficult to manage. They remain wet for long periods after heavy rains. For areas to be cultivated, row layout to lead water to ditches is an effective means of removing excess water.

Nitrogen is the only fertilizer needed; however, too much can result in excessive plant growth.

CAPABILITY UNIT 21(IVw-1)

Poorly drained, clayey soil in depressions:

Dowling clay is the only soil in this capability unit. It is in numerous, narrow to broad, flat depressions throughout the slack-water areas. Runoff water from nearby higher lying soils accumulates in the low areas and periodically deposits additional soil material. The clayey surface soil and subsoil are very plastic and very sticky. Water moves very slowly in the soil. In wet seasons, the water table is at the surface. The available moisture-holding capacity is high. The organic-matter content is higher than in the surrounding soils; natural fertility is fairly high. The soil is medium acid to neutral.

This soil is fairly well suited to hay and pasture, but row crops are uncertain. It is well suited to rice but is only fairly well suited to sorghum, soybeans, millet, sudangrass, tall fescue, bermudagrass, dallisgrass, and white clover. Cotton, corn, johnsongrass, and red clover are not suited. Trees that grow well are bitter pecan, cottonwood, cypress, tupelo-gum, and willow and overcup oak.

Suitable crop rotations are (1) 2 years of rice followed by 2 years of soybeans; (2) summer annual crops; and (3) 2 years of summer annuals or soybeans, followed by 4 years of sod crops.

Tilth is poor, and the soil is difficult to manage. Excess surface water often delays the planting and cultivation of row crops. When dry, the soil shrinks and cracks and roots of some plants are injured. Extensive surface drainage by means of V-type and W-type ditches and dragline ditches is needed for most crops. If this soil is cropped, rows should be arranged to give maximum surface drainage.

This soil is fairly fertile, but its low position, poor drainage, and fine texture prevent plants from using fertilizer effectively.

CAPABILITY UNIT 22(IVs-1)

Sandy loams and loamy sands on natural levees:

This capability unit has one mapping unit: Crevasse sandy loams and loamy sands. The surface soil is very fine sandy loam to loamy sand; the subsoil is loamy sand. Movement of water through the soils is rapid; the available water-holding capacity is low. The organic-matter content and natural fertility are low. The soils are strongly acid to mildly alkaline.

The low capacity for supplying water to plants and the difficulty in maintaining a good supply of plant nutrients greatly limit the suitability of this soil for cultivation. In general, bermudagrass, other pasture grasses, and trees—mainly sweetgum, water oak, white oak, and other hardwoods—are best for this soil. Early truck crops and crimson clover are fairly well suited, and early corn, small grains, and wild winter peas can be grown with some success.

Suitable crop rotations are (1) bermudagrass overseeded with crimson clover or oats and (2) early truck crops followed by native grasses.

The soils of this mapping unit are easy to work, but they erode easily. When row crops are planted, the rows should be carefully arranged to conserve moisture and reduce erosion. Vegetated outlets may be needed.

The addition of organic matter will improve the soil structure and increase the moisture-holding capacity. Use of sod crops in the rotation and the return of crop residues will add humus. Plants need several applications of nitrogen fertilizer during the growing season.

Estimated yields

The yields that may be expected from crops grown in any area vary because there are differences in soils, their management, weather, and other factors. Table 1 lists the major soils mapped in Washington County and gives the yields that may be expected from most locally grown

TABLE 1.—*Estimated average acre yields of principal crops at two levels of management*

[Yields in columns A are those obtained under common management; those in columns B, under improved management. Absence of yield indicates crop is not considered suitable at the level of management specified]

Soil [1]	Cotton (lint)		Corn		Soybeans		Oats		Rice		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Lb.	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Acres per animal unit* [2]	*Acres per animal unit* [2]
Alligator clay:												
Nearly level phase	225	375	-----	-----	20	35	30	50	50	85	6. 0	3. 0
Level phase	175	250	-----	-----	10	25	-----	-----	50	85	6. 0	3. 0
Gently sloping phase	225	375	-----	-----	20	35	30	50	-----	-----	5. 5	2. 5
Alligator silty clay loam:												
Nearly level phase	225	375	-----	-----	25	35	30	50	50	85	5. 0	2. 5
Level phase	175	250	-----	-----	10	25	-----	-----	50	85	6. 0	3. 0
Beulah very fine sandy loam:												
Nearly level phase	375	450	35	55	-----	-----	30	60	-----	-----	4. 0	2. 0
Gently sloping phase	350	425	25	40	-----	-----	30	60	-----	-----	4. 0	2. 0
Nearly level moderately shallow phase	450	550	40	65	-----	-----	35	65	-----	-----	4. 0	2. 0
Bosket very fine sandy loam:												
Nearly level phase	575	700	40	75	20	35	30	60	-----	-----	4. 5	2. 0
Gently sloping phase	475	600	30	60	20	30	30	60	-----	-----	4. 0	2. 0
Nearly level moderately shallow phase	575	700	40	75	20	35	35	65	-----	-----	4. 5	2. 0

See footnotes at end of table.

TABLE 1.—*Estimated average acre yields of principal crops at two levels of management*—Continued

Soil[1]	Cotton (lint)		Corn		Soybeans		Oats		Rice		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Lb.	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Acres per animal unit*[2]	*Acres per animal unit*[2]
Bosket silty clay loam, nearly level phase	475	600	30	60	20	35	30	60	---	---	4.0	2.0
Bowdre silty clay, nearly level phase	325	450	30	45	15	25	30	50	---	---	4.5	2.5
Bowdre silty clay loam, nearly level phase	325	450	30	65	15	25	30	50	---	---	4.5	2.5
Commerce silt loam:												
Nearly level phase	700	825	45	90	30	45	40	65	---	---	4.2	2.2
Nearly level shallow phase	675	800	40	85	30	45	40	65	---	---	4.2	2.2
Commerce silty clay loam, nearly level phase	650	775	35	60	30	40	35	55	---	---	4.5	2.5
Commerce very fine sandy loam	700	825	45	90	30	45	40	65	---	---	4.2	2.2
Commerce very fine sandy loam, moderately shallow phase	675	800	40	85	30	45	40	65	---	---	4.2	2.2
Crevasse sandy loams and loamy sands	---	---	---	---	---	---	---	---	---	---	20	10
Dowling clay	---	---	---	---	15	30	---	---	50	85	---	---
Dowling soils	200	300	15	35	15	30	---	---	50	85	---	---
Dubbs very fine sandy loam, nearly level phase	675	800	45	90	25	35	40	65	---	---	4.2	2.2
Dubbs silt loam, nearly level phase	675	800	45	90	25	35	40	65	---	---	4.2	2.2
Dundee very fine sandy loam:												
Nearly level phase	625	750	45	90	20	35	45	65	---	---	4.2	2.2
Gently sloping phase	400	650	30	75	15	30	40	60	---	---	4.2	2.4
Nearly level moderately shallow phase	600	725	40	85	20	35	40	60	---	---	4.2	2.2
Nearly level shallow phase	600	725	40	85	20	35	40	60	---	---	4.2	2.2
Dundee silt loam:												
Nearly level phase	625	750	45	90	20	35	40	60	---	---	4.2	2.2
Gently sloping phase	400	650	30	75	15	30	40	60	---	---	4.2	2.2
Dundee silty clay loam:												
Nearly level phase	525	650	30	55	20	35	35	55	40	70	4.0	2.0
Gently sloping phase	400	550	30	55	15	30	35	55	---	---	4.0	2.0
Sloping phase	375	450	25	50	15	25	30	50	---	---	4.0	2.0
Nearly level shallow phase	550	700	35	70	20	35	35	55	40	70	4.5	2.5
Dundee silty clay:												
Nearly level phase	450	600	30	45	20	35	35	55	40	70	4.5	2.5
Gently sloping phase	400	550	30	40	15	30	30	55	---	---	4.5	2.5
Forestdale silty clay loam:												
Nearly level phase	350	450	---	---	20	35	30	50	50	85	4.5	2.5
Gently sloping phase	325	425	---	---	15	30	30	50	---	---	4.5	2.5
Forestdale silty clay:												
Nearly level phase	225	375	---	---	20	35	30	50	50	85	6.0	3.0
Gently sloping phase	225	375	---	---	15	30	30	50	---	---	5.5	2.5
Forestdale silt loam, nearly level phase	375	500	35	55	20	35	30	50	40	70	4.5	2.5
Mhoon silty clay loam	350	450	---	---	25	40	30	50	50	85	4.5	2.5
Pearson silt loam, nearly level phase	625	750	45	90	20	35	40	60	---	---	4.5	2.5
Robinsonville very fine sandy loam	700	825	45	90	---	---	45	65	---	---	3.0	1.5
Sharkey clay:												
Nearly level phase	300	400	25	45	20	40	25	45	50	85	5.0	3.0
Level phase	175	250	---	---	10	30	25	45	50	85	---	5.0
Gently sloping phase	300	400	20	40	25	40	25	45	---	---	5.0	3.0
Sharkey silty clay loam, nearly level phase	300	400	25	45	25	40	25	45	50	85	5.0	3.0
Sharkey very fine sandy loam, nearly level overwash phase	375	500	35	50	25	40	25	45	50	85	5.0	3.0
Souva silt loam	350	500	45	85	25	35	---	---	---	---	4.2	2.2
Tunica clay:												
Nearly level phase	450	600	25	50	25	40	30	55	40	70	5.0	3.0
Gently sloping phase	450	600	20	45	30	40	30	55	---	---	5.0	3.0
Tunica silty clay loam, nearly level phase	475	650	25	50	15	25	30	55	---	---	5.0	3.0

[1] Miscellaneous land types (Alluvial land, Borrow pits, and Swamp) are not listed in this table, because they are not used for crops and are seldom pastured.

[2] An animal unit is equivalent to 1 cow, steer, or horse; 5 hogs; 7 sheep; or 7 goats.

crops. Estimates are given at two levels of management. The yields in columns A are those to be expected under common management. Those in columns B are to be expected under improved management.

The best management includes more liberal use of commercial fertilizer than in common management, better control of insects, use of crops better suited to the soils, and adequate drainage. Use of irrigation was not considered in making yield estimates.

Table 1 was compiled from yield information gathered from Washington County agricultural workers, from the Mississippi Delta Branch experiment station at Stoneville, and from farmers in adjoining counties who have similar soils and problems.

Pasture Management

In Washington County, as in many other counties in the Mississippi Delta, interest in grassland farming has grown during the past 10 years. According to the 1954 census, approximately 16 percent of the total cropland in the county was planted to perennial, rotated pasture crops. Since 1954, interest has continued to increase. More fields are pastured, and more livestock, including beef cattle, feeder cattle, and sheep, are raised.

Pastures are distributed throughout the county, mostly in low, flat areas. Various grazing programs are used. Because there is a large acreage of good, well-drained cropland, many farmers have planted small grains, sudangrass, millet, annual lespedeza, and other annuals for grazing. Also johnsongrass is a native plant that grows rapidly on practically every farm. In recent years most pastures have been built by using perennial grasses and legumes in rotation with row crops. Thus, pasture is part of a well-balanced cropping system that will conserve the soils and maintain yields.

A permanent grazing program consists of perennial winter and summer grasses with suitable legumes. The legumes supply nitrogen and improve the quality of the forage. Temporary crops can be fitted around a grass-legume base to provide supplemental grazing as needed. Small grains, millet, and other annual crops are good for limited or special use, as to finish feeder cattle or to maintain milk production from dairy cows during critical periods.

The most practical pasture program will include perennial grasses for both winter and summer. The summer grasses and winter grasses are in separate pastures. Both are overplanted with suitable legumes. If the pasture area is on poorly drained, fine-textured soils, a good combination for winter grazing is tall fescue overplanted with wild winter peas or white or ladino clover (fig. 5).

Figure 5.—**Herefords grazing fescue and ladino clover on Sharkey clay, nearly level phase.**

For summer grazing, use coastal bermudagrass overplanted with wild winter peas and vetch. Johnsongrass, dallisgrass, common bermudagrass, and other perennial grasses, each with a suitable legume, may be substituted in such a plan. Because coastal bermudagrass is such a thick, heavy grower, a winter legume, rather than a summer legume, overplanted with it is a better source of nitrogen.

Hardwood Management [1]

There were vast stands of virgin hardwoods and tupelo-cypress breaks in Washington County until the early settlers arrived and cleared the land for timber or for farming. Now, woodland occupies about 21 percent of the total land area. It consists mostly of privately owned tracts of mixed hardwoods. Because of the demand for pulpwood, tupelo-gum and sweetgum trees are rapidly being depleted.

Washington County has a volume of 2.4 million board feet in standing saw-log trees above 14 inches in diameter. The principal trees and the soils on which they grow best are shown in the following list.

Trees	*Soils*
American elm	Forestdale, Sharkey, Tunica, and Commerce.
Cottonwood	Bowdre, Commerce, Mhoon, and Crevasse.
Cypress	Dowling and Souva.
Black willow	Mhoon, Dowling, Souva, and Crevasse.
Green ash	Forestdale, Alligator, Sharkey, and Tunica.
Nuttall oak	Forestdale, Alligator, Sharkey, and Tunica.
Overcup oak	Forestdale, Alligator, Sharkey, and Tunica.
Water oak	Commerce, Dundee, Alligator, and Sharkey.
Cow oak	Dundee and Forestdale.
Sweetgum	Commerce, Dundee, Bowdre, Alligator, and Sharkey.
Tupelo-gum	Dowling and Souva.
Sycamore	Bosket, Beulah, Dundee, and Forestdale.
Cherrybark oak	Bowdre, Alligator, Sharkey, Dundee, and Forestdale.
Bitter pecan	Dundee, Forestdale, Alligator, and Sharkey.

The cottonwood, willow, and gum trees are cut for pulpwood; the green ash and the Nuttall, overcup, and water oaks are good saw-log trees.

Economics and farm management ordinarily will determine whether the soils will be used for crops, pasture, or woods. The trend in this area is toward general farming. Before clearing his land, however, each farmer should study his soils and consider the present and future value of his woods. He may decide that well-managed woodland is the best use.

Three steps necessary in beginning a hardwood management plan are:

(1) Stop all woods fires, and eliminate grazing where new trees are needed to complete the stocking of an area. Washington County does not have a State fire protection program.
(2) Harvest all badly damaged, overmature trees.
(3) Cut back red haw, privet, and other large shrubs; and cull the commercial trees.

For further help in forestry management, the farmer may consult with his State forestry representative who resides in the area.

[1] This section was prepared by J. S. McKnight, Forest Service, U. S. Department of Agriculture.

Engineering Properties of Soils

This section of the soil survey report provides information that engineers can use to help conserve soil and water or to build roads, dams, and other structures. Engineers can use the information in this section to—

1. Make studies of soil and land use that will aid in the selection and development of industrial, business, residential, and recreational sites.
2. Obtain part of the information needed to design drainage and irrigation systems and to plan dams and other structures that will conserve soil and water.
3. Make reconnaissance surveys of soil and ground conditions that will aid in the selection of locations for highways and airports and in planning detailed surveys for these and other structures that require special consideration of foundation materials.
4. Locate sand for use in structures.
5. Develop information useful in designing and maintaining pavements.
6. Determine suitability of soils for cross-county movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs, for the purpose of making soil maps and reports that engineers can readily use.

The mapping and the descriptive report are somewhat generalized, however, and should be used only in planning more detailed field surveys to determine the in-place condition of the soil at the site of the proposed engineering construction.

Engineering terms and classifications

This engineering section is based on five tables, each of which contains some engineering terms that may not be familiar to soils men or to farmers who are interested in building dams, ponds, or other structures on their land. These terms are explained in the following paragraphs. Terms used in soil science that may not be familiar are defined in the Glossary at the back of this report.

Maximum density (table 2) is the highest density obtained when a soil is compacted at the *optimum moisture content.* If soil material is compacted at successively higher contents of moisture, assuming that the compactive effort remains constant, the density of the compacted material will increase until the optimum moisture content is reached. After that, the density decreases with increase in moisture content.

Liquid limit, plastic limit, and plasticity index (table 2) measure the effect of water on the consistence of soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a solid to a semisolid or plastic state. As the moisture content is further increased, the material changes from the plastic to a liquid state. The plastic limit is the moisture content at which the material passes from the solid to a plastic state, and the liquid limit is the moisture content at which the material changes from the plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

USDA texture, expressed in such words as "clay, silty clay loam, and very fine sandy loam," does not conform with texture terms used by many engineers. In table 3 the texture term used by the United States Department of Agriculture is followed by the columns showing the Unified and AASHO classification symbols; thus, a clay soil, in agricultural terms, is about equivalent to soil material engineers would classify as CH in the Unified system or A–7 in the AASHO system.

Permeability (table 3) is the quality of the soil that enables it to transmit water or air. Permeability to water is expressed in inches of depth to which water penetrates in one hour. The rates for permeability in table 3 were estimated for the soil material in place. The estimates were based on study of soil structure (after the method developed by Alfred O'Neil) and were compared with undisturbed-core tests for permeability made on similar soil material.

Available water (table 3) is approximately the amount of capillary water in a soil when it is wet to field capacity. It is the number of inches of water needed to wet 1 foot of air-dried soil material. Hence, if a layer of soil material is 6 inches thick, and its available water capacity is 3 inches, 1.5 inches of water will be needed to wet the layer.

Dispersion (table 3) refers to the degree and rapidity with which soil structure breaks down, or slakes, in water. High dispersion means that the soil slakes easily.

Shrink-swell potential (table 3) is an indication of the volume change to be expected of soil material with changes in moisture content. As the moisture decreases, the soil shrinks; as it increases, the soil swells.

CBR, or California Bearing Ratio (table 6), expresses the results of a test to determine the ability of a soil material to bear loads. The numbers indicate bearing capacity and range from 2 to 5 for soft clay to more than 50 for some gravelly materials.

Subgrade modulus k (table 6) is defined as the reaction of the subgrade material per unit area of deformation and is given in pounds per square inch of area per inch of deformation. The unit load for a deformation of 0.05 inch is generally used in determining *k*. However, the Corps of Engineers determines *k* for the deformation obtained under a load of 10 pounds per square inch.

Classification Systems.—Two systems for classifying soils are used in this report, the AASHO and the Unified (see tables 2, 3, and 4). Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (*1*).[2] In this system soil materials are classified in seven principal groups. The groups range from A–1, consisting of gravelly soils of high bearing capacity, to A–7, consisting of clay soils having low strength when wet. Within each group, the relative engineering value of the soil material can be indicated by a group index number. Group indexes range from 0 for the best materials to 20 for the poorest. The group index number is shown in parentheses following the soil group symbol in table 2. For other tables, this engineering value is not indicated, because the engineering properties are based on estimates that were not precise enough to permit assigning group indexes. Table 5 shows the factors considered in assigning soil materials to groups according to the AASHO system.

Some engineers prefer to use the Unified soil classification system (*10*). In this system, soil materials are identified as coarse grained (8 classes), fine grained, (6 classes), or highly organic. The principal characteristics of the 15 classes of soils are given in table 6.

Test data and engineering interpretations

The five tables that follow serve different purposes. The first, table 2, gives results of actual tests on five soil profiles obtained in Humphreys and Leflore Counties. The results of these tests, along with information obtained by field observation and from the SCS Irrigation Guide, were used in estimating the engineering properties of the soils, which are presented in tables 3 and 4. Tables 5 and 6 provide background information; the first shows factors considered in arriving at AASHO ratings for soils, and the second, those used in arriving at Unified ratings.

The information presented in tables 3 and 4 can be supplemented by reading other parts of the soil survey report, particularly the section, Descriptions of Soils. Some general comments on the suitability of soils for engineering structures are made in the following paragraphs.

In Washington County the depth to bedrock is so great that excavation is not difficult, but neither is bedrock available for foundation footings.

The Alligator, Dowling, and Sharkey soils and the upper part of the profiles of the Bowdre and Tunica soils shrink greatly when dry and swell when wet. They are, therefore, unsuitable for subgrades on which to lay pavement. The cracking and warping of pavements, caused by expansion and contraction of these very plastic soils, can be minimized if a thick layer of soil material of low volume change is used as a foundation course. The foundation course should extend through the shoulders of the road. Sandy loams or loamy sands are generally the best sources of foundation material for road pavement and will support a limited amount of traffic on the road shoulders.

Many soils in Washington County have a shallow water table, and water ponds on them during much of the year. Roads on these soils should be constructed on embankments and should have adequate drainage, both on the surface and under the roadbed. In lowlands and in other areas that are flooded, roads should be constructed on a continuous embankment that is several feet above the level of frequent floods. Because of good surface drainage, the natural levees are generally the best sites for roads. The sandy soils are well suited to use as pavement foundation. Any of the medium-textured soils are suitable for farm or field roads, but they also require good surface drainage of roadbeds and shoulders.

[2] Italic numbers in parentheses refer to Literature Cited, page 54.

TABLE 2.—*Engineering test data*[1] *for soil*

Soil name and location	Parent material	Bureau of Public Roads report number	Depth	Horizon	Moisture-density: Maximum density	Moisture-density: Optimum moisture content
			Inches		*Lb. per cu. ft.*	*Percent*
Alligator clay: Center SW¼ sec. 33, T. 16 N., R. 4 W.[5]	Alluvium	93211	0–3	A_p	91	23
		93212	3–30		92	25
		93213	30–55		93	25
Dundee silty clay loam: SW¼ sec. 3, T. 20 N., R. 1 W.[6]	Old alluvium on Mississippi River flood plains.	92903	0–5	A_p	104	17
		92904	5–18	B_{21} and B_{22}	103	19
		92905	18–48	B_3 and C	108	17
Dundee very fine sandy loam: NE¼NW¼ sec. 8, T. 15 N., R. 2 W.[5]	Old alluvium on Mississippi River flood plains.	93217	0–6	A_p	100	17
		93218	6–24	B_2	104	18
		93219	24–38		106	18
		93220	38–56		108	17
Forestdale silty clay loam: NW¼NW¼ sec. 2, T. 16 N., R. 5 W.[5]	Old alluvium on Mississippi River flood plains.	93214	0–4	A_p	108	16
		93215	4–26	B_2	100	22
		93216	26–53	C	105	17
NE¼SW¼ sec. 7, T. 19 N., R. 1 W.[6]	Old alluvium on Mississippi River flood plains.	92900	0–9	A_p and A_2	108	17
		92901	9–27	B_{21g} and B_{22g}	99	21
		92902	27–59	C_{1g} and C_{2g}	108	17

[1] Tests performed by Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*).

[2] Mechanical Analysis of Soils according to AASHO Designation T. 88-54. Results by this procedure frequently differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material

TABLE 3.—*Estimated physical properties*

Map symbol	Soil name	Slope	Depth to water table	Description of soil and site	Depth from surface	USDA texture	Unified classification
	Alligator clay:	*Percent*	*Feet*		*Inches*		
Aa	Level phase	0–½	0–0.5	Poorly drained plastic clay	0–6	Clay	CH
Ab	Nearly level phase	½–2	0–0.5			Silty clay loam	CL
Ac	Gently sloping phase	2–5	0–0.5		6–24	Clay	CH
	Alligator silty clay loam:						
Ad	Level phase	0–½	0–0.5		24–40	Clay	CH
Ae	Nearly level phase	½–2	0–0.5				
Af	Alluvial land			Undifferentiated soils occurring below the levees and subject to overflow.			
	Beulah very fine sandy loam:			Somewhat excessively drained very fine sandy loam.	0–8	Very fine sandy loam.	SM
Ba	Nearly level phase	½–2	6+		8–14	Very fine sandy loam.	SM
Bb	Gently sloping phase	2–5	6+		14–33	Very fine sandy loam.	SM
					33–52	Very fine sandy loam.	SM
Bc	Nearly level moderately shallow phase.	½–2	2	Somewhat excessively drained very fine sandy loam underlain by clay at about 24 inches.	0–24	Very fine sandy loam.	SM
					24–42	Clay	CH

See footnotes at end of table.

samples taken from five soil profiles (8)

Mechanical analysis [2]						Liquid limit	Plasticity index	Classification	
Percentage passing sieve		Percentage smaller than—						AASHO [3]	Unified [4]
No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
100	99	91	76	63	52	71	40	A-7-5(20)	CH
100	99	88	75	65	54	85	54	A-7-5(20)	CH
100	99	85	69	61	50	94	64	A-7-5(20)	CH
100	97	85	60	29	21	34	11	A-6(8)	ML-CL
100	98	83	57	37	32	48	24	A-7-6(15)	CL
100	97	80	48	24	20	35	13	A-6(9)	ML-CL
100	91	60	26	10	7	23	0	A-4(8)	ML
100	96	82	56	37	31	42	20	A-7-6(12)	CL
100	97	78	48	26	23	37	14	A-6(10)	ML-CL
100	98	80	48	23	18	34	9	A-4(8)	ML-CL
100	93	78	55	35	28	33	13	A-6(9)	CL
100	97	86	68	50	45	63	38	A-7-6(20)	CH
99	91	74	50	35	31	47	24	A-7-6(15)	CL
100	93	77	50	29	24	31	11	A-6(8)	CL
100	98	85	60	39	35	50	25	A-7-6(16)	CL
100	97	80	52	30	25	39	17	A-6(11)	CL

coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

[3] Based on The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation: M 145-49.

[4] Based on the Unified Soil Classification System, Tech. Memo. No. 3-357, v. 1, Waterways Experiment Station, Corps of Engineers, March 1953 (*10*).

[5] Test data from Humphreys County, Miss.

[6] Test data from Leflore County, Miss.

of soils significant in engineering

AASHO classification	Percentage passing—		Permeability	Structure	Available water [1]	Reaction (pH value)	Dispersion	Shrink-swell potential
	No. 200 sieve (0.074 mm.)	No. 10 sieve (2.0 mm.)						
			Inches per hour		*Inches per foot*			
A-7	90	100	[2]−0.05	Massive	3.0	5.1-6.0	Low	Very high.
A-6	80	100	0.2-0.8	Massive	3.0	5.1-6.0	Moderate	Very high.
A-7	90	100	[2]−0.05	Massive to subangular blocky.	3.0	5.1-6.0	Low	Very high.
A-7	90	100	[2]−0.05	Massive	3.0	5.1-6.0	Low	Very high.
A-2	30	100	2.5-5.0	Structureless	1.2	5.1-6.0	High	Low.
A-2	30	100	2.5-5.0	Subangular blocky	1.2	5.6-6.5	High	Low.
A-2	30	100	2.5-5.0	Structureless	1.0	5.6-6.5	High	Low.
A-2	30	100	2.5-5.0	Structureless	1.0	5.6-7.8	High	Low.
A-2	30	100	2.5-5.0	Structureless	1.2	5.6-6.5	High	Low.
A-7	90	100	[2]−0.05	Structureless	3.0	5.6-6.5	Low	Very high.

TABLE 3.—*Estimated physical properties of*

Map symbol	Soil name	Slope	Depth to water table	Description of soil and site	Depth from surface	USDA texture	Unified classification
		Percent	*Feet*		*Inches*		
	Bosket very fine sandy loam:			Well drained to somewhat excessively drained very fine sandy loam and silty clay loam.	0–4	Very fine sandy loam.	SM
Be	Nearly level phase	½–2	6+			Silty clay loam	CL
Bf	Gently sloping phase	2–5	6+		4–14	Silty clay loam	CL
Bg	Nearly level moderately shallow phase.	½–2	6+		14–24	Silt loam	ML–CL
Bd	Bosket silty clay loam, nearly level phase.	½–2	6+		24–48	Very fine sandy loam.	SM
Bh	Bowdre silty clay, nearly level phase.	½–2	0.5–6	From 10 to 20 inches of silty clay overlying silty clay loam to loamy sand.	0–6	Silty clay	CH
						Silty clay loam	CL
Bk	Bowdre silty clay loam, nearly level phase.	½–2	0.5–6		6–10	Silty clay	CH
					10–14	Silty clay loam	CL
					14–50	Loamy sand	SM
Bp	Borrow pits	----	----	Open excavations from which soil and underlying material have been removed for levees and highways.	----	----	----
Cb	Commerce silt loam, nearly level phase.	½–2	2	Somewhat poorly drained to moderately well drained silt loam, very fine sandy loam, and silty clay loam.	0–5	Very fine sandy loam.	SM
Ce	Commerce very fine sandy loam.	½–2	2			Silt loam	ML
						Silty clay loam	CL
Ca	Commerce silty clay loam, nearly level phase.	½–2	2		5–18	Silt loam	ML–CL
					18–41	Very fine sandy loam.	SM
					41–48	Silt loam	ML–CL
Cf	Commerce very fine sandy loam, moderately shallow phase.	½–2	1–2	Somewhat poorly drained to moderately well drained silt loam and very fine sandy loam overlying clay at 10 to 36 inches.	0–6	Very fine sandy loam.	SM
						Silt loam	ML
Cd	Commerce silt loam, nearly level shallow phase.	½–2	1–2		6–14	Silt loam	ML–CL
					14–36	Clay	CH
Cg	Crevasse sandy loams and loamy sands.	½–2	6+	Excessively drained sandy loam and loamy sand.	0–10	Very fine sandy loam.	SM
						Loamy sand	SM
					10–42	Loamy sand	SM
Da	Dowling clay	0–2	0	Poorly drained clayey soils in depressions.	0–4	Clay	CH
Db	Dowling soils	0–2	0		4–24	Clay	CH
					24–40	Clay	CH
Dc	Dubbs silt loam, nearly level phase.	½–2	4	Moderately well drained to well drained very fine sandy loam to silt loam.	0–8	Very fine sandy loam.	SM
						Silt loam	ML–CL
Dd	Dubbs very fine sandy loam, nearly level phase.	½–2	4		8–20	Silty clay loam	CL
					20–36	Very fine sandy loam.	SM
	Dundee silty clay:			Somewhat poorly drained to moderately well drained very fine sandy loam to silty clay.			
Dg	Nearly level phase	½–2	2–4		0–7	Silty clay	CH
Dh	Gently sloping phase	2–5	2–4			Silty clay loam	CL
	Dundee silty clay loam:						
Dk	Nearly level phase	½–2	2–4			Silt loam	ML–CL
Dm	Gently sloping phase	2–5	2–4			Very fine sandy loam.	SM
Dn	Sloping phase	5–8	2–4				
	Dundee silt loam:				7–13	Silt loam	ML–CL
De	Nearly level phase	½–2	2–4		13–18	Silty clay loam	CL
Df	Gently sloping phase	2–5	2–4		18–31	Silt loam	ML–CL
	Dundee very fine sandy loam:				31–44	Very fine sandy loam.	SM
Dp	Nearly level phase	½–2	2–4				
Dr	Gently sloping phase	2–5	2–4				
Do	Dundee silty clay loam, nearly level shallow phase.	½–2	2–4	Somewhat poorly drained to moderately well drained very fine sandy loam to silty clay loam overlying clay at 10 to 36 inches.	0–6	Silty clay loam	CL
	Dundee very fine sandy loam:					Very fine sandy loam.	SM
Ds	Nearly level shallow phase	½–2	2–4		6–15	Silty clay loam	CL
Dt	Nearly level moderately shallow phase.	½–2	2–4		15–36	Clay	CH

See footnotes at end of table.

soils significant in engineering—Continued

AASHO classification	Percentage passing—		Permeability	Structure	Available water [1]	Reaction (pH value)	Dispersion	Shrink-swell potential
	No. 200 sieve (0.074 mm.)	No. 10 sieve (2.0 mm.)						
			Inches per hour		*Inches per foot*			
A–2	30	100	2.5–5.0	Subangular blocky	1.6	5.6–6.5	High	Low.
A–6	80	100	0.2–0.8	Subangular blocky	1.6	5.6–6.5	Moderate	Low to moderate.
A–6	80	100	0.2–0.8	Subangular blocky	1.6	5.6–7.3	Moderate	Low to moderate.
A–4	80	100	0.8–2.5	Structureless	2.2	5.6–7.3	High	Low.
A–2	30	100	2.5–5.0	Structureless	1.6	6.1–7.8	High	Low.
A–7	80	100	.05–0.2	Massive	3.0	5.6–7.3	Low	High.
A–6	80	100	0.2–0.8	Massive	2.5	5.6–7.3	Moderate	Moderate.
A–7	80	100	.05–0.2	Massive	3.0	5.6–7.3	Low	Very high.
A–6	80	100	0.2–0.8	Crumb	2.5	5.6–7.8	Moderate	Moderate.
A–2	20	100	[3] 10.0+	Structureless	2.5	5.1–7.8	High	Low.
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A–2	30	100	0.8–5.0	Structureless	2.0	6.1–7.8	High	Low.
A–4	80	100	0.8–2.5	Structureless	2.2	6.1–7.8	High	Low.
A–6	80	100	0.2–0.8	Structureless	2.0	6.1–7.8	Moderate	Moderate.
A–4	80	100	0.8–2.5	Structureless	2.0	6.6–7.8	High	Low.
A–2	30	100	2.5–5.0	Structureless	2.0	6.6–7.8	High	Low.
A–4	80	100	0.8–2.5	Structureless	2.0	6.6–7.8	High	Low.
A–2	30	100	0.8–5.0	Structureless	2.0	6.1–7.8	High	Low.
A–4	80	100	0.8–2.5	Structureless	2.0	6.1–7.8	High	Low.
A–4	80	100	0.8–2.5	Structureless	2.0	6.1–7.8	High	Low.
A–7	90	100	[2] –0.05	Massive	3.0	6.6–7.8	Low	Very high.
A–2	30	100	2.5–10.0	Structureless	[2] –1.2	5.1–7.8	High	Low.
A–2	20	100	[3] 10.0+	Structureless	.5	5.1–7.8	High	Low.
A–2	20	100	[3] 10.0+	Structureless	.5	5.1–7.8	High	Low.
A–7	90	100	[2] –0.05	Structureless	3.0	6.1–7.3	Low	Very high.
A–7	90	100	[2] –0.05	Massive	3.0	6.1–7.3	Low	Very high.
A–7	90	100	[2] –0.05	Massive	3.0	5.6–7.3	Low	Very high.
A–2	30	100	2.5–5.0	Crumb	1.8	5.6–6.5	High	Low.
A–4 to A–6	80	100	0.8–2.5	Crumb	2.0	5.6–6.5	High	Low.
A–6	80	100	0.2–0.8	Subangular blocky	2.2	5.6–6.5	Moderate	Moderate.
A–2	30	100	2.5–5.0	Structureless	1.5	5.6–7.8	High	Low.
A–7	80	100	.05–2.0	Structureless	2.5	5.6–6.0	Low	High.
A–6	80	100	0.2–0.8	Structureless	2.2	5.6–6.0	Moderate	Moderate.
A–4 to A–6	80	100	0.8–2.5	Structureless	2.2	5.6–6.0	High	Low.
A–2	30	100	2.5–5.0	Structureless	2.2	5.6–6.0	High	Low.
A–4 to A–6	80	100	0.8–2.5	Subangular blocky	2.2	5.6–6.0	High	Low.
A–6	80	100	0.2–0.8	Subangular blocky	2.2	5.1–6.0	Moderate	Moderate.
A–4 to A–6	80	100	0.8–2.5	Subangular blocky	2.2	6.1–7.3	High	Low.
A–2	30	100	2.5–5.0	Structureless	2.2	5.6–7.3	High	Low.
A–6	80	100	0.2–0.8	Structureless	2.2	5.6–6.0	Moderate	Moderate.
A–2	30	100	2.5–5.0	Structureless	2.2	5.6–6.0	High	Low.
A–6	80	100	0.2–0.8	Subangular blocky	2.2	5.1–6.0	Moderate	Moderate.
A–7	90	100	[2] –.05	Massive	3.0	6.1–7.3	Low	Very high.

TABLE 3.—*Estimated physical properties of*

Map symbol	Soil name	Slope	Depth to water table	Description of soil and site	Depth from surface	USDA texture	Unified classification
		Percent	*Feet*		*Inches*		
	Forestdale silty clay:						
Fb	Nearly level phase	½–2	0.5–1.0	Poorly drained to somewhat poorly drained silt loam to silty clay loam.	0–6	Silty clay	CH
Fc	Gently sloping phase	2–5	0.5–1.0			Silty clay loam	CL
	Forestdale silty clay loam:					Silt loam	ML–CL
Fd	Nearly level phase	½–2	0.5–1.0		6–24	Silty clay	CH
Fe	Gently sloping phase	2–5	0.5–1.0		24–36	Silty clay loam	CL
Fa	Forestdale silt loam, nearly level phase.	½–2	0.5–1.0				
Mh	Mhoon silty clay loam	½–2	0.5–1.0	Poorly drained to somewhat poorly drained silt loam to silty clay loam.	0–6	Silty clay loam	CL
						Silt loam	ML–CL
						Very fine sandy loam.	SM
					6–12	Silty clay	CH
					12–18	Silty clay loam	CL
					18–30	Clay	CH
Pe	Pearson silt loam, nearly level phase.	½–2	2–4	Moderately well drained silt loam to silty clay loam.	0–5	Silt loam	ML–CL
					5–15	Silt loam	ML–CL
					15–23	Silty clay loam	CL
					23–42	Silty clay loam	CL
Ro	Robinsonville very fine sandy loam.	½–2	3.0	Moderately well drained to well drained very fine sandy loam to silt loam.	0–6	Very fine sandy loam.	SM
					6–9	Silt loam	ML–CL
					9–13	Very fine sandy loam.	SM
					13–22	Silt loam	ML–CL
					22–54	Layered silt loam and very fine sandy loam.	ML–CL to SM.
	Sharkey clay:						
Sa	Level phase	0–½	0–0.5	Poorly drained plastic clay	0–5	Clay	CH
Sb	Nearly level phase	½–2	0–0.5			Silty clay loam	CL
Sc	Gently sloping phase	2–5	0–0.5			Very fine sandy loam.	SM
Sd	Sharkey silty clay loam, nearly level phase.	½–2	0–0.5		5–26	Clay	CH
Se	Sharkey very fine sandy loam, nearly level overwash phase.	½–2	0–0.5		26–50	Clay	CH
So	Souva silt loam	0–2	0–0.5	Somewhat poorly drained silt loam or silty clay loam in depressions.	0–10	Silt loam	ML–CL
					10–24	Silty clay loam	CL
					24–42	Silty clay loam	CL
Sw	Swamp			Low, wet areas flooded much of the time.			
	Tunica clay:						
Ta	Nearly level phase	½–2	2–4	Somewhat poorly drained clayey soils overlying silty clay loam to sandy loam material at 20 to 30 inches.	0–6	Clay	CH
Tb	Gently sloping phase	2–5	2–4			Silty clay loam	CL
Tc	Tunica silty clay loam, nearly level phase.	½–2	2–4		6–20	Clay	CH
					20–28	Silty clay	CH
					28–36	Silty clay loam	CL

[1] Available moisture capacity is the amount of water that can be removed from a moist soil (at field capacity) by plants. The estimated data was adapted from an irrigation guide for the Delta Area of Mississippi, prepared in 1955 and revised in 1956 by the Soil Conservation Service, in collaboration with Mississippi

soils significant in engineering—Continued

AASHO classification	Percentage passing— No. 200 sieve (0.074 mm.)	Percentage passing— No. 10 sieve (2.0 mm.)	Permeability	Structure	Available water [1]	Reaction (pH value)	Dispersion	Shrink-well potential
			Inches per hour		*Inches per foot*			
A–7	80	100	.05–0.2	Granular	2.5	5.1–6.0	Low	High.
A–6	80	100	0.2–0.8	Granular	2.5	5.1–6.0	Moderate	Moderate.
A–4 to A–6	80	100	0.8–2.5	Granular	2.2	5.1–6.0	High	Low.
A–7	80	100	.05–0.2	Subangular blocky	2.5	5.1–6.0	Low	High.
A–6	80	100	0.2–0.8	Structureless	2.5	5.1–6.0	Moderate	Moderate.
A–6	80	100	0.2–0.8	Crumb	2.2	6.1–7.8	Moderate	Moderate.
A–4 to A–6	80	100	0.8–2.5	Crumb	2.2	6.1–7.8	High	Low.
A–2	30	100	2.5–5.0	Crumb	2.2	6.1–7.8	High	Low.
A–7	80	100	.05–0.2	Massive	2.5	6.1–7.8	Low	High.
A–6	80	100	0.2–0.8	Massive	2.5	6.1–7.8	Moderate	Moderate.
A–7	80	100	.05–0.2	Massive	2.5	6.1–7.8	Low	Very high.
A–4 to A–6	80	100	0.8–2.5	Structureless	2.0	5.1–6.0	High	Low.
A–4 to A–6	80	100	0.8–2.5	Subangular blocky	2.2	5.1–6.0	High	Low.
A–6	80	100	0.2–0.8	Subangular blocky	2.5	5.1–6.0	Moderate	Moderate.
A–6	80	100	0.2–0.8	Subangular blocky	2.5	5.1–6.0	Moderate	Moderate.
A–2	30	100	2.5–5.0	Structureless	1.6	6.6–7.8	High	Low.
A–4 to A–6	80	100	0.8–2.5	Structureless	2.2	6.6–7.8	High	Low.
A–2	30	100	2.5–5.0	Structureless	1.4	6.6–7.8	High	Low.
A–4 to A–6	80	100	0.8–2.5	Structureless	2.0	6.6–7.8	High	Low.
A–2 to A–4 or A–6.	80 to 30	100	0.8–5.0	Structureless	1.4	6.6–7.8	High	Low.
A–7	90	100	[2]—0.05	Granular	3.0	5.6–6.5	Low	Very high.
A–6	80	100	0.2–0.8	Granular	2.5	5.6–6.5	Moderate	Moderate.
A–2	30	100	2.5–5.0	Granular	2.0	5.6–6.5	High	Low.
A–7	90	100	[2]—0.05	Subangular blocky	3.0	5.6–6.0	Low	Very high.
A–7	90	100	[2]—0.05	Massive	3.0	5.6–7.3	Low	Very high.
A–4	80	100	0.8–2.5	Crumb	2.0	5.6–7.3	High	Low.
A–6	80	100	0.2–0.8	Subangular blocky	2.5	5.6–7.3	Moderate	Moderate.
A–6	80	100	0.2–0.8	Crumb	2.5	5.6–7.3	Moderate	Moderate.
A–7	90	100	[2]—0.05	Massive	3.0	6.1–6.5	Low	Very high.
A–6	80	100	0.2–0.8	Massive	2.5	6.1–6.5	Moderate	Moderate.
A–7	90	100	[2]—0.05	Subangular blocky	3.0	6.1–7.3	Low	Very high.
A–7	80	100	[2]—0.05	Subangular blocky	3.0	6.1–7.3	Low	Very high.
A–6	80	100	0.2–0.8	Structureless	2.0	6.6–7.8	Moderate	Moderate.

State College, the Agricultural Extension Service, representatives of the Irrigation Equipment Industry, and others.

[2] Minus sign means less than the figure shown.
[3] Plus sign means more than the figure shown.

TABLE 4.—*Engineering*

Soil symbol	Soil series	Adaptability to winter grading	Suitability of soil material for—		Suitability as source of—	
			Road subgrade	Road fill	Topsoil	Sand
Aa, Ab, Ac, Ad, Ae	Alligator	Unsuitable because of high water table and clay content.	Poor	Poor	Poor	Poor
Ba, Bb, Bc	Beulah	Good; occurs on higher ridges and water table is low.	Good	Good	Good	Good
Bd, Be, Bf, Bg	Bosket	Good; occurs on higher ridges and water table is low.	Good	Good	Good	Fair
Bh, Bk	Bowdre	Poor to fair	Poor	Poor	Poor	Poor
Ca, Cb, Cd, Ce, Cf	Commerce	Fair	Fair	Fair	Good	Poor
Cg	Crevasse	Good; occurs on higher sandy ridges	Good	Good	Poor	Good
Da, Db	Dowling	Unsuitable because of low topographic position and clay content.	Poor	Poor	Poor	Poor
Dc, Dd	Dubbs	Good; occurs on higher ridges	Fair	Good	Good	Poor
De, Df, Dg, Dh, Dk, Dm, Dn, Do, Dp, Dr, Ds, Dt.	Dundee	Fair	Poor to fair.	Fair	Good	Poor
Fa, Fb, Fc, Fd, Fe	Forestdale	Unsuitable because of high water table	Poor	Poor	Poor	Poor
Mh	Mhoon	Unsuitable because of high water table	Poor	Poor	Poor	Poor
Pe	Pearson	Fair	Poor	Fair	Good	Poor
Ro	Robinsonville	Good	Good	Good	Good	Good
So	Souva	Unsuitable because of low topographic position.	Poor	Poor	Poor	Poor
Sa, Sb, Sc, Sd, Se	Sharkey	Unsuitable because of high water table and clay content.	Poor	Poor	Poor	Poor
Ta, Tb, Tc	Tunica	Unsuitable because of high water table and clay content.	Poor	Poor	Poor	Poor

interpretations of soils

Features affecting use for—				
Dikes or levees	Drainage	Irrigation	Land leveling	Farm ponds and reservoirs
Not suitable because of shrinking and swelling of soil.	Seasonal high water table; very slow permeability.	Low intake rate; good water-holding capacity; deep cracks form when dry.	Suitable when dry	Good; holds water well.
Good	Excessively drained	Rapid intake rate; low water-holding capacity.	Suitable	Poor; leakage through underlying sandy material.
Good	Somewhat excessively drained.	Good intake rate; fair water-holding capacity.	Suitable	Poor; leakage through underlying sandy material.
Good when surface layer is mixed with subsoil.	Needs surface drainage	Low intake rate; fair water-holding capacity.	Suitable when dry	Poor; possible leakage through underlying sandy material.
Good	Needs row arrangement and shallow field drains.	Good intake rate; good water-holding capacity.	Suitable; limited cuts on shallow phases.	Good.
Poor because of excessive sand.	Excessively drained	Not recommended	Not recommended	Poor; leakage through underlying sandy material.
Poor because of shrinking and swelling of soil.	Needs surface drainage; very slow permeability.	Low intake rate; good water-holding capacity.	Suitable	Good; holds water well.
Good	Needs row arrangement and shallow field drains.	Good intake rate; good water-holding capacity.	Suitable	Poor; possible leakage through underlying sandy material.
Good	Needs row arrangement and shallow field drains.	Fair intake rate; good water-holding capacity.	Suitable	Poor; possible leakage through underlying sandy material.
Good	Needs surface drainage; poor internal drainage.	Slow intake rate; good water-holding capacity.	Suitable; limited cuts.	Good; holds water well.
Good	Needs surface drainage; poor internal drainage.	Slow intake rate; good water-holding capacity.	Suitable; limited cuts.	Good; holds water well.
Good	Needs surface drainage; moderately permeable.	Fair intake rate; good water-holding capacity.	Suitable	Fair.
Good	Needs row arrangement	Good intake rate; fair water-holding capacity.	Suitable	Poor; leakage through underlying sandy material.
Good	Needs surface drainage	Fair intake rate; good water-holding capacity.	Suitable	Good.
Not suitable because of shrinking and swelling of soil.	Seasonal high water table; low permeability rate.	Low intake rate; good water-holding capacity; cracks when dry.	Suitable when dry	Good; holds water well.
Good when surface layer is mixed with subsoil.	Needs surface drainage	Low intake rate; fair water-holding capacity.	Suitable when dry	Poor; possible leakage through underlying sandy material.

TABLE 5.—*Classification of soils by American Association of State Highway Officials* [1]

General classification	Granular materials (35 percent or less passing No. 200 sieve)							Silt-clay materials (More than 35 percent passing No. 200 sieve)				
Group classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5	A-7-6
Sieve analysis: Percent passing—												
No. 10	50 maximum.											
No. 40	30 maximum.	50 maximum.	51 minimum.									
No. 200	15 maximum.	25 maximum.	10 maximum.	35 maximum.	35 maximum.	35 maximum.	35 maximum.	36 minimum.	36 minimum.	36 minimum.	36 minimum.	36 minimum.
Characteristics of fraction passing No. 40 sieve:												
Liquid limit			NP [2]	40 maximum.	41 minimum.	40 maximum.	41 minimum.	40 maximum.	41 minimum.	40 maximum.	41 minimum.	41 minimum.
Plasticity index	6 maximum.	6 maximum.	NP [2]	10 maximum.	10 maximum.	11 minimum.	11 minimum.	10 maximum.	10 maximum.	11 minimum.	11 minimum.[3]	11 minimum.[3]
Group index	0	0	0	0	0	4 maximum.	4 maximum.	8 maximum.	12 maximum.	16 maximum.	20 maximum.	20 maximum.
Usual types of significant constituent materials.	Stone fragments, gravel, and sand.	Stone fragments, gravel, and sand.	Fine sand.	Silty gravel and sand.	Silty gravel and sand.	Clayey gravel and sand.	Clayey gravel and sand.	Nonplastic to moderately plastic silty soils.	Highly elastic silts.	Medium plastic clays.	Highly plastic clays.	Highly plastic clays.
General rating as subgrade.	Excellent to good					Fair to poor						

[1] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (pt. 1; ed. 7): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation: M 145-49.

[2] NP—Nonplastic.

[3] Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.

Soils of the County

This section provides detailed information about the soils of the county. It has two subsections. The first explains how soils are mapped, and the second describes the soil series and mapping units in the county.

How a Soil Survey is Made

The scientist who makes a soil survey examines soils in the field, classifies them in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map.

FIELD STUDY.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart, and sometimes they are much closer. In most soils each boring or hole reveals several distinct layers, called *horizons*, which collectively are known as the soil *profile*. Each horizon is studied to see how it differs from others in the profile and to learn the things about this soil that influence its capacity to support plant growth.

Color is usually related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. A gray color generally indicates poor drainage and poor aeration. Colors are given in descriptive terms, such as "grayish brown," and followed by a Munsell color notation, for example, 10YR 5/2, which corresponds to the term "grayish brown." Munsell notations are a means of recording color more accurately than can be done in words.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers. Later it is checked by laboratory analyses. Texture determines how well a soil retains moisture, plant nutrients, and fertilizer and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger grains and the amount of pore space between grains, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Reaction, expressed in pH value, indicates the degree of acidity or alkalinity of the soil. Acidity affects the response of the soil to fertilizer and the suitability for crops.

CLASSIFICATION.—On the basis of the characteristics observed by the soil scientists or determined by laboratory tests, soils are classified by soil series, types, and phases.

Soil series.—In a soil series are soil types that, except for the texture of the surface soil, have similar characteristics within the profile. All soils of the same series have developed from the same kind of parent material. Variations in slope or in other features external to the soil profile are permitted, so long as these variations do not affect the profile characteristics. Each series is named for the locality where the series was first recognized.

Soil type.—Soils that are similar in kind, thickness, and arrangement of soil layers are classified as one soil type. The texture of the surface soil determines the number of soil types in a series. There may be one or more types in a series, because soil types are based on the texture of the surface soil. Thus, Alligator clay and Alligator silty clay loam are soil types within the Alligator series.

Soil phase.—Variations within the soil type, generally based on such external characteristics as relief, stoniness, accelerated erosion, or depth of surface soil, are designated as soil phases. Alligator clay, level phase; Alligator clay, nearly level phase; and Alligator clay, gently sloping phase, are examples of phases in Washington County that originate from differences in relief.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices, therefore, can be specified more easily than for a soil series or for broader groups that contain more variations.

Miscellaneous land types.—Areas of land that have little or no true soil are not classified by series, types, and phases. Alluvial land is a miscellaneous land type in Washington County.

DEFINITIONS.—Standard definitions of soil characteristics are essential if knowledge about soils is to be transferred accurately. Many definitions of soil terms will be found in the Glossary at the back of this report.

Descriptions of Soils

In the following pages the soil series of Washington County are described in alphabetic order. Following the description of each series, there is a description of the mapping units in that series. The first mapping unit described in each series is the one considered most typical of the series. Other mapping units are then described by pointing out how they differ from the first unit. A detailed description of a soil profile is given in the first mapping unit. The reader is to assume that all other mapping units in the series have essentially the same kind of profile. Differences in the profiles, if any, are stated in the text.

The approximate acreage and proportionate extent of the soils, with subtotals for acreage in pastureland, forested areas, cultivated land, and idle land, are given in table 7. The location and distribution of the mapping units are shown on the soil map at the back of the report.

Alligator series

The Alligator series consists of level to gently sloping, poorly drained soils that formed in thick beds of fine-textured, slack-water sediments along the Mississippi River. The surface soil ordinarily is light brownish-gray clay, but the texture ranges to silty clay loam. The subsoil is gray, mottled clay. The soils are medium acid to strongly acid. When dry, they shrink and form cracks that may be from 1 to 4 inches wide and several feet deep. When wet, the soils expand and the cracks seal.

Alligator soils are among the most extensive in the county. They are mainly in the eastern part and are associated with Forestdale, Sharkey, and Dowling soils. They are finer textured and have less profile development than the Forestdale soils. They are lighter colored than Sharkey and Dowling soils. They differ from Dowling soils in being on gentle slopes rather than in depressions.

TABLE 6.—*Classification of soil materials by the Unified soil classification*

Major division	Group symbol	Description	Value as foundation material[2]	Value as base course directly under bituminous pavement	Stability for embankments (dams and dikes)
Coarse-grained soils (*less than 50 percent passing No. 200 sieve*):					
Gravels and gravelly soils (*more than half of coarse fraction retained on No. 4 sieve*).	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	Excellent	Good	Very good stability; use in pervious shells of dikes and dams.
	GP	Poorly graded gravels and gravel-sand mixtures; little or no fines.	Good to excellent.	Poor to fair	Reasonable stability; use in pervious shells of dikes and dams.
	GM	Silty gravels and gravel-sand-silt mixtures.	Good	Poor to good	Reasonable stability; not particularly suited to shells, but may be used for impervious cores or blankets.
	GC	Clayey gravels and gravel-sand-clay mixtures.	Good	Poor	Fair stability; may be used for impervious cores in dams and dikes.
Sands and sandy soils (*more than half of coarse fraction passing No. 4 sieve*).	SW	Well-graded sands and gravelly sands; little or no fines.	Good	Poor	Very good stability; may be used in pervious sections; slope protection required.
	SP	Poorly graded sands and gravelly sands; little or no fines.	Fair to good	Poor to unsuitable.	Reasonable stability; may be used in dike sections having flat slopes.
	SM	Silty sands and sand-silt mixtures.	Fair to good	Poor to unsuitable.	Fair stability; not particularly suited to shells, but may be used for impervious cores or dikes.
	SC	Clayey sands and sand-clay mixtures.	Fair to good	Unsuitable	Fair stability; use as impervious core for water-control structures.
Fine-grained soils (*more than 50 percent passing No. 200 sieve*):					
Silts and clays (*liquid limit of 50 or less*).	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, and clayey silts of slight plasticity.	Fair to poor	Unsuitable	Poor stability; may be used for embankments if properly controlled.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays.	Fair to poor	Unsuitable	Good stability; use in impervious cores and blankets.
	OL	Organic silts and organic silty clays having low plasticity.	Poor	Unsuitable	Not suitable
Silts and clays (*liquid limit greater than 50*).	MH	Inorganic silt; micaceous or diatomaceous, fine, sandy or silty soils; and elastic silts.	Poor	Unsuitable	Poor stability; use in core of hydraulic fill dam; not desirable in rolled fill construction.
	CH	Inorganic clays having medium to high plasticity, and fat clays.	Poor to very poor.	Unsuitable	Fair stability on flat slopes; use in thin cores, blankets, and dike sections of dams.
	OH	Organic clays and organic silts having medium to high plasticity.	Poor to very poor.	Unsuitable	Not suitable
Highly organic soils	Pt	Peat and other highly organic soils.	Unsuitable	Unsuitable	Not used in embankments, dams, or subgrades for pavements.

[1] Ratings and ranges in test values are for guidance only; design should be based on field survey and test of samples from the construction site.

[2] Ratings are for subgrades and subbases for flexible pavements.

system, selected characteristics,[1] *and suggestions for use*

Compaction characteristics and recommended equipment	Approximate range in AASHO maximum dry density[3]	Field (in place) CBR	Subgrade modulus k	Drainage characteristics	Comparable groups AASHO classification
	Lb. per cu. ft.	*Percent*	*Lb. per sq. in. per in.*		
Good; use crawler-type tractor, pneumatic-tire roller, or steel-wheel roller.	125 to 135	60 to 80	300	Excellent	A-1.
Good; use crawler-type tractor, pneumatic-tire roller, or steel-wheel roller.	115 to 125	25 to 60	300	Excellent	A-1.
Good, but needs close control of moisture; use pneumatic-tire roller or sheepsfoot roller.	120 to 135	20 to 80	200 to 300	Fair to practically impervious	A-1 or A-2.
Fair; use pneumatic-tire roller or sheepsfoot roller.	115 to 130	20 to 40	200 to 300	Poor to practically impervious	A-2.
Good; use crawler-type tractor or pneumatic-tire roller.	110 to 130	20 to 40	200 to 300	Excellent	A-1.
Good; use crawler-type tractor or pneumatic-tire roller.	100 to 120	10 to 25	200 to 300	Excellent	A-1 or A-3.
Good, but needs close control of moisture; use pneumatic-tire roller or sheepsfoot roller.	110 to 125	10 to 40	200 to 300	Fair to practically impervious	A-1, A-2, or A-4.
Fair; use pneumatic-tire roller or sheepsfoot roller.	105 to 125	10 to 20	200 to 300	Poor to practically impervious.	A-2, A-4, or A-6.
Good to poor, but needs close control of moisture; use pneumatic-tire roller or sheepsfoot roller.	95 to 120	5 to 15	100 to 200	Fair to poor	A-4, A-5, or A-6.
Fair to good; use pneumatic-tire roller or sheepsfoot roller.	95 to 120	5 to 15	100 to 200	Practically impervious	A-4, A-6, or A-7.
Fair to poor; use sheepsfoot roller [4]	80 to 100	4 to 8	100 to 200	Poor	A-4, A-5, A-6, or A-7.
Poor to very poor; use sheepsfoot roller.[4]	70 to 95	4 to 8	100 to 200	Fair to poor	A-5 or A-7.
Fair to poor; use sheepsfoot roller [4]	75 to 105	3 to 5	50 to 100	Practically impervious	A-7.
Poor to very poor; use sheepsfoot roller.[4]	65 to 100	3 to 5	50 to 100	Practically impervious	A-5 or A-7.
				Fair to poor	None.

[3] Determined in accordance with test designation T 99-57, AASHO (*1*).

[4] Pneumatic-tire rollers may be advisable, particularly when moisture content is higher than optimum.

TABLE 7.—*Approximate acreage, proportionate extent, and use of the soils*

Soil	Area	Extent	Cultivated	Pasture	Forest	Idle
	Acres	*Percent*	*Acres*	*Acres*	*Acres*	*Acres*
Alligator clay:						
Level phase	7, 000	1. 5	1, 940	890	3, 880	290
Nearly level phase	29, 270	6. 3	19, 380	890	7, 960	1, 040
Gently sloping phase	470	. 1	220	210	40	0
Alligator silty clay loam:						
Level phase	720	. 2	200	0	520	0
Nearly level phase	4, 430	. 9	4, 200	80	150	0
Alluvial land	27, 850	6. 0	0	0	27, 850	0
Beulah very fine sandy loam:						
Nearly level phase	2, 740	. 6	2, 550	120	50	20
Gently sloping phase	940	. 2	850	50	40	0
Nearly level moderately shallow phase	600	. 1	530	70	0	0
Bosket silty clay loam, nearly level phase	620	. 1	500	110	10	0
Bosket very fine sandy loam:						
Nearly level phase	24, 100	5. 2	22, 530	1, 520	0	50
Gently sloping phase	910	. 2	590	320	0	0
Nearly level moderately shallow phase	680	. 1	590	90	0	0
Bowdre silty clay, nearly level phase	3, 170	. 7	1, 290	1, 230	650	0
Bowdre silty clay loam, nearly level phase	940	. 2	700	220	20	0
Borrow pits	7, 500	1. 6	0	0	0	7, 500
Commerce silty clay loam, nearly level phase	10, 140	2. 2	9, 630	400	30	80
Commerce silt loam:						
Nearly level phase	1, 220	. 3	1, 170	50	0	0
Nearly level shallow phase	480	. 1	440	40	0	0
Commerce very fine sandy loam	1, 040	. 2	830	180	0	30
Commerce very fine sandy loam, moderately shallow phase	780	. 2	600	180	0	0
Crevasse sandy loams and loamy sands	950	. 2	400	550	0	0
Dowling clay	51, 330	11. 0	35, 070	6, 940	5, 904	3, 416
Dowling soils	9, 000	1. 9	7, 660	1, 050	290	0
Dubbs silt loam, nearly level phase	600	. 1	600	0	0	0
Dubbs very fine sandy loam, nearly level phase	760	. 2	750	10	0	0
Dundee silt loam:						
Nearly level phase	3, 640	. 8	3, 460	180	0	0
Gently sloping phase	220	(1)	220	0	0	0
Dundee silty clay:						
Nearly level phase	2, 280	. 5	1, 790	450	10	30
Gently sloping phase	270	. 1	270	0	0	0
Dundee silty clay loam:						
Nearly level phase	15, 110	3. 2	13, 640	1, 380	0	90
Gently sloping phase	2, 100	. 4	1, 070	990	40	0
Sloping phase	450	. 1	90	220	140	0
Nearly level shallow phase	255	. 1	215	40	0	0
Dundee very fine sandy loam:						
Nearly level phase	19, 670	4. 2	18, 500	1, 150	20	0
Gently sloping phase	830	. 2	340	420	70	0
Nearly level shallow phase	1, 130	. 2	1, 100	30	0	0
Nearly level moderately shallow phase	1, 140	. 2	1, 140	0	0	0
Forestdale silt loam, nearly level phase	6, 000	1. 3	5, 890	110	0	0
Forestdale silty clay:						
Nearly level phase	15, 940	3. 4	13, 160	1, 770	1, 000	10
Gently sloping phase	740	. 2	640	20	20	60
Forestdale silty clay loam:						
Nearly level phase	19, 990	4. 3	17, 000	2, 540	440	10
Gently sloping phase	760	. 2	730	0	30	0
Mhoon silty clay loam	200	(1)	200	0	0	0
Pearson silt loam, nearly level phase	1, 280	. 3	1, 250	30	0	0
Robinsonville very fine sandy loam	1, 430	. 3	1, 170	260	0	0
Sharkey clay:						
Level phase	36, 630	7. 9	22, 820	1, 880	10, 270	1, 660
Nearly level phase	100, 460	21. 6	58, 950	9, 830	29, 340	2, 340
Gently sloping phase	2, 010	. 4	1, 420	290	300	0
Sharkey silty clay loam, nearly level phase	4, 060	. 9	3, 720	20	320	0
Sharkey very fine sandy loam, nearly level overwash phase	2, 000	. 4	1, 660	60	260	20
Souva silt loam	940	. 2	940	0	0	0
Swamp	5, 550	1. 2	0	0	5, 550	0
Tunica clay:						
Nearly level phase	10, 360	2. 2	4, 670	4, 150	930	610
Gently sloping phase	1, 280	. 3	530	550	200	0
Tunica silty clay loam, nearly level phase	455	. 1	455	0	0	0
Cities, levees, lakes, other waters, U.S. Air Force base	20, 500	4. 4				
Total	465, 920	100. 0	290, 260	41, 570	96, 334	17, 256

[1] Less than 0.1 percent.

The native vegetation on Alligator soils consists of mixed hardwoods, canes, and vines. About 60 percent of the acreage has been cleared and is farmed. Poor physical properties limit the use of these soils for cultivation.

Alligator clay, nearly level phase (½ to 2 percent slopes) (Ab).—This light-colored, poorly drained, clay soil formed from fine-textured alluvium in slack-water areas along the Mississippi River. It is very plastic when wet and very hard when dry. Deep, wide cracks form readily.

Profile:

A_p 0 to 6 inches, light brownish-gray (10YR 6/2) clay; firm when moist; massive structure; medium acid to strongly acid; abrupt boundary.

C_{1g} 6 to 24 inches, gray (10YR 5/1) clay mottled with yellowish brown (10YR 5/6); very firm when moist; massive, with a tendency toward weak, medium, subangular blocky structure; medium acid to strongly acid; clear boundary.

C_{2g} 24 to 36 inches, light gray (10YR 6/1) clay, mottled with gray, brown, and yellow; very firm when moist; massive, with a tendency toward weak, medium subangular blocky structure; medium acid to strongly acid.

The texture of the A_p horizon ranges from clay to silty clay loam or silty clay. Water movement into and through this soil is very slow. The available moisture-holding capacity is very high. The organic-matter content is low. Nitrogen is, in most cases, the only fertilizer needed for crop production.

Present use and management.—This is the most extensive soil of the Alligator series. About half the acreage has been cleared and is planted to cotton, soybeans, small grains, and rice. The pasture grasses are bermudagrass, dallisgrass, tall fescue, and johnsongrass. Drainage and workability are poor. V-type and W-type ditches and crop rows arranged to drain toward adequate outlets are needed to remove excess surface water. Additions of organic matter will improve workability. Capability unit 17(IIIs-4).

Alligator clay, level phase (0 to ½ percent slopes) (Aa).—This soil is in low, flat areas. Surface drainage is very slow. More than half of the soil is in forest. It is good for pasture and for rice. Row crops are likely to be damaged or killed by standing water. Capability unit 19(IIIw-11).

Alligator clay, gently sloping phase (2 to 5 percent slopes) (Ac).—This soil is along the banks of old drainageways. Small, eroded areas are included where the subsoil is exposed. A few slopes may be as much as 8 percent. Surface runoff is somewhat faster than on the nearly level phase of Alligator clay.

This is an inextensive soil. Almost all of the acreage has been cleared and is used for row crops and pasture. Cotton, soybeans, and bermudagrass are the principal crops. Rows should be arranged on the contour and V-type and W-type ditches provided to take water from the rows. Capability unit 17(IIIs-4).

Alligator silty clay loam, nearly level phase (½ to 2 percent slopes) (Ae).—This soil is normally adjacent to higher ridges and streambanks. The upper 4 to 6 inches is silty clay loam, which is overwash from floods or material brought down by erosion from higher areas. Small areas on steeper slopes are included.

This soil is easier to work than other soils of the Alligator series. Because of its coarser textured surface soil, it is somewhat better suited to row crops than Alligator clay, nearly level phase. The principal crops are cotton, soybeans, small grains, and rice. Capability unit 10(IIs-4).

Alligator silty clay loam, level phase (0 to ½ percent slopes) (Ad).—This soil is in low, flat areas surrounded by higher ridges. In use and management it is similar to Alligator clay, level phase. Capability unit 18(IIIw-5).

Alluvial land

Alluvial land (Af).—This mapping unit consists of soil materials between the Mississippi River and its levees. Overflows are frequent, and during these overflows fresh soil material is deposited. Alluvial land includes soil materials that range in texture from loamy sand to clay. The drainage ranges from poor to excessive. The reaction is neutral to alkaline. The topography is mainly nearly level; however, there are steeper slopes along the streambanks and depressions.

Most of the acreage is wooded, but a few very small areas on the higher elevations have been cleared and are farmed. When it becomes feasible to protect this alluvial land from floods, it will be among the most productive areas in the county. Alluvial land has not been placed in a capability unit.

Beulah series

The Beulah series consists of nearly level to gently sloping, somewhat excessively drained soils that formed from moderately coarse textured alluvium along the Mississippi River. Ordinarily these soils are on the higher parts of the old natural levees. The surface soil generally is a dark grayish-brown very fine sandy loam over a yellowish-brown sandy loam subsoil. The entire profile is strongly acid to mildly alkaline.

The Beulah soils are among the inextensive soils on the old natural levees. They occur throughout the county along old stream runs. Associated with them are Crevasse, Bosket, and Dubbs soils. The Beulah soils are finer textured and not so excessively drained as the Crevasse soils. They are coarser textured than Bosket and Dubbs soils and do not have so much profile development.

The native vegetation consists of oak, pecan, hickory, and gum, with an undergrowth of vines and canes. Most of the Beulah soils have been cleared and are farmed. The soils are somewhat droughty and are best suited to early crops.

Beulah very fine sandy loam, nearly level phase (½ to 2 percent slopes) (Ba). This is a somewhat droughty soil formed from moderately coarse textured alluvium on some of the higher parts of the old natural levees along the Mississippi River.

Profile:

A_p 0 to 8 inches, dark grayish-brown (10YR 4/2) very fine sandy loam; loose when moist; structureless; medium acid to strongly acid; abrupt boundary.

B_1 8 to 14 inches, dark yellowish-brown (10YR 4/4) very fine sandy loam; very friable when moist; very weak, subangular blocky structure; medium acid to slightly acid; gradual boundary.

B_2 14 to 33 inches, yellowish-brown (10YR 5/4) very fine sandy loam, with few, fine, faint mottles of dark yellowish brown (10YR 4/4); loose when moist; structureless; medium acid to slightly acid; diffuse boundary.

C_1 33 to 41 inches, dark-brown (10YR 4/3) very fine sandy loam; very friable when moist; structureless; medium acid to slightly acid; diffuse boundary.

C_2 41 to 52 inches, brown (10YR 5/3) very fine sandy loam; loose when moist; structureless; slightly acid to mildly alkaline; diffuse boundary.

The A_p horizon may range in texture from very fine sandy loam to fine sandy loam. Color ranges from light brownish gray to dark grayish brown. The B horizon may range in texture from very fine sandy loam to fine sandy loam and in color from light yellowish brown to dark yellowish brown. The C horizon may range from very fine sandy loam to sandy loam. The rate of infiltration is fairly good, and the internal movement of water is moderately rapid. The available moisture-holding capacity is low. The organic-matter content is low. Nitrogen is usually the only fertilizer needed, although tests should be made for other elements.

Present use and management.—This is the most extensive soil in the Beulah series. Most of it has been cleared and is used for crops and rotation pasture. Early crops, such as small grains and truck crops, are best suited. Cotton, corn, and wild winter peas are fairly well suited. Bermudagrass, johnsongrass, and crimson clover are well suited pasture plants. The principal management need is to add fertilizer in several applications to reduce the effect of leaching. Organic-matter content can be increased by the use of sod crops in rotations, by turning under crop residues, and by growing cover crops. Capability unit 7(IIs–1).

Beulah very fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Bb).—This soil normally occurs on narrow slopes near old stream runs. Included with this soil are small areas that have a sandy loam surface layer and slopes that range to 8 percent. In use and management, this soil is similar to the nearly level phase of Beulah very fine sandy loam. Capability unit 7(IIs–1).

Beulah very fine sandy loam, nearly level moderately shallow phase (½ to 2 percent slopes) (Bc).—This soil is underlain by slack-water clay at depths of 20 to 36 inches. In small areas clay is at depths of 10 to 20 inches.

Present use and management.—Most of this soil has been cleared and is in crops and pasture. Early truck crops, cotton, and small grains are well suited. Early corn is fairly well suited. Bermudagrass, johnsongrass, and crimson clover grow well. The organic-matter content may be increased by the use of sod crops in rotations, by turning under crop residues, and by growing cover crops. Row arrangement is needed for the removal of surface water. Capability unit 2(I–2).

Bosket series

The Bosket series consists of nearly level to gently sloping, well drained to somewhat excessively drained soils that formed in medium-textured sediments from the Mississippi River. The soils are on old natural levees along streams and bayous. The surface soil ordinarily is a dark grayish-brown very fine sandy loam. The subsoil is a dark-brown silty clay loam to silt loam over friable sandy loam. The soils are medium acid to mildly alkaline.

The Bosket soils are among the more extensive on the natural levees. They are mainly along Deer Creek and in the southwestern part of the county. Associated with them are Beulah, Dubbs, Dundee, and Souva soils. The Bosket soils are better drained and have less profile development than the Dubbs and the Dundee soils. They are slightly finer textured and have more profile development than the Beulah soils. They are better drained and have more profile development than the Souva soils, which are in depressions.

The native vegetation consists of oak, pecan, hickory, sycamore, gum, and elm trees, and an undergrowth of vines and canes. Almost all of the acreage of the Bosket soils has been cleared and is used for row crops. Good tilth and gentle relief make Bosket soils well suited to cultivation.

Bosket very fine sandy loam, nearly level phase (½ to 2 percent slopes) (Be). This well drained to somewhat excessively drained soil has formed from medium-textured alluvium on old natural levees along streams and bayous near the Mississippi River.

Profile:

A_p 0 to 4 inches, dark grayish-brown (10YR 4/2) very fine sandy loam; loose when moist; structureless; medium acid to slightly acid; abrupt boundary.

B_1 4 to 14 inches, dark-brown (10YR 4/3) silty clay loam; few, fine, faint mottles of dark grayish brown (10YR 4/2); friable when moist; weak, subangular blocky structure; medium acid to neutral; clear boundary.

B_2 14 to 24 inches, dark yellowish-brown (10YR 4/4) silt loam; few, fine, faint mottles of grayish brown (10YR 5/2); very friable when moist; structureless to very weak, subangular blocky structure; medium acid to neutral; gradual boundary.

C_1 24 to 48 inches, brown (10YR 5/3) very fine sandy loam; many, fine, distinct mottles of grayish brown (10YR 5/2) and light brownish gray (10YR 6/2); loose when moist; structureless; slightly acid to mildly alkaline.

The B horizon ranges in texture from silty clay loam to silt loam. The C horizon ranges from very fine sandy loam to loamy fine sand. The organic-matter content is low. Nitrogen is usually the only fertilizer needed for crop production. Water movement into and through the soil is good. This soil may be slightly droughty; its water-holding capacity is moderate.

Present use and management.—Bosket very fine sandy loam, nearly level phase, is one of the most productive soils in the county for crops that require good drainage. Cotton is the principal crop grown. A small acreage is planted to corn, soybeans, small grains, and pasture, but the soil is slightly droughty for late corn, soybeans, and summer grasses. The soil can be cultivated easily under a wide range of moisture conditions. Where a plowsole is present, it should be broken by deep tillage when the soil is dry. Sod and cover crops should be in the cropping system to improve the soil. Crop rows should be on the contour, and W-type ditches should be provided to remove excess surface water. Capability unit 2(I–2).

Bosket very fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Bf).—This soil is along streambanks and in sharp bends of streams. Small areas on the steeper slopes are moderately eroded. The rate of surface runoff is greater than from the nearly level phase of Bosket very fine sandy loam.

Practically all of the acreage has been cleared and is used for row crops. Rows should run on the contour to conserve rainfall and to prevent excessive runoff and erosion. Vegetated water outlets may be required. Capability unit 5(IIe–2).

Bosket very fine sandy loam, nearly level moderately shallow phase (½ to 2 percent slopes) (Bg).—This soil has a layer of clay at depths of 20 to 36 inches. Included are small areas with clay at depths of only 10 to 20 inches. In use and management, this soil is similar to Bosket very fine sandy loam, nearly level phase. Capability unit 2(I–2).

Bosket silty clay loam, nearly level phase (½ to 2 percent slopes) (Bd).—This soil is adjacent to, or near, slack-water clay areas. Slopes in some small areas range from ½ to 5 percent. The soil is somewhat difficult to cultivate. Late planting of cotton is hazardous because of uncertain moisture conditions and the difficulty in getting a stand. Rows should be on the contour to prevent erosion, and vegetated water outlets are needed for removal of surface water. Capability unit 12(IIs–6).

Bowdre series

The Bowdre series consists of nearly level, moderately well drained soils formed in fine-textured, slack-water clay sediments that overlie coarser material at depths of less than 20 inches. The soils occur in the higher areas in the slack-water clay sections. The surface and subsurface layers are very dark grayish-brown silty clay. These layers overlie silty clay loam to loamy sand at less than 20 inches in depth. Reaction ranges from strongly acid to mildly alkaline.

The Bowdre soils are inextensive in the county. They are in the western two-thirds of the county in the slack-water clay areas and are associated with Sharkey, Tunica, and Dundee soils. The Bowdre soils are coarser textured within the upper 20 inches than the Sharkey and Tunica soils. They are finer textured and darker colored than the Dundee soils. They are better drained and are over coarser textured material than the Dowling soils, which are in depressions.

The native vegetation consists of hardwoods that are underlain by canes and vines. Most of the Bowdre soils have been cleared and are used for crops and pasture. Because the soils occupy the higher positions, surface drainage is generally fairly good.

Bowdre silty clay, nearly level phase (½ to 2 percent slopes) (Bh).—This is a dark-colored, moderately well drained, clayey soil underlain at shallow depths by coarser textured material.

Profile:

A_{1p} 0 to 6 inches, very dark grayish-brown (10YR 3/2) silty clay; very firm when moist; massive; medium acid to neutral; abrupt boundary.

A_{12} 6 to 10 inches, dark grayish-brown (10YR 4/2) silty clay; very firm when moist; massive; medium acid to neutral; gradual boundary.

D_1 10 to 14 inches, dark yellowish-brown (10YR 4/4) silty clay loam; friable when moist; weak, fine, crumb structure; medium acid to mildly alkaline; gradual boundary.

D_2 14 to 50 inches, pale-brown (10YR 6/3) loamy sand; loose when moist; structureless; strongly acid to mildly alkaline.

The D horizon ranges in texture from silty clay loam to loamy sand, and in color from dark grayish brown to pale brown.

The infiltration rate and movement of water in the upper part of the profile are very slow. The available water-holding capacity is moderately high. The organic-matter content is low. Nitrogen is usually the only fertilizer needed.

Present use and management.—This is the most extensive soil in the Bowdre series. Cotton, sorghum, soybeans, and small grains are grown. Tall fescue, johnsongrass, and clovers are used in pastures. Sweetgum and water oak make up the woodland. This soil is very difficult to work. Seedbeds should be prepared as early as possible. When used for crops, this soil needs row arrangement and V-type and W-type ditches to remove surface water. Capability unit 8(IIs–2).

Bowdre silty clay loam, nearly level phase (½ to 2 percent slopes) (Bk).—The infiltration rate of this soil is slightly higher than for Bowdre silty clay, nearly level phase. The surface soil is generally a silty clay loam because of overwash received from the surrounding soils on the higher, old levees.

This is an inextensive soil, and most of it is not cultivated. Its use and management problems are the same as those of Bowdre silty clay, nearly level phase. Capability unit 12(IIs–6).

Borrow pits

Borrow pits (Bp).—This mapping unit consists of open excavations from which soil and underlying material have been removed for use in building levees and highways. The pits are along the Mississippi River and along highways. During heavy rains water fills them, and many of them never dry up. Some of the largest ones provide hunting and fishing. Borrow pits have not been placed in a capability unit.

Commerce series

The Commerce series consists of nearly level, somewhat poorly drained to moderately well drained soils that formed in medium-textured sediments deposited by the Mississippi River. The soils are on recent natural levees along stream channels near the river. The surface soil, generally a pale-brown silt loam over a grayish-brown silt loam, is mottled with shades of yellow and brown. The soils are neutral to mildly alkaline.

The Commerce soils are mainly in the western part of the county. Associated with them are Crevasse, Robinsonville, and Mhoon soils. The Commerce soils are not so well drained as the Crevasse and Robinsonville soils. They are better drained than the Mhoon soils.

The native vegetation on Commerce soils consists of red oak, post oak, hickory, tupelo-gum, vines, and canes. Commerce soils are among the best in the county for agriculture. All of their acreage is used for crops and pasture. Their good tilth and nearly level relief make them well suited to intensive use.

Commerce silt loam, nearly level phase (½ to 2 percent slopes) (Cb).—This moderately well drained to somewhat poorly drained, medium-textured, friable soil is on nearly level, recent natural levees. It is suitable for a wide range of crops and is one of the most productive soils in the county.

Profile:

A_p 0 to 5 inches, pale-brown (10YR 6/3) silt loam; loose when moist; structureless; slightly acid to mildly alkaline; abrupt boundary.

AC 5 to 18 inches, grayish-brown (10YR 5/2) silt loam; few, fine, faint mottles of brown (10YR 5/3); very friable when moist; structureless; neutral to mildly alkaline; gradual boundary.

C_1 18 to 41 inches, grayish-brown (10YR 5/2) very fine sandy loam; common, fine, distinct mottles of brown (10YR 5/3) and dark brown (10YR 4/3); very friable when moist; structureless; neutral to mildly alkaline; gradual boundary.

C_2 41 to 48 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); very friable when moist; structureless; neutral to mildly alkaline.

The texture of the A_p horizon ranges from silty clay loam to very fine sandy loam. The texture of the AC, C_1, and C_2 horizons ranges from silty clay loam to very fine sandy loam. Blotches or lenses of reddish-brown, silty clay material may occur in the AC and C horizons.

Infiltration and movement of water through the soil are fairly good. The available water-holding capacity is high. Nitrogen is the only fertilizer needed.

Present use and management.—This soil has been cleared and is used for cotton, corn, soybeans, sorghum, and small grains. The plants in pastures are bermudagrass, dallisgrass, johnsongrass, and clover. This soil is easy to work; seedbeds can be prepared within a wide range of moisture content. Because the surface soil crusts and packs when bare, organic matter should be added. The use of sod crops in rotations, plowing under of crop residues, and the use of cover crops will improve tilth. If plowsoles have formed, they can be broken by deep tillage when the soil is dry. Arrangement of rows and V-type and W-type ditches are needed to remove the surface water. Capability unit I(I–1).

Commerce silt loam, nearly level shallow phase (½ to 2 percent slopes) (Cd).—This soil is similar to Commerce silt loam, nearly level phase, but contains a clay layer at depths of 10 to 20 inches. Included with this soil are areas where clayey layers are at depths of 20 to 30 inches.

Use and management of this soil are about the same as those for Commerce silt loam, nearly level phase. Capability unit 3(I–3).

Commerce silty clay loam, nearly level phase (½ to 2 percent slopes) (Ca).—The rate of infiltration is slower in this soil than in Commerce silt loam, nearly level phase. Small areas are underlain by clay at depths of 20 to 36 inches.

Present use and management.—This is the most extensive Commerce soil in the county. Most of it has been cleared. It is suited to the same crops as Commerce silt loam, nearly level phase, but is not so good for corn. It needs similar management, but seedbeds cannot be prepared within so wide a range of moisture content. Capability unit 12(IIs–6).

Commerce very fine sandy loam (½ to 2 percent slopes) (Ce).—This is one of the most productive soils in the county. Except for texture of the surface soil, it is similar to Commerce silt loam, nearly level phase. The two soils are managed in the same way. Capability unit 1(I–1).

Commerce very fine sandy loam, moderately shallow phase (½ to 2 percent slopes) (Cf).—This soil is similar to Commerce silt loam, nearly level phase, but it has a clay layer at depths of 20 to 36 inches. Included with this soil are small areas with slopes ranging up to 5 percent.

Use and management of this soil are the same as for Commerce silt loam, nearly level phase. Capability unit 1(I–1).

Crevasse series

In the Crevasse series are nearly level, excessively drained soils that formed in beds of coarse-textured alluvium from the Mississippi River. They are in areas where the Mississippi River has broken through its natural or artificial levees. The surface soil, ordinarily a yellowish-brown sandy loam or loamy sand, overlies yellowish-brown loamy sand. Crevasse soils are strongly acid to mildly alkaline.

The Crevasse are minor soils on the recent natural levees. They occur with the Robinsonville and Commerce soils but are better drained and coarser textured.

The native vegetation on Crevasse soils consists of black willow, cottonwood, sycamore, and elm trees. Most of the acreage has been cleared and planted to row crops, but the soils are now used mainly for pasture. Crevasse soils are of limited value for row crops, mainly because of their poor tilth and droughtiness. Only one mapping unit of the Crevasse series was delineated in Washington County.

Crevasse sandy loams and loamy sands (½ to 2 percent slopes) (Cg).—This mapping unit consists of excessively drained, droughty, sandy soils on nearly level, recent natural levees.

Profile of Crevasse fine sandy loam:

A_p 0 to 10 inches, yellowish-brown (10YR 5/4) fine sandy loam; loose when moist; structureless; strongly acid to mildly alkaline.

AC 10 to 36 inches, yellowish-brown (10YR 5/8) loamy sand; loose when moist; structureless; strongly acid to mildly alkaline.

C 36 to 42 inches, yellowish-brown (10YR 5/6) loamy sand; very friable when moist; structureless; mildly alkaline.

The texture of the A_p horizon ranges from very fine sandy loam to loamy sand. The AC horizon ranges from fine sandy loam to loamy sand. The organic-matter content is low. Water movement into and through the soils is rapid. Soils of this mapping unit are droughty because of their low water-holding capacity. Nitrogen is usually the only element needed for pasture grasses.

Present use and management.—These soils are used mainly for pasture. Bermudagrass is the pasture plant ordinarily grown. In some areas cottonwood and willow trees are planted. Small grain is the main field crop. Management that will conserve moisture is necessary. Capability unit 22(IVs–1).

Dowling series

The Dowling series consists of poorly drained soils in depressions. They have formed from slack-water deposits and may include local alluvium washed down from surrounding areas. The surface soil ordinarily is very dark gray clay overlying dark gray, mottled clay. Dowling soils are medium acid to neutral.

The Dowling soils are among the most extensive in the county; they make up about 13 percent of the total acreage. They are within areas of Forestdale, Dundee, Sharkey, Tunica, and Alligator soils. They are more poorly drained and darker colored than Forestdale and Dundee soils and are in depressions rather than on old natural levees. From the Sharkey soils they differ mainly in position. They lack the coarser textured underlying layer that is characteristic of the Tunica soils and are lighter colored than the Alligator soils.

The native vegetation consists of cypress, tupelo-gum, cottonwood, and willow trees. Dowling soils are very difficult to drain, and the excess water makes them unsafe for many crops. Most of the acreage is in forest.

Dowling clay (0 to 2 percent slopes) (Da).—This is a dark-colored, poorly drained, clayey soil in depressions. It is very plastic when wet, is very hard when dry, and forms cracks readily.

Profile:

A_g 0 to 4 inches, very dark gray (10YR 3/1) clay; very hard when dry; structureless, with tendency toward a weak, medium, crumb structure; slightly acid to neutral; gradual boundary.

AC_g 4 to 24 inches, dark-gray (10YR 4/1) clay; few, fine, prominent mottles of yellowish red (5YR 5/6); very firm when moist; massive; slightly acid to neutral; gradual boundary.

C_g 24 to 40 inches, gray (10YR 5/1) clay; common, fine, prominent mottles of yellowish red (5YR 4/6); very firm when moist; massive; medium acid to neutral; gradual boundary.

The rate of movement of water into and through the soil is very slow. The available water-holding capacity is high. The organic-matter content and inherent fertility are fairly high. Because the drainage is poor, this soil is difficult to manage.

Present use and management.—Much of this soil is wooded and is best for that use. When adequately drained, it can be used for row crops and pasture. Rice is well suited. Late crops such as sorghum and soybeans are fairly well suited; however, the soil is often flooded. Tall fescue and bermudagrass are well suited. When this soil is used for field crops, adequate outlets, good row arrangement, and V-type and W-type ditches or dragline ditches are needed. Capability unit 21(IVw–1).

Dowling soils (0 to 2 percent slopes) (Db).—The texture of the surface layer is variable; it ranges from clay to very fine sandy loam. Because of this variation, it is not practical to separate the soils into types; therefore, they have been placed in an undifferentiated mapping unit.

Present use and management.—This is a minor mapping unit in the Dowling series. Most of the acreage has been cleared and is used for crops and pasture. Where cleared, the areas have been drained by V-type and W-type ditches and by dragline ditches. Rice, sorghum, and wild winter peas, as well as bermudagrass and tall fescue, are well suited. In undrained areas, sweetgum, water oak, cypress, and cottonwood trees do well. Capability unit 20(IIIw–13).

Dubbs series

The Dubbs series consists of nearly level, moderately well drained to well drained soils that formed in medium-textured alluvium from the Mississippi River. They are in the higher parts of old natural levees. The surface soil ordinarily is a grayish-brown very fine sandy loam or silt loam. The subsoil, a brown silty clay loam, overlies a light yellowish-brown very fine sandy loam or silt loam. The soils are medium acid to mildly alkaline.

The Dubbs soils are among the least extensive on the old natural levees in this county. They are mainly along Deer Creek and in the southwestern part of the county. Associated with them are Bosket, Dundee, and Dowling soils. The Dubbs soils have more profile development than the Bosket soils and are not so well drained. They are better drained than Dundee soils and are lighter colored, coarser textured, and much better drained than Dowling soils, which are in depressions.

The natural vegetation consists of oak, gum, hickory, and maple trees and a dense undergrowth of vines and canes. Most of the acreage has been cleared and farmed for a long time. Good tilth and mild slopes make Dubbs soils well suited to cultivation. Most of the soils are suited to irrigation.

Dubbs very fine sandy loam, nearly level phase (½ to 2 percent slopes) (Dd).—This is a moderately well drained to well drained, medium-textured, friable soil in nearly level parts of old natural levees. It is suited to a wide range of crops and is one of the most productive soils in the county.

Profile:

A_p 0 to 8 inches, grayish-brown (10YR 5/2) to dark-brown (10YR 4/3) very fine sandy loam; weak, fine, crumb structure; loose when dry, very friable when moist; medium acid to slightly acid; clear boundary.

B 8 to 20 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) silty clay loam; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist; medium acid to slightly acid; clear boundary.

C 20 to 36 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; mostly structureless; loose when dry, very friable when moist; medium acid to mildly alkaline.

The texture of the B horizon ranges from silty clay loam to silty clay. Infiltration and internal movement of water are fairly good. The available moisture-holding capacity is high. The organic-matter content of the soil is low. Nitrogen is usually the only element needed for crop production.

Present use and management.—Most of the soil has been cleared and is used for cultivated crops and rotation pasture. Cotton, corn, soybeans, and small grains are well suited. Pasture plants such as bermudagrass, dallisgrass, johnsongrass, and clover are also well suited. This soil is easy to work, and seedbeds can be prepared within a wide range of moisture content. The supply of organic matter may be improved and maintained by using sod crops in rotations and by turning under crop residues. Row arrangement and W-type ditches are needed for the removal of surface water. Where plowsoles have formed, they should be broken by deep tillage when the soil is dry. Capability unit 1(I–1).

Dubbs silt loam, nearly level phase (½ to 2 percent slopes) (Dc).—Most of this soil has been cleared. The infiltration rate is slower, and the tendency to crust and pack is greater for this soil than for Dubbs very fine sandy loam, nearly level phase. The acreages of the two soils are about equal. They produce the same crops and need the same kind of management. Capability unit 1(I–1).

Dundee series

The Dundee series consists of dominantly nearly level, somewhat poorly drained to moderately well drained soils that formed in medium- and fine-textured sediments from the Mississippi River. They occur on old natural levees along old streams and bayous. They range from nearly level to sloping, but are mainly nearly level. The surface layer is a dark-brown to grayish-brown very fine sandy loam to silty clay. It overlies a subsoil that is grayish-brown silt loam to silty clay, with mottles mainly of yellowish brown. The subsoil is underlain by grayish-brown silt loam to very fine sandy loam. The Dundee soils are strongly acid to neutral.

Dundee soils are among the best agricultural soils; they occupy a little less than 10 percent of the county. They occur throughout the county, but mainly along Deer Creek. Associated with them are Bosket, Beulah, Dubbs, and Dowling soils. The Dundee soils are not so well drained as the Bosket and Beulah soils, and they have finer textured, better developed profiles. They are slightly finer textured, more mottled, and more poorly drained than the Dubbs soils. They differ from the Dowling soils in being mainly nearly level rather than depressional.

The native vegetation on Dundee soils consists of sweetgum, blackgum, hickory, cherrybark oak, water oak, cow oak, winged-elm, white elm, other oaks and elms, and an undergrowth of vines and canes. Most of the acreage has been cleared and is used for row crops. Good tilth and gentle relief make Dundee soils well suited to cultivation.

Dundee very fine sandy loam, nearly level phase (½ to 2 percent slopes) (Dp).—This is a somewhat poorly drained to moderately well drained, medium-textured, friable soil in the nearly level parts of old natural levees. Profile:

A_p 0 to 7 inches, dark-brown (10YR 4/3) very fine sandy loam; friable when moist; structureless; medium acid; abrupt boundary.

B_1 7 to 13 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, faint mottles of grayish brown (10YR 5/2); very friable when moist; weak, subangular blocky structure; medium acid; clear boundary.

B_2 13 to 18 inches, grayish-brown (10YR 5/2) silty clay loam; common, fine, faint mottles of yellowish brown (10YR 5/4); friable when moist; medium, subangular blocky structure; medium acid to strongly acid; clear boundary.

C_1 18 to 31 inches, light brownish-gray (10YR 6/2) silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); slightly hard when dry; structureless to very weak subangular blocky; neutral to slightly acid; gradual boundary.

C_2 31 to 44 inches, pale-brown (10YR 6/3) very fine sandy loam; few, fine, faint mottles of yellowish brown (10YR 5/4); loose when moist; structureless; medium acid to neutral.

The A_p horizon ranges from very fine sandy loam to silty clay in texture and from 4 to 7 inches in thickness. The texture of the B horizon ranges from silt loam to silty clay; that of the C horizon ranges from silt loam to silty clay loam. The organic-matter content is low. Nitrogen is usually the only fertilizer needed for crop production. Movement of water into and through the soil is moderate to moderately slow. The water-holding capacity is high.

Present use and management.—This is one of the most productive soils in the county. Cotton is the principal crop, though the soil is suited to most crops that require good drainage. A small acreage is planted to corn, soybeans, small grains, and pasture. This soil is easy to work within a wide range of moisture content. Where a plowsole has developed, it can be broken by deep tillage when the soil is dry. The use of sod and cover crops in rotations will improve the soil structure, and the return of crop residues will add organic matter (fig. 6). To drain

***Figure 6.*—Crop residue from corn, used to provide winter cover and to improve the supply of organic matter in Dundee very fine sandy loam, nearly level phase.**

off excess water, till on the contour and provide V-type and W-type ditches. Capability unit 1(I–1).

Dundee very fine sandy loam, gently sloping phase (2 to 5 percent slopes) (Dr).—This soil ordinarily is on somewhat narrow ridges in sharp bends of streams and along streambanks. Small areas on the steeper slopes are moderately eroded. The rate of surface runoff is greater for this soil than for Dundee very fine sandy loam, nearly level phase.

Present use and management.—This is a minor soil in the Dundee series. Most of it has been cleared, and it is suitable for about the same crops as Dundee very fine sandy loam, nearly level phase. To conserve rainfall and to prevent excessive runoff, till on the contour. In some areas, vegetated water outlets may be required. Capability unit 4(IIe–1).

Dundee very fine sandy loam, nearly level moderately shallow phase (½ to 2 percent slopes) (Dt).—This soil has a clayey layer at depths of 20 to 30 inches. The movement of water through this layer is slower than in the subsoil of Dundee very fine sandy loam, nearly level phase. Use and management are the same for both soils. Capability unit 1(I–1).

Dundee very fine sandy loam, nearly level shallow phase (½ to 2 percent slopes) (Ds).—This soil has a clayey layer at depths of 10 to 20 inches, in which movement of water is slow. In use and management this soil is similar to Dundee very fine sandy loam, nearly level phase. Capability unit 3(I–3).

Dundee silt loam, nearly level phase (½ to 2 percent slopes) (De).—This is one of the best agricultural soils in the county. Although crusting and packing are more severe in this soil, use and management needs are the same as for Dundee very fine sandy loam, nearly level phase. Capability unit 1(I–1).

Dundee silt loam, gently sloping phase (2 to 5 percent slopes) (Df).—This is a minor soil in the Dundee series. Small areas have slopes that range up to 8 percent. The rate of surface runoff is greater than for Dundee silt loam, nearly level phase.

Use and management are the same as for Dundee very fine sandy loam, gently sloping phase. Capability unit 4(IIe–1).

Dundee silty clay loam, nearly level phase (½ to 2 percent slopes) (Dk).—This soil ordinarily is adjacent to areas of slack-water clay. Its infiltration rate is slow. Plowsoles are not so common as in Dundee very fine sandy loams, but this soil cannot be cultivated within so wide a range of moisture content.

This soil can be used for the same crops as Dundee very fine sandy loams, and use and management are about the same. Capability unit 12(IIs–6).

Dundee silty clay loam, gently sloping phase (2 to 5 percent slopes) (Dm). This soil is along streams and banks of bayous. Small areas with slopes of 5 to 8 percent and small, moderately eroded areas are included.

This Dundee silty clay loam is suited to about the same crops as Dundee very fine sandy loam, gently sloping phase. It requires careful arrangement of rows to remove surface water and to prevent erosion. Capability unit 6(IIe–4).

Dundee silty clay loam, sloping phase (5 to 8 percent slopes) (Dn).—This soil is on banks of streams and bayous. Small, moderately eroded areas are included. Surface runoff is greater than from Dundee very fine sandy loam, nearly level phase.

Present use and management.—Most of this soil is used for pasture. A small acreage is in cotton, soybeans, and small grains. To reduce runoff and erosion, it is best to keep this soil in sod crops. If it is used for row crops, arrange rows carefully to control erosion. Capability unit 14(IIIe–3).

Dundee silty clay loam, nearly level shallow phase (½ to 2 percent slopes) (Do).—This soil is on broad, almost flat ridges adjacent to areas of slack-water clay. A clayey layer is at depths of 20 to 36 inches. The movement of water into and through the soil is slow. Use and management are about the same as for Dundee silty clay loam, nearly level phase. Capability unit 10(IIs–4).

Dundee silty clay, nearly level phase (½ to 2 percent slopes) (Dg).—This soil, an overwash phase of Dundee silty clay, generally is in slack-water areas with Tunica and Sharkey soils. The infiltration rate is very slow. Most of the soil has been cleared and is used for pasture and for cultivated crops. The same plants are suited to this soil as to Dundee silty clay loam, nearly level phase.

This is a difficult soil to till and manage, as it has only a narrow moisture range within which seedbeds can be prepared and cultivation operations can be carried out. For successful farming, removal of surface water by row arrangement and by V-type and W-type ditches is necessary. Capability unit 8(IIs–2).

Dundee silty clay, gently sloping phase (2 to 5 percent slopes) (Dh).—This soil is along the breaks of bayous and streams, where soils on old natural levees join the slack-water areas.

Management needs and crops are about the same as for Dundee silty clay, nearly level phase. To reduce erosion, arrange crop rows carefully and use vegetated outlets. Capability unit 16(IIIs–2).

Forestdale series

The Forestdale series consists of nearly level to gently sloping, poorly drained to somewhat poorly drained soils that formed in stratified beds of fine textured to moderately fine textured alluvium from the Mississippi River. These soils are on natural levees along old or present stream channels. The surface soil is generally a light brownish-gray silt loam or silty clay loam. It overlies a grayish-brown silty clay, which, in turn, overlies light-gray silty clay loam. The Forestdale soils are medium acid to strongly acid.

Forestdale soils are among the most extensive on the natural levees. Associated with them are Dubbs, Bosket, and Alligator soils. They are not so well drained as Dubbs and Bosket soils, nor are they so fine textured as the Alligator soils.

The native vegetation on the Forestdale soils consists of mixed hardwoods and an undergrowth of canes and vines. Most of the acreage of the Forestdale soils has been cleared and is farmed. The soils are difficult to cultivate.

Forestdale silty clay loam, nearly level phase (½ to 2 percent slopes) (Fd).—This is a nearly level, poorly drained to somewhat poorly drained soil in the lower parts of old natural levees.

Profile:

A_p 0 to 6 inches, light brownish-gray (10YR 6/2) silty clay loam; weak, granular structure; friable when moist; medium acid to strongly acid; clear boundary.

B 6 to 24 inches, grayish-brown (10YR 5/2) silty clay mottled with shades of gray; weak, subangular blocky structure; hard when dry, firm when moist; medium acid to strongly acid; clear boundary.

C 24 to 36 inches, light-gray (10YR 7/1) to gray (10YR 6/1) silty clay loam mottled with various shades of yellow and brown; structureless; slightly hard when dry; medium acid to strongly acid.

A very small level area is included with this soil.

Movement of water into and through the soil is slow. The moisture-holding capacity is high. The organic-matter content is low. Nitrogen is usually the only fertilizer needed for crop production.

Present use and management.—This is the most extensive soil in the Forestdale series. Most of it has been cleared and is used for cotton, soybeans, corn, small grains, and rice. The pasture grasses are bermudagrass, johnsongrass, dallisgrass, and tall fescue. The soil is somewhat difficult to work. V-type and W-type ditches and row arrangement are needed to remove excess surface water. The addition of organic matter will improve workability of the soil. Capability unit 10(IIs–4).

Forestdale silty clay loam, gently sloping phase (2 to 5 percent slopes) (Fe).—This soil is along old drainageways. Included with it are small, galled areas where the subsoil is exposed. A few areas have slopes as steep as 8 percent. Surface runoff is somewhat greater than on the nearly level phase of Forestdale silty clay loam.

Present use and management.—This is a minor soil in the Forestdale series. Most of the acreage has been cleared and is used mainly for cotton, soybeans, and bermudagrass. Removal of surface water is a problem. Arrange rows on the contour and use V-type and W-type ditches to take water from the rows. Capability unit 15(IIIe–5).

Forestdale silty clay, nearly level phase (½ to 2 percent slopes) (Fb).—This soil is in broad, nearly level areas that grade into clayey soils of the slack-water areas. Included with it is a very small acreage of level relief.

Present use and management.—This is the second most extensive soil in the Forestdale series; about 90 percent of it is used for row crops, and the rest is in pasture and in forest. It is planted to cotton, soybeans, small grains, and rice. Bermudagrass, johnsongrass, dallisgrass, tall fescue, and clover are well suited. Because of the fine surface layer, it is difficult to work this soil. Removal of surface water is a problem. Crop rows, however, can be arranged on the contour, and V-type and W-type ditches can be provided to take water from the rows. Capability unit 17(IIIs–4).

Forestdale silty clay, gently sloping phase (2 to 5 percent slopes) (Fc).—This soil is in narrow bands along old stream runs. Water rapidly runs off the surface layer.

Most of the acreage is used for cotton, soybeans, and small grains. It is well suited to pasture. Row arrangement that will remove surface water with a minimum of soil loss is necessary, and V-type and W-type ditches can provide outlets for water. Capability unit 17(IIIs–4).

Forestdale silt loam, nearly level phase (½ to 2 percent slopes) (Fa).—Included with this soil are small areas that have a very fine sandy loam surface texture, areas that have slopes ranging up to 8 percent, and small areas that are silty.

Most of the acreage has been cleared and is used for cotton, corn, soybeans, and small grains. Bermudagrass, johnsongrass, dallisgrass, tall fescue, and clover are well suited. This soil is easy to work, as it has a silt loam surface layer. Row arrangement and V-type and W-type ditches are needed, however, to remove the excess surface water. Capability unit 9(IIs–3).

Mhoon series

The Mhoon series consists of nearly level, poorly drained to somewhat poorly drained soils that formed in sediments from the Mississippi River. They are on low ridges of recent natural levees, adjacent to areas of slack-water clay. The surface layer generally is a very dark grayish-brown silty clay loam, which overlies a dark yellowish-brown, gray-mottled silty clay loam or silt loam. The Mhoon soils are slightly acid to mildly alkaline.

The Mhoon soils are inextensive. They occur along the Mississippi River, in the western part of the county, in association with Robinsonville, Commerce, and Sharkey soils. Mhoon soils differ from the Robinsonville and Commerce soils in having a finer textured profile and in being more poorly drained. They differ from the Sharkey soils in having a coarser textured profile.

The native vegetation on Mhoon soils consists of black willow, cottonwood, sycamore, sweet pecan, green ash, sugarberry, and mulberry trees, and an undergrowth of vines and canes. All of the acreage has been cleared and is used for row crops. Poor tilth and slow surface runoff make the soils difficult to manage. Only one soil of the Mhoon series was mapped in Washington County.

Mhoon silty clay loam (½ to 2 percent slopes) (Mh).—This is a nearly level, poorly drained to somewhat poorly drained, slightly acid to mildly alkaline soil on recent natural levees, mainly in the western half of the county.

Profile:

A_p 0 to 6 inches, very dark grayish-brown (10YR 3/2) silty clay loam; friable when moist, slightly hard when dry; weak, fine, crumb structure; slightly acid to mildly alkaline; abrupt boundary.

AC 6 to 12 inches, very dark grayish-brown (10YR 3/2) silty clay; common, medium, faint mottles of dark brown (7.5YR 3/2); very hard when dry; massive; slightly acid to mildly alkaline; clear boundary.

C_1 12 to 18 inches, dark yellowish-brown (10YR 4/4) silty clay loam; many, medium, distinct mottles of very dark gray (10YR 3/1); friable when moist; massive; slightly acid to mildly alkaline; clear boundary.

C_2 18 to 30 inches, very dark grayish-brown (10YR 3/2) clay; thin lenses of dark reddish brown (5YR 3/2); very firm when moist; massive; slightly acid to mildly alkaline; clear boundary.

The A_p horizon includes small areas of silt loam and very fine sandy loam. The C_1 horizon ranges in texture from silty clay to silt loam. It may contain blotches or lenses of reddish-brown silty clay. The texture of the C_2 horizon ranges from clay to silt loam, in which reddish-brown blotches of silty clay may occur. Movement of water into and through the soil is slow. The available water-holding capacity is high. Nitrogen is the only fertilizer needed.

Present use and management.—This inextensive soil is used for cotton, soybeans, small grains, corn, and pasture. It needs drainage, however, for this use. To remove excess surface water, row arrangement and V-type and W-type ditches can be provided. The tilth of this soil is poor, but the use of sod crops and cover crops in rotations will improve it. Capability unit 10(IIs–4).

Pearson series

The Pearson series consists of nearly level to gently sloping, moderately well drained soils on terraces that are on old natural levees. The soil material is alluvium derived from loess. The surface soil generally is a light yellowish-brown silt loam. It overlies a subsoil that is yellowish-brown silt loam or silty clay loam that has mottles of grayish brown in the lower part. Pearson soils are medium acid to strongly acid.

Pearson soils are associated with Dowling, Dundee, and Dubbs soils in the eastern part of the county. They are not so fine textured as the Dundee and Dubbs soils, and they have developed from different parent materials. They differ from the Dowling soils in being nearly level to gently sloping rather than depressional.

The native vegetation on the Pearson soils is mixed hardwoods and an undergrowth of vines and canes. Most of the acreage is used for crops. The soils are easy to work and respond well to good management. Only one soil of the Pearson series was mapped in Washington County.

Pearson silt loam, nearly level phase (½ to 2 percent slopes) (Pe).—This moderately well drained, friable soil has developed in silty alluvium on old natural levees, mainly in the northwestern part of the county.

Profile:

A_p 0 to 5 inches, light yellowish-brown (10YR 6/4) silt loam; very friable when moist; structureless; medium acid to strongly acid; abrupt boundary.

B_1 5 to 15 inches, grayish-brown (10YR 5/2) silt loam; very friable when moist; structureless to very weak subangular blocky; medium acid to strongly acid; gradual boundary.

B_2 15 to 23 inches, brown (10YR 5/3) silty clay loam; common, fine, distinct mottles of brown (10YR 4/3); friable when moist; weak, subangular blocky structure; medium acid to strongly acid; gradual boundary.

C_1 23 to 42 inches, dark reddish-brown (5YR 3/3) silty clay loam; common, fine, distinct, grayish-brown mottles (10YR 5/2); friable when moist; weak, subangular blocky structure; medium acid to strongly acid.

The texture of the B_1 horizon in some places is silty clay loam. Infiltration of water is slow; the internal movement is fairly good. The available water-holding capacity is high. The organic-matter content is low. Nitrogen is the only fertilizer generally needed; however, tests should be made to determine the need for other elements. Included with this soil are small areas with slopes ranging to 5 percent and some that are moderately eroded.

Present use and management.—This soil is used for crops and pasture. Cotton, corn, soybeans, sorghum, dallisgrass, johnsongrass, and clover are well suited. The soil is easy to work, and preparation of seedbeds is no problem. If plowsoles have formed, they should be broken by deep tillage when the soil is dry. The organic-matter content is low; it can be improved by using sod crops in rotations and by turning under crop residues. Row arrangement and W-type ditches are needed to remove excess surface water. Capability unit 1(I–1).

Robinsonville series

The Robinsonville series consists of nearly level, moderately well drained to well drained soils that formed in moderately coarse textured sediments from the Mississippi River. They are on recent natural levees along the river and along old stream channels and cutoffs. The surface layer is brown very fine sandy loam. The subsoil is yellowish-brown to brown very fine sandy loam or silt loam. Robinsonville soils are neutral to mildly alkaline.

The Robinsonville soils are in the western part of the county. Associated with them are the Commerce, Mhoon, and Crevasse soils. Robinsonville soils are better drained than the Commerce and Mhoon soils. They are finer textured and not so well drained as the Crevasse soils.

The native vegetation of the Robinsonville soils consists of cottonwood, sycamore, sweet pecan, sweetgum, water oak, and boxelder trees, and an undergrowth of vines and canes. All of the soils have been cleared and are used mainly for row crops. Robinsonville soils are among the most productive in the county. Only one soil of the series was mapped in Washington County.

Robinsonville very fine sandy loam (½ to 2 percent slopes) (Ro).—This is a nearly level, moderately well drained to well drained, neutral to mildly alkaline, friable soil. It is on recent natural levees along the Mississippi River, in the western part of the county. It is one of the best agricultural soils.

Profile:

A_p 0 to 6 inches, brown (10YR 5/3) very fine sandy loam; loose when moist; structureless; neutral to mildly alkaline; abrupt boundary.

C_1 6 to 9 inches, brown (10YR 5/3) silt loam; very friable when moist; structureless; neutral to mildly alkaline; clear boundary.

C_2 9 to 13 inches, pale-brown (10YR 6/3) very fine sandy loam; loose when moist; structureless; neutral to mildly alkaline; gradual boundary.

C_3 13 to 22 inches, yellowish-brown (10YR 5/4) silt loam; very friable when moist; structureless; neutral to mildly alkaline; clear boundary.

C_4 22 to 32 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; loose when moist; structureless; neutral to mildly alkaline; gradual boundary.

C_5 32 to 37 inches, dark yellowish-brown (10YR 4/4) silt loam; very friable when moist; structureless; neutral to mildly alkaline; gradual boundary.

C_6 37 to 54 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; loose when moist; structureless; mildly alkaline; gradual boundary.

The surface soil is dominantly very fine sandy loam. Some areas have fine sandy loam or silt loam surface layers. Horizon C_1 may range in texture from silt loam to sandy clay loam, and horizon C_2, from silt loam to sandy clay loam. Horizon C_3 ranges from silt loam to fine sandy loam and, in places, contains blotches or lenses of reddish-brown silty clay. Horizons C_3, C_4, and C_5 may all be absent from the profile. Horizon C_6 may range from very fine sandy loam to loamy sand.

The organic-matter content of Robinsonville very fine sandy loam is generally low. Water movement into and through the soil is good. This soil is slightly droughty, as the water-holding capacity is moderate. Nitrogen is the only fertilizer needed.

Present use and management.—This soil is well suited to crops that require good drainage. A small acreage is planted to corn, soybeans, small grains, and pasture grasses, but cotton is the main crop. The soil is easy to till within a wide range of moisture content. If a plowsole has formed, it can be broken by deep tillage when the soil is dry. Use of sod crops and cover crops in the rotation will improve tilth. To remove excess surface water, row arrangement can be on the contour and W-type ditches can be provided. Capability unit 2(I–2).

Sharkey series

The Sharkey series consists of level to gently sloping, poorly drained, clayey soils that formed in fine-textured sediments of the slack-water areas along the Mississippi River. The surface soil is a dark grayish-brown clay, which overlies a very dark gray to dark gray, clayey subsoil. The Sharkey soils shrink when dry and form cracks from 1 to 5 inches wide and several feet deep. The Sharkey soils are medium acid to neutral.

Sharkey soils are associated with the Tunica, Alligator, Mhoon, and Dowling soils, mainly in the western part of the county. They occupy about one-third of the county. Sharkey soils differ from the Tunica soils in being finer textured to a greater depth and in being more poorly drained. They are darker colored than the Alligator soils. They have deep, clayey profiles; whereas the Mhoon soils are stratified with coarser textured material. They differ from the Dowling soils in being level to gently sloping rather than depressional.

The native vegetation on the Sharkey soils consists of American elm, sugarberry, bitter pecan, green ash, willow oak, Nuttall oak, overcup oak, other oaks and gums, and an undergrowth of vines and canes. More than half of the total acreage has been cleared and is planted to cotton, soybeans, and small grains. Because of poor drainage and clayey texture, use of the Sharkey soils for farming is limited.

Sharkey clay, nearly level phase (½ to 2 percent slopes) (Sb).—This dark-colored, poorly drained, clayey soil formed in fine-textured alluvium in slack-water areas along the Mississippi River. It is very plastic when wet, and, when it dries, it becomes very hard and cracks form.

Profile:

A_p 0 to 5 inches, very dark grayish-brown (10YR 3/2) clay; very hard when dry; moderate, fine and medium, granular structure; medium acid to slightly acid; abrupt boundary.

AC_g 5 to 26 inches, very dark gray (10YR 3/1) clay; common, small, prominent mottlings of reddish brown (5YR 4/4) and dark brown (7.5YR 4/4); very firm when moist; moderate, medium, subangular blocky structure; medium acid; gradual boundary.

C 26 to 50 inches, dark-gray (10YR 4/1) clay; many medium-sized mottles of shades of yellow and brown; very firm when moist; massive; medium acid to neutral.

The surface soil ranges to very dark gray, though it is normally very dark grayish brown. The AC_g horizon ranges from very dark grayish brown to very dark gray. In places it contains layers or blotches of reddish-brown silty clay or clay.

The organic-matter content is medium. Water movement into and through the soil is very slow when the soil is wet. The available water-holding capacity is very high. Surface runoff is very slow. Poor tilth makes the soil difficult to work.

Present use and management.—About 70 percent of the Sharkey acreage consists of Sharkey clay, nearly level phase. About two-thirds of this soil has been cleared and is used for crops and pasture. Adequate drainage is necessary for best use. This soil needs row arrangement and V-type and W-type ditches to provide adequate outlets for removal of excess water. When drained, it is suited to cotton, soybeans, rice, small grains, and pasture. Using sod crops in rotations and turning under crop residues will improve tilth. Prepare seedbeds early to permit settling. Capability unit 17(IIIs-4).

Sharkey clay, level phase (0 to ½ percent slopes) (Sa).—This soil is on broad flats or in slightly depressed areas. Water from the surrounding higher areas collects and ponds on it. Infiltration and the rate of runoff are very slow.

Present use and management.—This is the second most extensive soil of the Sharkey series. Most of the acreage is now wooded. If the soil is adequately drained, cotton, rice, soybeans, grasses, and legumes can be grown. Drainage can be provided by row arrangement, by V-type and W-type ditches, and by adequate outlets to remove water. Capability unit 19(IIIw-11).

Sharkey clay, gently sloping phase (2 to 5 percent slopes) (Sc).—This soil is in narrow bands along old streams and on narrow ridges within sharp bends of old stream channels. Surface runoff is faster than for Sharkey clay, nearly level phase. Small, moderately eroded areas and some areas with slopes up to 8 percent are included with Sharkey clay, gently sloping phase.

About 90 percent of the acreage has been cleared and is used for cotton, soybeans, small grains, and pasture. To prevent soil loss, arrange crop rows on the contour and keep vegetation on the soil as much of the time as possible. Capability unit 17(IIIs-4).

Sharkey silty clay loam, nearly level phase (½ to 2 percent slopes) (Sd).—This soil lies between the soils on old levees and those in clayey, slack-water areas. The silty clay loam surface layer (less than 10 inches thick) is an overwash from soils at the higher elevations. Small areas with slopes from 5 to 8 percent are included with this soil.

Because it has a silty clay loam surface layer, this soil is not so difficult to manage as other Sharkey soils. Suitable crops and management are about the same as for Sharkey clay, nearly level phase. Capability unit 10(IIs-4).

Sharkey very fine sandy loam, nearly level overwash phase (½ to 2 percent slopes) (Se).—The grayish-brown surface layer is 6 to 10 inches deep. It consists of overwash material that was deposited when the Mississippi River broke its levees in 1927. Infiltration of water is slow.

The soil has been cleared and is used mainly for cotton, corn, soybeans, and rice. A small acreage is in pasture. Preparation of seedbeds and cultivation of this soil are not so difficult as for the Sharkey soils that have a clayey surface layer. Other management needs are about the same. Capability unit 11(IIs-5).

Souva series

The Souva series consists of somewhat poorly drained, depressional soils that formed from local alluvium washed down from the surrounding areas. The surface soil, generally a dark grayish-brown to dark yellowish-brown silt loam, overlies a mottled, grayish-brown silty clay loam that is grayer with depth. The Souva soils are medium acid to neutral.

Souva soils are inextensive in the county and are in areas of old natural levees. They occur with Dubbs, Dundee, and Bosket soils. Souva soils, however, are in depressions, rather than on the natural levees. They are more poorly drained and have weaker profile development than the associated soils.

The native vegetation on Souva soils consists of cypress, tupelo-gum, sweetgum, willow, and cottonwood trees. If drained, Souva soils are productive. Most of the soils have been cleared and are used for crops and pasture. Only one soil of the Souva series was mapped in Washington County.

Souva silt loam (0 to 2 percent slopes) (So).—This is a somewhat poorly drained, friable soil that formed in local wash in depressions. It is scattered through areas of Boskett, Dubbs, Dundee, and other better drained soils.

Profile:

A 0 to 10 inches, dark grayish-brown (10YR 4/2) to dark yellowish-brown (10YR 4/4) silt loam; friable when moist; crumb structure; medium acid to neutral; clear boundary.

C_1 10 to 24 inches, grayish-brown (10YR 5/2) silty clay loam; friable when moist; moderate, medium, subangular blocky structure; medium acid to neutral; clear boundary.

C_2 24 to 42 inches, gray (10YR 5/1) to grayish-brown (10YR 5/2) silty clay loam; friable when moist; crumb structure; medium acid to neutral; clear boundary.

Although the texture of the A horizon is dominantly silt loam, some areas have silty clay and very fine sandy loam surface soils. The infiltration and internal movement of water are fairly slow. The available water-holding capacity is high. Nitrogen is generally the only fertilizer needed.

Present use and management.—Practically all of this soil has been cleared and is used for crops and rotation pasture. If the soil is drained, cotton, corn, soybeans, and sorghum are well suited. Suitable pasture plants are bermudagrass, dallisgrass, johnsongrass, red clover, and wild winter peas. The soil should be prepared in spring. The organic-matter content can be built up by use of sod crops in the rotation, by turning under crop residues, and by planting cover crops. Row arrangement and V-type and W-type ditches are needed for drainage. Capability unit 13(IIw-3).

Swamp

Swamp (Sw).—This mapping unit is in low, wet areas and is flooded much of the time. Cypress, tupelo-gum, water oak, and a dense understory of bush and swamp-type vegetation grow well. Swamp has not been placed in a capability unit.

Tunica series

The Tunica series consists of nearly level to gently sloping, somewhat poorly drained soils that formed in fine-textured alluvium along the Mississippi River. They occupy the higher elevations in slack-water areas. The surface soil ordinarily is a thin, very dark grayish-brown clay, which overlies a dark-gray clay subsoil. Coarser textured material is at depths ranging from 20 to 30 inches. Tunica soils are slightly acid to mildly alkaline.

Tunica soils occupy approximately 3 percent of the county; they occur in the western two-thirds of the county in the clayey, slack-water areas. Associated with them are the Dundee, Dowling, Bowdre, and Sharkey soils. They are darker colored and finer textured than the Dundee soils. From the Dowling soils they differ mainly in position. The depth to underlying coarser material is 20 to 30 inches in the Tunica soils, as compared to 10 to 20 inches in the Bowdre soils. Tunica soils differ from Sharkey soils in having coarser textured materials below the clay layers. Sharkey soils are clayey throughout the profile.

The native vegetation on Tunica soils consists of hardwoods and an undergrowth of vines and canes. Most of the acreage has been cleared and is used for crops. Because they usually occupy higher elevations than the other soils in slack-water areas, Tunica soils generally have better surface drainage.

Tunica clay, nearly level phase (½ to 2 percent slopes (Tc).—This is a nearly level, dark-colored, somewhat poorly drained, clayey soil. Coarser textured material lies at depths of 20 to 30 inches.

Profile:

A_p 0 to 6 inches, very dark grayish-brown (10YR 3/2) clay; very firm when moist; massive; slightly acid; abrupt boundary.

AC 6 to 20 inches, dark-gray (10YR 4/1) clay; common, fine, distinct mottles of dark yellowish brown (10YR 4/4); very firm when moist; moderate, medium, subangular blocky structure; neutral to slightly acid; gradual boundary.

C_1 20 to 28 inches, very dark gray (10YR 3/1) silty clay; very firm when moist; moderate, medium, subangular blocky structure; neutral to slightly acid; gradual boundary.

D_1 28 to 36 inches, gray (10YR 5/1) silty clay loam; many, medium, distinct mottles of brown (7.5YR 5/4); friable when moist; structureless; neutral to mildly alkaline.

The D_1 horizon ranges from silty clay loam to sandy loam. When the soil is wet, water movement into and through it is very slow; when it is dry, the soil cracks. The available water-holding capacity is high. The organic-matter content is low. Nitrogen is generally the only fertilizer needed.

Present use and management.—Most of Tunica clay, nearly level phase, is used for row crops and rotation pasture. Cotton, small grains, sorghum, soybeans, and rice are well suited. Corn is fairly well suited. Suitable pasture plants are tall fescue, dallisgrass, johnsongrass, and clover. Wooded areas generally need better woodland management. This soil is difficult to work, and early preparation of seedbeds is advisable. Surface drainage is needed. Capability unit 8(IIs-2).

Tunica clay, gently sloping phase (2 to 5 percent slopes) (Tb).—This soil is on slopes along the banks of bayous. Small, moderately eroded areas and some areas with slopes up to 8 percent are included.

Present use and management.—This inextensive soil needs about the same use and management as Tunica clay, nearly level phase. Arrangement of crop rows to prevent erosion and to reduce surface runoff is necessary. In some areas, vegetated waterways may be needed. Capability unit 16(IIIs-2).

Tunica silty clay loam, nearly level phase (½ to 2 percent slopes) (Tc).—The rate of infiltration is slightly higher for this soil than for the Tunica clays.

Most of the soil is now used for crops. Seedbeds can be prepared within a fairly wide range of moisture content. Use and management are about the same as for the Tunica clays. Capability unit 12(IIs-6).

Genesis, Morphology, and Classification of Soils[3]

Factors of Soil Formation

Soil is a function of climate, living organisms, parent materials, topography, and time. The nature of the soil at any point on the earth depends upon the combination of the five major factors at that point. All five of these factors come into play in the genesis of every soil. The relative importance of each differs from place to place; sometimes one is more important and sometimes another. In extreme cases one factor may dominate in the formation of the soil and fix most of its properties, as is common when the parent material consists of pure quartz sand. Little can happen to quartz sand, and the soils derived from it usually have faint horizons. Even in quartz sand, however, distinct profiles can be formed under certain types of vegetation where the topography is low and flat and a high water table is present. Thus, for every soil, it is the past combinations of the five major factors that are of first importance to its present character.

Climate

The climate of Washington County is of the humid, warm-temperate, continental type characteristic of the southeastern United States. As a rule, soils in this type of climate are strongly weathered, leached, acid, and of low fertility. The flood plain of the Mississippi River,

[3] Much of the material in this section was taken, with modification, from the Soil Survey of Tunica County, Miss. (*9*).

however, is geologically young. Time has not yet permitted strong weathering of the sediments in place. The sediments themselves have come in large part from sections of the country where weathering is not intense. Thus, the kinds of soils normally associated with warm-temperate, humid climates do not occur in Washington County, though they are present within short distances to the east and west. The soils resemble those commonly found in cooler and slightly drier climates. In this county the climate has been a uniform factor in soil development and has made only a slight impression on the soils.

In Washington County, summers are hot and sultry and winters are moderate. There are hot, droughty spells in summer when the temperature stays high both day and night. Winter temperatures above 70° F. are common, but at times during short cold spells the temperature is much lower. The amount of rainfall varies greatly throughout the county. Some areas may have an abundance of rainfall and others may have a shortage in any one year. Infrequent snows are light and do not remain on the ground long. The average temperature and rainfall distribution by months are indicated in table 8.

TABLE 8.—*Temperature and precipitation at Greenville Station, Washington County, Miss.*

[Elevation, 132 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1952)	Wettest year (1923)	Average snowfall
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	45.6	85	6	6.57	4.40	11.73	0.4
January	45.5	90	−1	4.78	3.75	5.50	1.1
February	48.6	91	−5	4.48	4.17	6.83	.5
Winter	46.6	91	−5	15.83	12.32	24.06	2.0
March	56.3	91	15	5.53	3.50	5.88	.2
April	64.6	95	29	5.03	5.67	6.37	0
May	72.1	99	38	5.02	1.98	7.85	0
Spring	64.3	99	15	15.58	11.15	20.10	.2
June	79.7	105	47	3.31	([3])	4.65	0
July	82.1	110	53	3.35	2.42	5.33	0
August	81.8	107	54	3.86	1.50	8.10	0
Summer	81.2	110	47	10.52	3.92	18.08	0
September	76.8	107	37	3.17	1.33	3.98	0
October	65.4	96	25	2.69	.03	4.79	0
November	54.7	87	16	4.13	2.60	5.65	.1
Fall	65.6	107	16	9.99	3.96	14.42	.1
Year	64.4	110	−5	51.92	31.35	76.66	2.3

[1] Average temperature based on a 69-year record, through 1955; highest and lowest temperatures on a 59-year record, through 1952.

[2] Average precipitation based on a 68-year record, through 1955; wettest and driest years based on a 68-year record, in the period 1887–1955; snowfall based on a 57-year record, through 1952.

[3] Trace.

Living organisms

Before the county was settled, the native vegetation was most important in the complex of living organisms that affect soil development. The activities of animals were seemingly of minor importance. The first settlers found a cover of dense forests broken by occasional canebrakes. Heavy stands of cypress filled the swampy areas, whereas hardwood stands occupied most of the better drained soils and many of the wet ones. Trees on the slight ridges were chiefly hickory, pecan, post oak, blackgum, and winged-elm. In the swales and low places that were wet but not swampy, the principal trees were tupelo-gum, sweetgum, soft elm, green ash, hackberry, cottonwood, overcup oak, and willow oak. Canebrakes covered many of the broader flats between the swamps in the sloughs and bayous. These differences in native vegetation seem to have been associated mainly with variations in drainage. Only the major differences in the original vegetation are reflected to any extent in the soils, probably because of the general youth of the land surface.

With the development of agriculture in Washington County, man has become important to the future direction and rate of development of the soils. The clearing of the forests, the cultivation of the soils, the introduction of new species of plants, the building of levees for flood protection, and the artificial improvement of natural drainage will be reflected in the direction and rates of soil genesis in the future. Few results of these changes can as yet be seen. Some probably will not be evident for many centuries. The complex of living organisms affecting soil genesis in Washington County has been drastically changed, however, as a result of man's activity.

Parent materials

Alluvial sediments laid down by the Mississippi River are the chief parent materials of soils in the county. The total thickness of alluvium in Washington County ranges from many tens to several hundreds of feet.

The alluvium in Washington County has a mixed lithology, originating as it does in the wide reaches of the upper Mississippi River basin. Sedimentary rocks are most extensive in this upper basin, which extends from Montana to Pennsylvania, but other kinds of rocks are also exposed and serve as sediment sources in many places. Immense areas in the upper basin are mantled by recent glacial drift and loess. The alluvium along the lower stretches of the Mississippi River, including Washington County, has come from the multitude of soils, rocks, and unconsolidated sediments of some 20 states. As a result, the alluvium consists of a mixture of minerals. Furthermore, many of the minerals are comparatively fresh and are only slightly weathered.

Within Washington County, there are wide ranges in the texture of the alluvium because of differences in deposition. All of it has been laid down by river water either when quiet or in flood. As the river overflows its channels and the water spreads out over the flood plain, the coarser sediments are dropped first. Sands are commonly deposited in bands parallel to and near the channel. Low ridges thus formed are known as natural levees. As the floodwaters continue to spread, they move more slowly and the finer sediments, such as silts, are deposited next, usually in mixture with some sands and clays. When the flood has passed and water is left standing in the lowest parts of the flood plain, the finest sediments or clays may settle. These so-called slack-water clays do not settle until the water becomes still.

The simple pattern of coarse sediments near the channel, fine sediments in slack-water areas some distance away, and medium-textured sediments between the two, is not common at the present time along the Mississippi River. Over the centuries the river channel has migrated back and forth across much of the flood plain, sometimes cutting out natural levees laid down earlier, sometimes depositing sand on top of slack-water clays. The normal pattern of sediment distribution from a single channel has been partly or wholly truncated in many places and has had subsequent beds of alluvium superimposed on it. All possible combinations of sediments resulting from the superposition of the simple patterns, one upon another, now exist in the flood plain. Fragments of former channels with their adjacent sandy natural levees, the gently sloping bodies of medium-textured sediments, and slack-water clays can be found in a number of places. On the whole, the large areas of slack-water clays have been stable, partly because they lie farthest from the meander belt established by the river channel in the central part of the broad flood plain.

Textural differences in the alluvium are accompanied by some differences in chemical and mineralogical composition. Sandier sediments are usually higher in quartz than are those of intermediate or fine textures. Conversely, they are lower in feldspars and ferromagnesian minerals. Sandier sediments are characteristically more siliceous and lower in bases. They are also lower in carbonates for the most part, but that is not always true. Some of the more recently deposited, sandier levees are distinctly calcareous, whereas many of the slack-water sediments are free of carbonates and are slightly acid.

Topography

Washington County is a small part of an immense flood plain that is nearly level. The topography ranges from the flat bodies of slack-water clays to a gently sloping succession of ridges and swales in areas that once bordered the river channel. Local differences in elevation are commonly measurable in feet. Seldom are there differences as great as 15 feet within 1 square mile. In some of the lowest and most nearly level parts of the flood plain, the maximum differences in elevation are less than 5 feet in as many square miles. Slopes are generally less than 2 percent in gradient. Greater slopes occur on a few streambanks and on the present natural levees of the Mississippi River; these may range up to 10 percent. The total area of strong slopes in the county is very small.

The highest point in the county lies in the northwestern corner near the Mississippi River and is 140 feet above sea level. The lowest point in the county is in the Swan Lake area, near the center of the southern end. It is 90 feet above sea level, only 50 feet below the highest point.

Because of the higher elevations near the Mississippi River and Deer Creek, natural drainage in the western half of the county is east and southeast from the Mississippi River into Black Bayou and west to southwest from Deer Creek into Black Bayou, through Swan Lake, and into Steele Bayou. The higher elevations in the eastern half of the county are along Deer Creek and the Big Sunflower River. Natural drainage in this section is east and southeast from Deer Creek into the Bogue Phalia River and west and southwest from the Sunflower River in neighboring Sunflower County into the Bogue Phalia River and on into the Big Sunflower River, which forms the southeastern border of Washington County.

The flatness of the county contributes to the slow drainage of many of the soils. Water moves into the main channels with difficulty, especially from the areas of slack-water clays. Movement of water through such soils is also slow, which tends to increase drainage problems. A much larger part of the county would probably have been wet and swampy if, in the past, the Mississippi River channel had not meandered so much across the flood plain.

Time

Geologically, soils of the county are young. Most of the county was receiving occasional deposits until the levee was built in 1859. The last flood from the Mississippi River was in 1927, when the levee broke at Scott, Miss., about 3 miles north of the Washington County line. This flood deposited sand and silt from several inches to several feet deep over natural levees and slack-water clay soils.

It seems probable that the sediments now forming the land surface in Washington County arrived during and after the advances of the Wisconsin glaciers, the latest of which was moving into the North-Central States, 11,000 years ago (*2*). The soils being formed on glacial drift of the Mankato stage (last of the Wisconsin glaciers) in those States show little horizonation other than the downward leaching of carbonates and the accumulation of organic matter in the surface layer. The present surface of the Mankato drift has probably been exposed for 8,000 years. Assuming that rates of horizon differentiation in the alluvium of Washington County would be as rapid as that on the Mankato drift, the soils could be somewhat older than those of south-central Minnesota. Even so, the comparison indicates that the time span for the development of horizons in soils of Washington County has been short.

Morphology and Composition of the Soils

Soil morphology in Washington County is expressed generally in faint horizons. Some of the soils do have one distinct or prominent horizon, but they are in the minority. None of the soils have prominent horizons within the solum. Marked differences in texture of the solum or the C horizon and an underlying D horizon occur in some profiles, as, for example, in the Tunica soils formed from thin beds of clay over sand. Generally speaking, horizon differentiation is in the early stages or has scarcely started, and the horizons themselves are indistinct.

The differentiation of horizons in soils of the county is the result of one or more of the following processes: Accumulation of organic matter; leaching of carbonates and salts more soluble than calcium carbonate; translocation of silicate clay minerals; and reduction and transfer of iron. In most soil profiles in the county, two or more of these processes have operated in the development of horizons. For example, the first two are reflected in the feeble horizons of Crevasse sandy loams and loamy sands, whereas the first and last are the chief causes of the morphology of Sharkey clay. All four processes have operated to some extent in the differentiation of horizons in the Dundee soils.

Some organic matter has accumulated in the uppermost layer of all but a few soils in Washington County to form an A_1 horizon. Most of the organic matter is in the form of humus. The quantities are very small in some soils but fairly large in others. Soils such as Crevasse sandy loams and loamy sands have faint and thin A_1 horizons low in organic matter at best. Some areas of the soils lack any A_1 horizon. Other soils, such as Sharkey clay, have evident, thick A_1 horizons fairly high in organic matter. Taking the soils of the county as a whole, the accumulation of organic matter has been most important among processes of horizon differentiation.

Leaching of carbonates and salts has occurred in all soils of the county, although it has had limited effect on horizon differentiation. The effects have been indirect, in that the leaching permitted the subsequent translocation of silicate clay minerals in some soils. Carbonates and other salts have been carried completely out of the profiles of most of the well-drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by the acid reactions. Leaching of the very wet soils is slow because water moves slowly through the profile. Leaching has also made little progress in removal of carbonates from soils forming on the most recent sediments near the channel of the Mississippi River. Carbonates and other salts have been washed out of the profiles of most soils in Washington County.

Translocation of silicate clay minerals has contributed to the development of horizons in relatively few soils in the county, mainly those of the Dubbs, Dundee, and Bosket series. The darker coatings on ped faces and the clay films in former root channels in the B horizon of these soils indicate some downward movement of silicate clay minerals from the A horizon. The actual amount of clay movement has been small, but it has contributed to horizon differentiation. In the Dubbs, Dundee, and Bosket soils, translocation of clay has been about as important as the accumulation of organic matter in horizon differentiation. Leaching of carbonates and salts from the upper profile seems to be a necessary prelude to the movement of the silicate clays.

The reduction and transfer of iron has occurred in all of the poorly drained and somewhat poorly drained soils. It has also occurred to some extent in deeper horizons of moderately well drained soils, such as Dundee very fine sandy loam. In the large areas of naturally wet soils in Washington County, the reduction and transfer of iron, a process often called gleying, has been of importance in horizon differentiation.

The gray colors of the deeper horizons of the wet soils indicate the reduction of iron oxides. This reduction is commonly accompanied by some transfer of the iron, which may be local or general in character. After it has been reduced, iron may be removed completely from some horizons and may even go out of the soil profile. More commonly in Washington County, it has moved a short distance and stopped either in the horizon of its origin or in a nearby horizon. Iron has been segregated within deeper horizons of many of the soils to form yellowish-red, strong-brown, or yellowish-brown mottles. Iron has also been segregated into concretions in the deeper profiles of some soils.

The differentiation of the A_1 horizon from the deeper horizons in the poorly drained soils of Washington County is caused in part by the reduction and transfer of iron. Horizon differences also result in part from a greater accumulation of organic matter in the surface layer. The effects of gleying—the reduction and transfer of iron—are generally evident but not prominent in the profiles of the soils in Washington County. This seems to reflect the youth of the land surface and of the soils. The time during which the sediments have been subject to horizon differentiation has not yet been long enough to permit the development of prominent horizons in the soil profiles.

The comparative effects of the several processes in horizon differentiation can be illustrated by detailed profile descriptions. Representative soil profiles from Washington County are, therefore, described in subsequent paragraphs. Field descriptions for the Sharkey and Dubbs soils are supplemented by laboratory analyses for particle size distribution and exchangeable cations. One or more profile descriptions are given for Sharkey clay, Dubbs silt loam, Dubbs very fine sandy loam, Robinsonville very fine sandy loam, and Commerce very fine sandy loam. The location of each profile is given either by land description (section, township, range), or by reference to a geographic landmark. Profiles that were sampled for laboratory analyses are numbered for identification in the tables of data. The classification of these soils into great soil groups and orders is discussed in the subsection, Classification of Soils by Higher Categories, that follows the profile descriptions and laboratory data.

Representative soil profiles

Sharkey clay.—This is one of the most extensive soil types in Washington County. It represents a group of soils formed entirely or very largely from slack-water sediments. Three profiles of Sharkey clay are described. They are located in Tunica County, Miss. (*9*).

Profile No. 1—Sharkey clay (NE¼NE¼ sec. 2, T. 7 S., R. 12 W.):

A_{1p} 0 to 5 inches, very dark gray (5Y 3/1 to 10YR 3/1) clay; moderate, medium, granular structure; hard when dry, friable when moist, plastic when wet; abrupt boundary (furrow slice).

A_{12} 5 to 10 inches, very dark gray (5Y 3/1) clay, a trifle lighter in color when crushed; few, fine, faint, brownish-yellow (10YR 6/6) mottles; weak, medium, granular structure; very hard when dry, very firm when moist; gradual boundary.

A_{13} 10 to 16 inches, very dark gray (5Y 3/1) clay, a trifle lighter in color when crushed; few, fine, faint, brownish-yellow (10YR 6/6) mottles; weak, medium, granular structure; very hard when dry, very firm when moist; irregular, gradual boundary.

C_{1g} 16 to 28 inches, mottled light brownish-gray (2.5Y 6/2), light olive-gray (5Y 6/2), brownish-yellow (10YR 6/8), and strong-brown (7.5Y 5/8) clay; mottles are light yellowish brown (10YR 6/4); massive; very hard when dry, very firm when moist, very plastic and very sticky when wet; cores of olive-gray clay 6 to 15 millimeters in diameter extend down from A_{13} layer; gradual boundary.

C_g 28 to 34 inches, mottled grayish-brown (2.5Y 5/2), light olive-brown (2.5Y 5/4), and yellow (10YR 7/6) clay; many, fine, faint mottles; massive; very hard when dry, firm when moist, very plastic and very sticky when wet; few, very fine pores; gradual boundary.

D_g 34 to 55 inches+, mottled dark olive-gray (5Y 3/2), olive (5Y 4/3), dark grayish-brown (2.5Y 4/2), and brown (7.5YR 5/4) clay; many, fine, faint mottles; massive to very weak, fine and medium, granular structure; very hard to extremely hard when dry, very firm when moist, very plastic and very sticky when wet.

Profile No. 2—Sharkey clay (SE¼SE¼ sec. 33, T. 4 S., R. 11 W.):

A_{1p} 0 to 4 inches, very dark gray (10YR 3/1) clay; moderate, fine granular structure; hard when dry, friable when moist, very plastic and sticky when wet; abrupt boundary.

A_{1g} 4 to 13 inches, very dark gray (5Y 3/1) clay mottled with dark brown (7.5YR 4/4); many, fine, distinct mottles; massive, with slight indication of very fine, irregular, blocky structure in lower part; extremely hard when dry, extremely firm when moist, very plastic and very sticky when wet; black flecks in upper part and few spherical pockets (20 to 30 millimeters in diameter) of darker soil material in lower part; gradual boundary.

AC_g 13 to 17 inches, mottled very dark gray (5Y 3/1), olive (5Y 5/4), and strong-brown (7.5YR 5/6) clay; many, fine, distinct mottles; massive, with slight suggestion of weak, medium, irregular blocky structure; extremely hard when dry, extremely firm when moist, very plastic and very sticky when wet; largely interpenetrating cores and masses from horizons above and below.

C_{1g} 17 to 24 inches, mottled light-gray (5Y 6/1), brownish-yellow (10YR 6/8), and reddish-yellow (7.5YR 6/8) clay; many, fine, distinct to prominent mottles; crushed soil is olive brown (2.5Y 4/4); massive; extremely hard when dry, extremely firm when moist, very plastic and very sticky when wet; few dark cores extend into layer from above; gradual boundary.

C_{2g} 24 to 42 inches+, mottled dark-gray (5Y 4/1) and olive-brown (2.5Y 4/4) clay; many, fine, faint mottles; massive; extremely firm when dry, very plastic and very sticky when wet.

Profile No. 3—Sharkey clay (NW¼NW¼ sec. 2, T. 5 S., R. 11 W.):

A_{1p} 0 to 4 inches, very dark gray (10YR 3/1) clay; moderate, fine to medium, granular structure; hard when dry, friable when moist, very plastic and sticky when wet; abrupt boundary (furrow slice).

A_{1g} 4 to 13 inches, very dark gray (5Y 3/1) clay mottled with yellowish brown (10YR 5/6) and yellowish red (5YR 4/6); mottles are mostly yellowish brown, fine and medium, distinct to faint, and many; massive, with suggestion of weak, coarse, irregular blocky structure; very hard when dry, extremely firm when moist, very plastic and very sticky when wet; gradual boundary.

C_{1g} 13 to 23 inches, mottled olive-gray (5Y 5/2), brownish-yellow (10YR 6/8), and strong-brown (7.5YR 5/8) clay; many, fine and medium, distinct mottles; massive; extremely hard when dry, extremely firm when moist, very plastic and very sticky when wet; few dark cores (10 to 30 millimeters in diameter) extend down from layer above; gradual boundary.

C_{2g} 23 to 36 inches+, mottled gray (5Y 5/1) and strong-brown (7.5YR 5/8) clay; many, fine, prominent to distinct mottles; layer appears speckled in place; massive; extremely hard when dry, extremely firm when moist, very plastic and very sticky when wet; few worm channels and dark cores from layer above.

The chief horizon distinctions in the three profiles of Sharkey clay are in color, mainly in difference of hue and in degree of mottling. There are a few slight differences in texture, structure, and consistence, but these occur erratically in the profiles. The A_1 horizon in all three profiles reflects past accumulation of organic matter, and the deeper horizons have been affected by gleying, that is, the reduction and transfer of iron. Evidence for gleying lies in the 5Y hue (Munsell system) and in the mottled color patterns. Common ranges in thickness of horizons, as well as those in drainage, are indicated by the three profiles. The low degree of horizon differentiation in Sharkey clay is further shown by the laboratory data in table 9.

As shown by the laboratory data, the content of organic matter decreases with depth, but no other consistent trends or appreciable differences are evident in the profiles. All three profiles are high in clay and low in sand, have high cation exchange capacities, and have high values for exchangeable calcium, magnesium, and potassium. They are low in exchangeable hydrogen, as compared to exchangeable bases. The percentage for base saturation is high. The high exchange capacities are consistent with the identification of montmorillonite as a dominant clay mineral in Sharkey clay. The analytical data for the three profiles, as a whole, emphasize further the low degree of horizon differentiation.

Lack of distinct horizons in Sharkey clay is a reflection of the youth of the soil, the resistance of fine sediments to change, and some mixing of materials within the profile. The youth of the land surface and of the sediments in Washington County has been discussed earlier. The fine texture of soils such as Sharkey clay acts as an effective brake on processes of horizon differentiation. Movements of constituents from one horizon to another are naturally slow in profiles with many very fine pores and few large ones. Rates of hydrolysis and breakdown of primary minerals are reduced because of the slow removal of the end products of those processes.

Mixing of materials from the present horizons is a further factor offsetting horizon differentiation in Sharkey clay. Because of the montmorillonitic nature of the clay, the soil shrinks greatly when it becomes dry. Cracks 1 to 4 inches wide form at the surface, extend downward for 2 or 3 feet, and become narrower with depth. When the soil becomes wet again, it swells so that the cracks close; but seldom does that happen before some material from the A_1 horizon drops down into the cracks and becomes mixed with the C and D horizons. The shrinking and swelling seem to be less than in the Grumusols (*4*) or the Regur soils of India (*6*), but the process is operating to some extent, the degree of which is as yet unknown. The mixing or churning of the soil seems to have partly offset horizon differentiation.

Dubbs soils.—The well-drained soils formed on the older natural levees are represented by soils of the Dubbs series, which have slightly more distinct horizons than Sharkey clay. Closely related to the Dubbs in profile characteristics and in processes of formation are the Bosket and Dundee soils. Collectively, these soils occupy only about 16 percent of the total area of Washington County, but they are among its most productive soils.

TABLE 9.—*Laboratory data for Sharkey clay*

[Analyses by Soil Survey Laboratory, Soil Conservation Service, Beltsville, Md.]

Profile and laboratory number	Horizon	Depth	Mechanical separates: Very coarse sand, coarse sand, and medium sand [2]	Fine sand	Very fine sand	Silt	Clay	Organic matter [3]	Exchangeable cations [1]: H	Ca	Mg	K	Sum of cations	Base saturation	pH
Profile No. 1—(D45 Mi 014—1 to 8):		*Inches*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*						*Percent*	
46244	A_{1p}	0–5	1.7	1.3	1.7	38.2	57.1	3.7	9.7	25.0	7.9	1.1	43.7	78	5.6
46245	A_{12}	5–10	1.0	1.3	1.8	34.1	61.8	2.8	10.3	23.8	8.0	.8	42.9	76	5.2
46246	A_{13}	10–16	1.2	1.6	2.2	37.5	57.5	2.5	13.9	19.1	7.5	.6	41.1	66	5.0
46247	C_{1g}	16–28	.4	.5	1.6	35.6	61.9	.9	11.7	20.0	9.7	.7	42.1	72	4.6
46248	C_g	28–34	.5	.7	2.9	37.1	58.8	.9	10.7	21.6	10.5	.7	43.5	75	4.8
46249	D_g	34–42	.7	.9	4.3	33.2	60.9	.9	9.4	21.8	10.5	.7	42.4	78	4.9
46250	D_g	42–49	.8	1.0	4.1	39.2	54.9	.7	6.4	21.7	10.1	.6	38.8	84	5.3
46251	D_g	49–55	.9	.7	2.4	43.9	52.1	.6	3.7	23.3	10.5	.5	38.0	90	6.1
Profile No. 2—(D45 Mi 017—1 to 6):															
46264	A_{1p}	0–4	1.3	1.5	2.5	34.4	60.3	2.5	7.6	25.9	9.2	1.1	43.8	83	5.9
46265	A_{1g}	4–8	1.1	1.0	1.5	31.8	64.6	2.2	7.1	28.0	9.8	.7	45.6	84	5.9
46266	A_{1g}	8–13	1.3	1.2	1.9	33.0	62.6	2.3	6.4	27.3	10.2	.6	44.5	86	5.9
46267	AC_g	13–17	2.7	1.7	1.8	35.0	58.8	1.6	7.7	25.6	10.2	.6	44.1	83	5.9
46268	C_{1g}	17–24	.3	.7	1.9	31.8	65.3	1.2	7.3	24.7	11.8	.6	44.4	84	5.6
46269	C_{2g}	24–42	.4	.6	1.6	35.6	61.8	1.2	7.3	23.3	11.9	.7	43.2	83	5.5
Profile No. 3—(D45 Mi 018—1 to 4):															
46270	A_{1p}	0–4	1.1	.9	.7	32.1	65.2	2.4	6.8	26.9	9.4	1.0	44.1	85	5.9
46271	A_{1g}	4–13	1.3	.8	.4	32.5	65.0	1.8	5.4	27.1	8.9	.7	42.1	87	6.2
46272	C_{1g}	13–23	1.1	1.0	.6	37.4	59.9	1.1	7.8	26.9	9.6	.6	44.9	83	5.6
46273	C_{2g}	23–36	.6	.7	.4	39.4	58.9	.5	8.2	19.6	11.3	.7	39.8	79	5.0

[1] Chemical data obtained by Fidelia Davol, Soil Survey Laboratory, Soil Conservation Service, Beltsville, Md.

[2] Very coarse sand, coarse sand, and medium sand are combined here because of the very small amounts of each.

[3] The content of organic matter was estimated by the hydrogen peroxide method (*5*).

Two profiles of Dubbs silt loam, and one of Dubbs loam, were described and sampled at different locations in Tunica County (*9*). The descriptions of the three profiles follow.

Profile No. 4—Dubbs silt loam (NW¼ sec. 6, T. 6 S., R. 11 W.):

A_p 0 to 4 inches, dark grayish-brown to dark yellowish-brown silt loam; moderate, medium, granular structure; very friable; abrupt boundary (furrow slice).

B_{21} 4 to 9 inches, variegated, dark yellowish-brown and dark-brown silty clay loam; strong, fine, subangular blocky structure; friable; crushed mass is yellowish brown; gradual boundary.

B_{22} 9 to 20 inches, variegated, dark yellowish-brown to yellowish-brown silt loam; moderate, medium and coarse, subangular blocky structure; lighter in color when crushed; friable; slightly plastic when wet; few, very fine, dark-brown concretions and yellowish-red specks inside peds; pinholes common; texture becomes coarser with increasing depth; gradual boundary.

B_3 20 to 30 inches, yellowish-brown loam with weak, coarse, irregular, blocky structure; some ped faces have dark yellowish-brown coatings; pinholes common; a few very dark brown streaks, which are former root channels; very friable; nonplastic; gradual boundary.

C_1 30 to 36 inches, yellowish-brown very fine sandy loam to loamy very fine sand; structureless; soft when dry, very friable when moist, nonplastic when wet; distinct boundary.

C_2 36 to 48 inches, light yellowish-brown very fine sandy loam; structureless; soft when dry, very friable when moist, nonplastic when wet; distinct boundary.

D 48 to 56 inches +, light yellowish-brown fine sandy loam with fine, light-gray and reddish-yellow flecks; structureless; loose when dry, nonplastic when wet.

Profile No. 5—Dubbs silt loam (SE¼NE¼ sec. 13, T. 6 S., R. 12 W.):

A_p 0 to 5 inches, grayish-brown to dark yellowish-brown silt loam; moderate, fine, granular structure; very friable; abrupt boundary (furrow slice).

B_{21} 5 to 11 inches, dark yellowish-brown clay loam; strong, medium, subangular blocky structure that crushes readily to mixture of moderate, fine, subangular blocks and moderate, medium granules; hard when dry, friable when moist, slightly plastic when wet; few pinholes; crushed mass is yellowish brown; gradual boundary.

B_{22} 11 to 14 inches, yellowish-brown, heavy loam; weak to moderate, coarse, irregular, blocky structure; peds have partial coatings of dark yellowish brown, and interiors have network of pinholes with very dark brown linings; hard when dry, friable when moist, slightly plastic when wet.

B_3 14 to 21 inches, light yellowish-brown very fine sandy loam; many, fine, faint, reddish-yellow mottles; weak, coarse, irregular, blocky structure; pinholes and very dark brown streaks common; gradual boundary.

C_{1g} 21 to 33 inches, mottled pale-yellow and reddish-yellow very fine sandy loam; many, fine, faint mottles; crushed mass appears light yellowish brown; structureless; soft when dry, very friable when moist; pinholes few to common; black and very dark brown, very fine, soft concretions common (2 per square inch); gradual boundary.

C_{2g} 33 to 60 inches +, mottled pale-yellow, reddish-yellow, and light-gray loam; many, fine, faint and distinct mottles; structureless; soft when dry, very friable when moist; few black and very dark brown, very fine concretions.

Profile No. 6—Dubbs loam (NE¼NW¼ sec. 17, T. 6 S., R. 11 W.):

A_p 0 to 5 inches, variegated dark yellowish-brown and dark grayish-brown loam; weak, fine, granular structure; very friable; abrupt boundary (furrow slice).

B_{21} 5 to 12 inches, variegated very dark brown and dark grayish-brown clay loam; strong, fine and medium, subangular blocky structure; lighter in color when crushed; hard when dry, firm when moist, slightly plastic when wet; pinholes common; gradual boundary.

B_{22} 12 to 19 inches, variegated yellowish-brown, dark yellowish-brown, and very dark brown sandy clay loam; strong, coarse, subangular blocky structure; peds have very dark brown coatings and yellowish-brown to dark yellowish-brown interiors marked by a network of pinholes with very dark brown linings; very hard when dry, firm when moist, slightly plastic when wet; gradual boundary.

B_3 19 to 26 inches, yellowish-brown very fine sandy loam; weak, coarse, irregular, blocky structure; peds have partial dark-brown coatings that fade in lower part; slightly hard when dry, very friable when moist, nonplastic when wet; gradual boundary.

C 26 to 36 inches, yellowish-brown loamy very fine sand with few dark-brown streaks; structureless; slightly hard when dry, very friable when moist, nonplastic when wet; gradual boundary.

D 36 to 60 inches +, light yellowish-brown very fine sand; structureless; loose.

Horizons in the Dubbs profiles are set apart by differences in one or more of the following: Color, texture, structure, and consistence. For example, the A horizon is darker than the B or C horizon but not much darker than the upper B horizon. The B horizon has finer texture, less friable consistence, and more distinct structure than the others. Clay films are also present on some ped faces and in pores of the B_2 horizon but are absent from the others. Even with differences in more than one property, however, the horizons are not yet distinct, except for the D horizons in profiles No. 4 and No. 6. The markedly different D horizons in those profiles reflect stratification of the alluvium rather than horizon development.

Some indication of normal ranges in horizon thickness, texture, structure, consistence, and the like is provided by the three profile descriptions. The thickness of solum, the combined A and B horizons, ranges from about 20 to 30 inches. The texture ranges from very fine sandy loam to silt loam in the A horizon and from clay loam to silty clay loam in the B horizon. The first and last of the three profiles are well drained, but slight restriction of drainage in the C horizon is evident in profile No. 5. In its natural drainage, this profile is marginal to the Dundee soils, although it lies within the permissible range of the Dubbs series.

Analytical data for the three Dubbs profiles are given in table 10. These data further characterize the soils and are consistent with the morphological features described in the field.

Few differences in the horizons are indicated by the laboratory data. The A horizon contains more organic matter than the B and C horizons, although the distinction between it and the upper B horizon is very slight. It seems certain that the original content of organic matter in the A horizon, especially in the upper part, has been lowered by cultivation of the soils. The B_2 horizon is sharply higher in clay than are the A and C horizons. This difference may be caused, in part, by stratification.

The relative proportions of fine sand, very fine sand, and silt change from one horizon to another. The shifts in relative amounts of the three size fractions suggest stratification of the sediments that now comprise the soil profile. Present distribution of clay in the profiles may, therefore, be more the result of original differences than of horizon differentiation. Despite that probability, the presence of clay films on ped faces and in pores of the B_2 horizon demonstrates some movement of silicate clay

TABLE 10.—*Laboratory analyses for two soils*

[Analyses by Soil Survey Laboratory, Soil Conservation Service, Beltsville, Md.]

Profile and laboratory number	Horizon	Depth	Mechanical separates						Organic matter [3]	Exchangeable cations [1]				Sum of cations	Base saturation	pH
			Very coarse sand and coarse sand [2]	Medium sand	Fine sand	Very fine sand	Silt	Clay		H	Ca	Mg	K			
Profile No. 4—Dubbs silt loam (D44 Mi 001—1 to 7):		*Inches*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*						*Percent*	
D4354	A_p	0–4	0. 2	0. 2	1. 2	13. 6	65. 5	19. 3	1. 5	3. 3	12. 0	2. 1	1. 05	18. 4	82	6. 6
D4355	B_{21}	4–9	. 1	. 1	. 6	13. 3	54. 8	31. 1	1. 2	5. 9	15. 9	3. 1	. 92	25. 8	77	6. 2
D4356	B_{22}	9–20	. 1	. 1	. 5	20. 3	54. 1	24. 9	. 8	6. 6	11. 9	2. 7	. 53	21. 7	70	5. 4
D4357	B_3	20–30	. 1	. 1	1. 1	42. 2	39. 2	17. 3	. 5	5. 1	8. 6	2. 1	. 46	16. 3	68	5. 3
D4358	C_1	30–36	. 1	. 1	2. 3	54. 1	32. 9	10. 5	. 3	3. 5	6. 6	1. 6	. 31	12. 0	71	5. 5
D4359	C_2	36–48	. 2	. 1	1. 4	43. 8	42. 2	12. 3	. 3	4. 1	7. 5	1. 9	. 43	13. 9	71	5. 3
D4360	D	48–57	. 1	. 1	2. 9	60. 3	29. 1	7. 5	. 1	2. 9	5. 7	1. 5	. 47	10. 6	72	5. 3
Profile No. 5—Dubbs silt loam (D44 Mi 004—1 to 6):																
D4373	A_p	0–5	. 4	. 6	3. 2	25. 2	55. 5	15. 1	1. 0	4. 2	8. 0	1. 8	. 78	14. 8	72	6. 2
D4374	B_{21}	5–11	. 1	. 1	. 7	28. 0	42. 6	28. 5	. 7	10. 7	8. 2	3. 2	. 53	22. 6	53	4. 6
D4375	B_{22}	11–14	. 1	. 1	1. 0	36. 0	38. 4	24. 4	. 6	9. 4	7. 7	3. 0	. 40	20. 5	54	4. 7
D4376	B_3	14–21	. 1	. 1	1. 6	49. 5	31. 9	16. 8	. 2	9. 1	6. 1	2. 9	. 35	18. 4	50	4. 8
D4377	C_{1g}	21–33	. 2	. 2	1. 1	42. 4	39. 6	16. 5	. 2	4. 9	7. 3	2. 9	. 43	15. 5	68	5. 0
D4378	C_{2g}	33–60	. 2	. 2	. 9	45. 4	40. 4	12. 9	. 0	3. 2	7. 8	2. 6	. 35	14. 0	77	5. 4
Profile No. 6—Dubbs very fine sandy loam (D44 Mi 001—1 to 6):																
D4367	A_p	0–5	. 3	. 2	3. 5	33. 5	46. 2	16. 3	1. 7	5. 2	7. 2	1. 6	. 60	14. 6	64	5. 4
D4368	B_{21}	5–12	. 1	. 1	1. 2	25. 2	38. 2	35. 2	1. 6	11. 6	9. 2	2. 3	. 43	23. 5	51	4. 6
D4369	B_{22}	12–19	. 0	. 0	1. 6	46. 7	25. 3	26. 4	1. 3	10. 7	8. 4	2. 5	. 33	21. 9	51	4. 8
D4370	B_3	19–26	. 1	. 1	2. 7	65. 3	15. 0	16. 8	. 7	6. 7	6. 1	2. 0	. 28	15. 1	56	4. 9
D4371	C	26–36	. 0	. 0	13. 7	70. 2	8. 7	7. 4	. 2	2. 9	3. 9	1. 2	. 21	8. 2	65	5. 2
D4372	D	36–60	. 0	. 0	42. 2	49. 9	5. 2	2. 7	. 0	1. 6	3. 1	. 8	. 21	5. 7	72	5. 8

[1] Chemical data obtained by Fidelia Davol, Soil Survey Laboratory, Soil Conservation Service, Beltsville, Md.

[2] Very coarse sand and coarse sand are combined here because of the very small amounts of each.

[3] The content of organic matter was estimated by the hydrogen peroxide method (*5*).

minerals downward from the A horizon. Base status is high throughout the profiles, and calcium is dominant among the exchangeable cations. This is further evidence of limited weathering and is consistent with the low degree of horizon differentiation.

Lack of distinct horizons in the Dubbs soils seems to be caused largely by their youth. Carbonates and salts have been completely removed from the solum, and leaching has also replaced some of the exchangeable bases with hydrogen. Organic matter has accumulated in the upper horizons, no doubt originally in larger amounts than are now present. Some translocation of silicate clay minerals has taken place, but this process is in very early stages. As time passes, the differentiation of horizons may be expected to continue.

Robinsonville very fine sandy loam.—The accumulation of organic matter in the upper profile has been solely responsible for the very slight horizonation in some soils of Washington County, for example, Robinsonville very fine sandy loam. This soil, like others on recent sediments, is in the first stages of formation. The total extent of this soil, and of others like it, is very small.

Profile No. 7—Robinsonville very fine sandy loam, near the bridge that crosses the Mississippi River between Greenville in this county and Lake Village in Arkansas:

A_p 0 to 6 inches, yellowish-brown (10YR 5/4) very fine sandy loam; loose when moist; structureless; neutral; abrupt boundary.

A_1 6 to 9 inches, brown (10YR 5/3) silt loam; very friable when moist; structureless; neutral; clear boundary.

AC 9 to 13 inches, pale-brown (10YR 6/3) very fine sandy loam; loose when moist; structureless; neutral; gradual boundary.

C_1 13 to 22 inches, dark-brown (10YR 4/3) silt loam; very friable when moist; structureless; neutral; clear boundary.

C_2 22 to 32 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; loose when moist; structureless; neutral; gradual boundary.

C_3 32 to 37 inches, dark yellowish-brown (10YR 4/4) silt loam; very friable when moist; structureless; neutral; gradual boundary.

C_4 37 to 54 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; loose when moist; structureless; mildly alkaline.

A question may be raised about the recognition of horizons in Robinsonville profiles, especially when the full range of the series is considered. In the profile just described, the surface layer is a disturbed layer and seems to have more organic matter than the deeper horizons. Hence, it is identified as an A_p horizon. The profile is stratified with layers of silt loam and very fine sandy loam. The silt loam layers seem to have retained more organic matter than the very fine sandy loam layers.

Within the range of the Robinsonville series are other profiles that are essentially uniform in color throughout. These profiles may be considered as having no more than a C horizon. They comprise materials from which soils are being formed. Some carbonates and salts have been leached from these profiles, but some also remain. Robinsonville very fine sandy loam, as before mentioned, represents a group of well-drained soils in which horizon differentiation is just beginning.

Commerce very fine sandy loam.—This soil is representative of those soils in the first stages of horizon development that are wet at least part of the time. Their morphology reflects this wetness, although the degree of horizon differentiation parallels that of Robinsonville very fine sandy loam.

Profile No. 8—Commerce very fine sandy loam, near the bridge that crosses the Mississippi River between Greenville in this county and Lake Village in Arkansas:

A_p 0 to 5 inches, pale-brown (10YR 6/3) very fine sandy loam; loose when moist; structureless; neutral to mildly alkaline; abrupt boundary.

AC 5 to 18 inches, grayish-brown (10YR 5/2) silt loam; few, fine, faint mottles of brown (10YR 5/3); very friable when moist; structureless to very weak, subangular blocky structure; mildly alkaline; gradual boundary.

C_1 18 to 41 inches, grayish-brown (10YR 5/2) very fine sandy loam; common, fine, distinct mottles of brown (10YR 5/3) and dark brown (10YR) 4/3; very friable when moist; structureless; mildly alkaline; gradual boundary.

C_2 41 to 48 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); very friable when moist; structureless; mildly alkaline.

In the profile of Commerce very fine sandy loam, as in that of Robinsonville very fine sandy loam, horizon differentiation is in the very early stages. In the range of the Commerce series, organic matter has accumulated in the surface layer to form an incipient A_p horizon. In this respect Commerce and Robinsonville soils are much alike. Because of the wetness of the Commerce soils, some reduction of iron has also occurred in the profile, as is evidenced by the mottling.

Because Commerce soil is in the early stages of formation, the need for recognition of horizons in the profile may be questioned. The A_p horizon is incipient, and the leaching of carbonates and salts has not progressed far. Mottled patterns of colors can develop in soils within a few years. It is clear that horizon differentiation in Commerce very fine sandy loam, as in Robinsonville very fine sandy loam, has made little progress and is yet in the earliest stages. The horizons barely qualify for recognition and are very faint at best.

Classification of Soils by Higher Categories

Soils are placed in narrow classes for the organization and application of knowledge about their behavior within farms or counties. They are placed in broad classes for study and comparisons of large areas, such as continents. In the comprehensive system of soil classification followed in the United States (*3*), the soils are placed in six categories, one above the other. Beginning at the top, the six categories are the order, suborder, great soil group, family, series, and type.

In the highest category the soils of the whole country are placed in three orders, whereas thousands of soil types are recognized in the lowest category. The suborder and family categories have never been fully developed and thus have been little used. Attention has largely been given to the classification of soils by soil types and series, within counties or comparable areas, and to the subsequent grouping of series into great soil groups and orders.

The nature of the soil series and soil type is discussed in the section, Soils of the County. Subdivisions of soil types into phases, so as to provide finer distinctions significant to soil use and management, are also discussed in that section. The soil series of the county are grouped by orders and great soil groups as shown in table 11.

TABLE 11.—*Classification of soils by higher categories and some of the factors contributing to their morphology*

ZONAL SOILS

Great soil group and soil series	Profile description [1]	Position	Drainage	Slope range	Parent material
Gray-Brown Podzolic:				*Percent*	
Bosket	Dark grayish-brown very fine sandy loam surface soil over a dark-brown silty clay loam subsoil underlain by friable sandy loam.	Old natural levees.	Well drained to somewhat excessively drained.	½ to 5	Medium-textured sediments from the Mississippi River.
Dubbs	Grayish-brown very fine sandy loam or silt loam surface soil over a brown silty clay loam subsoil underlain by very fine sandy loam or silt loam.	Old natural levees.	Moderately well drained to well drained.	½ to 2	Medium-textured alluvium from the Mississippi River.
Dundee	Grayish-brown to dark-brown very fine sandy loam to silty clay surface soil over mottled, grayish-brown silt loam to silty clay underlain by grayish-brown silt loam to very fine sandy loam.	Old natural levees	Somewhat poorly drained to moderately well drained.	½ to 8	Medium- and fine-textured sediments from the Mississippi River.
Pearson	Light yellowish-brown silt loam surface soil over a mottled, yellowish-brown silt loam or silty clay loam subsoil.	Old natural levees.	Moderately well drained	½ to 2	Loessal alluvium.

INTRAZONAL SOILS

Great soil group and soil series	Profile description [1]	Position	Drainage	Slope range	Parent material
Low-Humic Gley:					
Alligator	Light brownish-gray clay or silty clay loam surface soil over a mottled, gray clay subsoil.	Slack-water areas.	Poor	0 to 5	Fine-textured sediments from the Mississippi River.
Dowling	Very dark gray clay surface soil over a dark gray, mottled clay subsoil.	Depressions	Poor	0 to 2	Slack-water deposits.
Forestdale	Light brownish-gray silt loam or silty clay loam surface soil over a mottled, grayish-brown silty clay subsoil underlain by light-gray silty clay loam at about 24 inches.	Old natural levees.	Poorly drained to somewhat poorly drained.	½ to 5	Fine textured to moderately fine textured alluvium from the Mississippi River.
Mhoon	Very dark grayish-brown silty clay loam surface soil over a dark yellowish-brown, gray-mottled silt loam or silty clay loam subsoil.	Recent natural levees.	Poorly drained to somewhat poorly drained.	½ to 2	Moderately fine textured alluvium from the Mississippi River.
Grumusols:					
Sharkey	Dark grayish-brown clay surface soil underlain at about 5 inches by very dark gray to dark gray clay.	Slack-water areas.	Poorly drained	0 to 5	Fine-textured alluvium from the Mississippi River.

Alluvial soils:					
Bowdre	Very dark grayish-brown silty clay surface soil and subsoil underlain at 10 to 20 inches by silty clay loam to loamy sand.	Slack-water clay areas.	Moderately well drained	½ to 2	Fine-textured sediments from the Mississippi River over coarser textured material.
Commerce	Pale-brown silt loam surface soil underlain at about 5 inches by mottled, grayish-brown silt loam.	Recent natural levees.	Somewhat poorly drained to moderately well drained.	½ to 2	Medium-textured sediments from the Mississippi River.
Crevasse	Yellowish-brown sandy loam or loamy sand underlain at about 10 inches by yellowish-brown loamy sand.	Recent natural levees.	Excessively drained	½ to 2	Coarse-textured alluvium from the Mississippi River.
Robinsonville	Brown very fine sandy loam surface soil underlain at about 6 inches by yellowish-brown to brown very fine sandy loam or silt loam.	Recent natural levees.	Moderately well drained to to well drained.	½ to 2	Moderately coarse textured sediments from the Mississippi River.
Souva	Dark grayish-brown to dark yellowish-brown silt loam surface soil over a mottled, grayish-brown silty clay loam subsoil that becomes grayer with depth.	Depressions	Somewhat poorly drained	0 to 2	Medium-textured local alluvium.
Tunica	Very dark grayish-brown clay surface soil overlying a dark gray clay subsoil. Coarser textured material is at depths of from 20 to 30 inches.	Slack-water areas.	Somewhat poorly drained	½ to 5	Fine-textured alluvium from the Mississippi River over coarser textured material.
Regosols:					
Beulah	Dark grayish-brown very fine sandy loam surface soil over a yellowish-brown sandy loam subsoil.	Old natural levees.	Somewhat excessively drained	½ to 5	Moderately coarse textured alluvium from the Mississippi River.

[1] These descriptions are of soil profiles not materially affected by accelerated erosion.

Soil orders and great soil groups

In the highest category of the classification scheme are the zonal, intrazonal, and azonal orders (*3*). The zonal order consists of soils with evident, genetically related horizons that reflect the predominant influence of climate and living organisms in their formation. In the intrazonal order are soils with evident, genetically related horizons that reflect the dominant influence of a local factor of topography or parent materials, over the effects of climate and living organisms. The azonal order consists of soils that lack distinct, genetically related horizons, commonly because of youth, resistant parent material, or steep topography.

ZONAL SOILS

Among the soils of Washington County, the Bosket, Dubbs, Dundee, and Pearson may be considered zonal soils. The horizons in these soils are evident but more nearly faint than distinct. The horizons are genetically related and seem to reflect the influence of climate and living organisms, although the effect of time is also important. The four series are considered to fall barely within the zonal order and may be looked upon as intergrades to the azonal order.

The Bosket, Dubbs, Dundee, and Pearson soils are tentatively classified in the Gray-Brown Podzolic group, although there is evidence for placing the Bosket, Dubbs, and Dundee soils in the Prairie group as well. Gray-Brown Podzolic soils have thin, dark A_1 horizons over light brownish-gray and often platy A_2 horizons. The A_2 horizons are underlain by brown to yellowish-brown, finer textured B horizons that grade into lighter colored and usually coarser textured C horizons.

Prairie soils, in contrast, have thick, dark grayish-brown to very dark brown A_1 horizons grading to brownish B horizons, which may be mottled. The B horizons grade, in turn, into lighter colored and usually coarser textured C horizons. Both great soil groups normally occur under humid, cool-temperate climates, the Gray-Brown Podzolic under deciduous forest (*4*) and the Prairie under tall grasses.

The Bosket, Dubbs, Dundee, and Pearson soils lack a distinct A_2 horizon, but all areas of the soils have been disturbed through cultivation. Consequently, it seems highly probable that the plow layer now includes former thin A_1 and A_2 horizons. The soils clearly lack thick, dark A_1 horizons and do not appear to have had them in the past.

The present character of the B horizon, using the Dundee profile as an example, would permit classification of the soils in either of the two great soil groups. The apparent absence of a thick A_1 horizon, and the probability that the A_1 and A_2 horizons have been mixed by plowing, is used as a basis for placing the soils in the Gray-Brown Podzolic group. It should be recognized, however, that the Bosket, Dubbs, and Dundee soils are intergrades to the Prairie soils, and that they are almost as much like them as they are like the central members of the Gray-Brown Podzolic group.

INTRAZONAL SOILS

Soils of the intrazonal order are by far the most extensive in Washington County. In this order are the Alligator, Dowling, Forestdale, Mhoon, and Sharkey soils. All of these are either poorly drained or somewhat poorly drained. None seem to have distinct horizons, although they show the effects of gleying and accumulation of organic matter in their morphology. These soils either are members of or are closely related to hydromorphic groups. The absence of a thick A_1 horizon high in organic matter is used as a basis for excluding these soils from the Humic Gley group (*7*). Alligator, Dowling, Forestdale, and Mhoon soils seem more appropriately classified as Low-Humic Gley soils (*7*). The Sharkey soils exhibit properties of churning through shrinking, swelling, and cracking and are, therefore, tentatively classified as Grumusols (*4*).

Recognition of the Low-Humic Gley group was proposed initially for somewhat poorly drained to poorly drained soils lacking prominent A_1 horizons but having strongly gleyed B and C horizons with little textural differentiation. The recognition of two great soil groups, Low-Humic Gley and Humic Gley (Wiesenboden) soils, was based on thickness of the A horizon and on its content of organic matter.

Humic Gley soils are defined as high in organic matter, whereas Low-Humic Gley soils are moderate to low. The Alligator, Dowling, Forestdale, and Mhoon soils are not high in organic matter, and they do show effects of gleying in their morphology. Beyond that, there is less evidence of cracking and churning in these soils than in the Sharkey soils, which have been classed as Grumusols. On the basis of present knowledge, classification of the Alligator, Dowling, Forestdale, and Mhoon soils as Low-Humic Gley soils seems appropriate.

Recognition of Grumusols was proposed (*4*) for a group of soils dominated by montmorillonitic clays. These soils are typically clay in texture. They lack eluvial and illuvial horizons, have moderate to strong granular structure in the upper horizons, and have high coefficients of expansion and contraction upon wetting and drying. Calcium and magnesium are dominant in their exchange complex. With their high coefficients of expansion and contraction, the Grumusols shrink and swell markedly with changes in moisture content. In the process of shrinking and swelling, the soils crack and materials from upper horizons drop down into lower ones. Thus, the soils are being churned or mixed continually, a process that partially offsets horizon differentiation.

Grumusols may have prominent A_1 horizons but lack B horizons. They have dull colors of low chroma, as a rule, and are not well drained. The Sharkey soils have many of the features common to Grumusols. The profiles have a clay texture throughout, and the clay is dominantly montmorillonitic. The soils have dark A_1 horizons plus evidence of gleying in the deeper horizons, which suggests placement of the series in the Humic Gley group. Laboratory analyses, however, indicate that the content of organic matter in the A_1 horizon (taking Sharkey clay as an example) is appreciably lower than that normal to Humic Gley soils and more nearly comparable to that of typical Grumusols. Furthermore, the dark A_1 horizon is also common to many Grumusols. Consequently, the Sharkey soils are tentatively classified as Grumusols, which intergrade to the Low-Humic Gley soils. They seem more poorly drained than is typical of Grumusols, but they are not too wet for operation of the churning and mixing process.

AZONAL SOILS

Despite the fact that the whole area consists of geologically recent alluvium, azonal soils are less extensive in Washington County than either the zonal or intrazonal soils. At the same time, all soils classified in the zonal and intrazonal orders are marginal to the azonal order because of their low degree of horizonation. Only the soils that lack genetically related horizons or that are in the initial stages of horizon differentiation are placed in the azonal order. Bowdre, Commerce, Crevasse, Robinsonville, Souva, Tunica, and Beulah soils are in the azonal order. All except the Beulah are classed as Alluvial soils, although some exhibit effects of gleying.

The Souva soils are somewhat poorly drained. Their morphology shows that some reduction and transfer of iron has occurred. Even so, the horizons are faint at best and, in some profiles, all but lacking. Consequently, the soils are considered wet Alluvial soils rather than Low-Humic Gley. Unless drainage is greatly improved in the future, Souva soils can be expected to develop into a Low-Humic Gley as horizon differentiation continues.

The Alluvial soils in Washington County lack distinct horizons because the sediments in which they are developing are so young. Given more time under natural conditions, most of these soils would eventually have profiles similar to those of the Dubbs, Dundee, and Bosket series. Whether that will now occur in soils under cultivation remains to be seen. The regime in which the soils now exist differs greatly from that of their original natural environment. Some of the processes important in horizon differentiation probably will be accentuated and others subdued. Some may progress more rapidly, and others more slowly. The net effect of the change in environment on future development of the soils cannot be forecast, as yet, with any certainty, and may not be apparent for some centuries.

Additional Facts About the County

This section is provided primarily for those who are not familiar with Washington County. It gives some general information about the natural resources, transportation, public facilities, industry, and agriculture of the county.

Settlement and Population

Washington County was created by the Mississippi State legislature in 1827 and was named for George Washington. The county was formed from part of the land bought from the Choctaw Indians in 1820. New counties were formed as population increased, and Washington County was divided. It now has less than half of its original acreage.

Before the pioneers settled the county, the Indians gained a living by hunting, fishing, and practicing a primitive kind of farming. For protection from high water during spring, they built mounds for their homes and burial grounds. Many of these mounds are on choice farming land on the old natural levees.

The first settlers made their homes near Lake Washington and along Deer Creek. They established the towns of Princeton, Mexico City, and Bachelors Bend, none of which now exist. Princeton, which was located on the Mississippi River, was the first seat of government. In 1846 the seat was moved to old Greenville, which was destroyed during the Civil War. In 1865 the present county seat was established at Greenville, just north of the old town.

In 1950 the population of Washington County was 70,504. By 1954 it had increased 2.7 percent. Incorporated cities are Greenville (population about 30,000), Leland, Arcola, and Hollandale. Other important trade centers or communities are Winterville, Priscilla, Metcalfe, Dunleith, Stoneville, Wayside, Estill, Avon, Tribbett, Tralake, Darlove, Chatham, Glen Allan, and Murphy.

Drainage and Water Supply

The Mississippi River runs along most of the western side of the county. Black Bayou is also in the western part, and Deer Creek winds through the central part. The Bogue Phalia River is in the eastern part, and the Big Sunflower River, in the extreme southeastern part. The Bogue Phalia River and Black Bayou drain most of the county. Three large lakes and several small lakes are in the county. The three large lakes are Lake Washington, Lake Lee, and Lake Ferguson.

Deep wells supply water for most of the towns; shallow wells furnish most of the water for rural household use and for livestock and irrigation.

Schools, Churches, and Parks

Consolidated schools throughout the county provide education for all communities. Most denominations have churches in the county. At Leroy Percy State Park and other parks, swimming pools, lakes, and other recreational facilities are available.

Transportation

United States Highway No. 61 runs north and south through the county, and United States Highway No. 82 runs east and west. State Highway No. 1 passes north and south through the western part of the county. Other State highways and farm-to-market roads are numerous. Most of the county is accessible by highways or by graveled roads.

Two railroads serve the county. The Yazoo and Mississippi Valley Railroad, a part of the Illinois Central system, runs parallel to United States Highway No. 61 and gives access to northern and southern markets. The Columbus and Greenville Railway, parallel to United States Highway No. 82, runs east to west through Greenville. An airline makes two stops daily in Greenville, one en route north, and one south.

The Mississippi River is one of the main means of freight transportation in the county.

Industries

A number of industries, most of them in Greenville, employ from 2 to 700 people. The largest sources of industrial employment in Greenville are a rug and carpet factory, a plant making insulation board and wallboard, and a poultry-processing plant. Several firms produce soft drinks, bakery goods, dairy products, meat products, livestock feeds, cottonseed and soybean products, concrete, plastic containers, sand and gravel, insecticides, fertilizer, and other products. Other companies do cotton ginning, printing, metal working, boat and barge building, and laboratory testing.

Agriculture

Most of the early settlers in Washington County were farmers. Cotton was the principal crop, and, therefore, some of the early settlers were cotton buyers and riverboat owners.

Government restrictions on acreage of cotton, beginning in 1934, have affected the agricultural pattern. Growing of crops other than cotton and raising of livestock have increased. The county is still largely agricultural, but many farm workers have left the farms to work in industry. Following are some statistics on agriculture taken from reports by the United States Bureau of the Census.

Land use.—In 1954 Washington County had 4,348 farms. The approximate total land area of the county was 465,920 acres, of which 378,791 acres, or 81.3 percent, was land in farms.

Type, size, and tenure of farms.—In 1954 there were fewer cotton farms than in 1950, but cotton farms still far outnumbered farms of other types. The farms of the county are listed by type as follows:

	1954
Cotton	3,831
Cash-grain	117
Livestock other than dairy and poultry	40
Dairy	11
Vegetable	5
General farms	29
Miscellaneous and unclassified	314

In 1954 the average farm contained 87.1 acres, as compared to 66.7 acres in 1950. Since 1950 there has been an increase in number of farms 1,000 acres or more in size, a slight increase in number of farms covering less than 10 acres, and a definite decrease in the number of farms 10 to 999 acres in size.

Size of farms:	*1950*	*1954*
Under 10 acres	1,415	1,431
10 to 99 acres	3,809	2,442
100 to 999 acres	430	378
1,000 acres and over	76	97

Most of the farms in the county are worked by tenants. The following list shows number of farms operated by owners, tenants, and managers in 1950 and 1954.

Tenure of operator:	*1950*	*1954*
Tenants	4,657	3,422
Full owners	817	683
Part owners	200	218
Managers	56	25

Crops and livestock.—Between 1949 and 1954, the acreage planted to cotton decreased approximately 38 percent, the acreage in corn decreased by about 61 percent, the acreage in soybeans increased by about 77 percent, and the acreage in oats increased by about 72 percent. In 1954, for the first time, the census reported figures for rice production. Comparisons of 1949 and 1954 acreages in crops do not necessarily indicate trends, for the acreage in a given crop fluctuates from year to year. Acreages of principal crops are shown in table 12 for 1949 and 1954.

TABLE 12.—*Acreages of principal crops*

Crop	1949	1954
Cotton harvested	162, 166	100, 838
Soybeans harvested for beans, grown alone	9, 993	43, 684
Oats threshed or combined	12, 843	45, 660
Corn for all purposes	28, 989	11, 206
Rice threshed or combined	(1)	13, 430
Hay total	17, 426	11, 029
Lespedeza cut for hay	10, 707	4, 195
Small grains cut for hay	531	1, 158
Other hay cut	6, 188	5, 676

[1] Not reported.

Between 1950 and 1954, the number of cattle on farms more than doubled, and the number of sheep increased. In contrast, there were only about half as many swine and horses and mules on the farms in 1954 as there were in 1950 (table 13).

TABLE 13.—*Number of livestock on farms, in stated years*

Livestock	1950	1954
Cattle and calves	15, 097	31, 533
Horses and mules	5, 361	2, 034
Hogs and pigs	17, 310	9, 020
Sheep and lambs	3, 855	5, 987
Chickens, 4 months old and over	85, 543	72, 771

Use of fertilizer.—In 1954 farmers in the county applied 782 tons of commercial fertilizer to 11,262 acres of hay and cropland pasture; 285 tons to 4,490 acres of other pasture; 1,018 tons to 9,419 acres of corn; and 11,290 tons to 100,303 acres of cotton.

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Glossary

Acidity. (*See* Reaction.)

Aggregate (of soil). Many fine soil particles held in a single mass or cluster, such as a clod, crumb, block, or prism. Many properties of the aggregate differ from those of an equal mass of unaggregated soil.

Alluvium. Sand, silt, clay, or other sediments deposited on land by streams.

Available water-holding capacity. (*See* Water-holding capacity.)

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that contains 40 percent or more of clay, less than 45 percent of sand, and less than 40 percent of silt.

Consistence, soil. The attributes of soil material that are expressed by the degree and kind of cohesion and adhesion or by the resistance to deformation or rupture. Terms commonly used to describe consistence are *brittle, compact, firm, friable, plastic, sticky, stiff,* and *tight.*

Contour tillage. Furrows plowed at right angles to the direction of slope, at the same level throughout, and ordinarily at comparatively close intervals.

Cropland. Land regularly used for crops, except forest crops. Cropland includes rotation pasture, cultivated summer fallow, or other land ordinarily used for crops but temporarily idle.

Crumb (structure). Generally soft, small, porous aggregates, irregular but tending toward a spherical shape, as in the A_1 horizons of many soils. Crumb structure is closely related to granular structure. (*See* Structure, soil.)

Depressional soils. Soils that occupy low or depressed areas in old stream runs or in similar positions.

Erosion, soil. The wearing away or removal of soil material by water or wind.

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

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Forest land. Land not in farms that bears a stand of trees of any age or stature, including seedlings, and of species that attain a minimum average height of 6 feet at maturity.

Genesis, soil. The mode of origin of the soil. Soil genesis refers particularly to the processes causing the development of the solum (horizons A and B) from the unconsolidated parent materials. (*See* Horizon, soil.)

Granular (structure). Roughly spherical, firm, small aggregates that may be either hard or soft; aggregates generally more firm than those having crumb structure, and without the distinct faces of those having blocky structure. (*See* Structure, soil.)

Great soil group. Any one of several broad groups of soils that have fundamental characteristics in common.

Horizon, soil. A layer of soil, approximately parallel to the soil surface, that has distinct characteristics produced by soil-forming processes.

Horizon A. The master horizon consisting of (1) one or more mineral horizons of maximum organic accumulation; or (2) surface or subsurface horizons that are lighter in color than the underlying horizon and that have lost clay minerals, iron, and aluminum with resultant concentration of the more resistant minerals; or (3) horizons belonging to both of these categories.

Horizon B. The master horizon of altered material characterized by (1) an accumulation of clay, iron, or aluminum, with accessory organic material; or (2) more or less blocky or prismatic structure together with other characteristics, such as stronger colors, unlike those of the A horizons or the underlying horizons of nearly unchanged material; or (3) characteristics of both these categories. Commonly, the lower limit of the B horizon corresponds to the lower limit of the solum.

Horizon C. A layer of unconsolidated material, relatively little affected by the influence of organisms and, in chemical, physical, and mineralogical composition, presumed to be similar to the material from which at least a part of the overlying solum has developed.

Horizon D. Any stratum underlying the C, or the B if no C is present, which is unlike the C, or unlike the material from which the solum has formed.

Idle land. Land capable of producing crops but not now being used.

Internal drainage. The movement of water through the soil profile. The rate of movement is affected by the texture of the surface soil and subsoil, and by the height of the ground water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Leaching, soil. The removal of materials in solution by percolating water.

Low bottoms. (*See* Slack-water soils.)

Mapping unit. Any soil or miscellaneous land type shown on the detailed soil map and identified by a letter symbol.

Massive. Large uniform masses of cohesive soil, sometimes with ill-defined and irregular breakage, as in some of the fine-textured alluvial soils; structureless. (*See* Structure, soil.)

Morphology, soil. The physical constitution of the soil, including the texture, structure, consistence, color, and other physical and chemical properties of the soil horizons that make up the soil profile.

Mottled (or Mottling). Contrasting color patches, usually associated with poor drainage. Descriptive terms for mottles follow: Contrast—*faint, distinct,* and *prominent;* abundance—*few, common,* and *many;* and size—*fine, medium,* and *coarse.* The size measurements are as follows: *Fine,* commonly less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* commonly ranging between 5 and 15 millimeters (about 0.2 to 0.6 inch) along the greatest dimension; and *coarse,* commonly more than 15 millimeters (about 0.6 inch) along the greatest dimension.

Natural drainage. Kind of drainage that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by natural deepening of channels, or by blocking of drainage outlets and by other factors. The following relative terms are used to express natural drainage: *Excessively drained, somewhat excessively drained, well drained, moderately well drained, imperfectly* or *somewhat poorly drained, poorly drained,* and *very poorly drained.*

Natural levee. The higher land adjacent to streams where the coarse- and medium-textured sediments have settled out of suspension.

Normal soil. A soil having a profile in near-equilibrium with its environment; developed under good but not excessive drainage from parent material of mixed mineral, physical, and chemical composition; and expressing in its characteristics the full effects of the forces of climate and living matter.

Nutrients, plant. The elements taken in by a plant, essential to its growth, and used by it in the elaboration of its food and tissue. Essential nutrients include nitrogen, phosphorus, calcium, potassium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps others obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Parent material. The unconsolidated mass from which the soil profile develops. (*See* Horizon C; Profile, soil; Substratum.)

Pastureland. Land used primarily for grazing.

Permeability, soil. That quality of the soil that enables it to transmit water or air.

Phase, soil. A subdivision of the soil type covering variations chiefly in such external characteristics as relief, stoniness, or accelerated erosion.

Plowsole. A compacted layer, several inches thick, just beneath the A_p horizon. A plowsole is believed to be caused by tillage implements that regularly reach to the same depth.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. (*See* Horizon, soil; Parent material.)

Reaction, soil. The degree of acidity or alkalinity of the soil mass, expressed in either words or in pH values, as follows:

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

Sand. Individual rock or mineral fragments 0.05 to 2.0 millimeters in diameter. Usually sand grains consist chiefly of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more of sand and not more than 10 percent of clay.

Series, soil. A group of soils having the same profile characteristics; the same general range in color, structure, consistence, and sequence of horizons; the same general conditions of relief and drainage; and, usually, a common or similar origin and mode of formation. A group of soil types that are similar in all respects, except for the texture of the surface soil.

Silt. (1) Individual mineral particles of soil that range in diameter between the upper size of clay, 0.002 millimeter, and the lower size of very fine sand, 0.05 millimeter. (2) Soils of this textural class contain 80 percent or more of silt and less than 12 percent of clay. (3) Sediments deposited from water in which the individual grains are approximately of the size of silt, although the term is sometimes applied loosely to sediments containing considerable sand and clay.

Single grain. A structureless soil in which each particle exists separately, as in sand. (*See* Structure, soil.)

Slack-water soils. Areas in low bottoms where the clay sediments in the backwaters from streams have dropped out of suspension.

Soil. The natural medium for the growth of land plants. Soil is composed of organic and mineral materials.

Structure, soil. The arrangement of the individual grains and aggregates that make up the soil mass; refers to both the natural arrangement of the particles when in place and undisturbed or their arrangement at any degree of disturbance.

Subsoil. That part of the soil profile commonly below plow depth and above the parent material. (*See* Horizon B.)

Substratum. Any layer lying beneath the solum, or true soil; applies to the parent materials or to layers unlike the parent material that are below the B horizon, or subsoil.

Surface runoff. The amount of water removed by flow over the surface of the soil. The amount and rapidity of surface runoff are affected by factors such as texture, structure, and porosity of the surface soil; the plant cover; the prevailing climate; and the slope. Degree of surface runoff is expressed by the terms *very rapid, rapid, medium, slow, very slow,* and *ponded.*

Surface soil. That part of the soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. (*See* Horizon A.)

Terrace (geological). An old alluvial plain, generally flat or smooth, that borders a stream or lake; frequently called a second bottom, as contrasted to a flood plain; seldom subject to overflow.

Texture, soil. The relative proportions of sand, silt, and clay particles in the soil mass. A coarse-textured soil contains much sand, a fine-textured one, a large proportion of clay. (*See* Sand; Silt; Clay.)

Type, soil. A group of soils having genetic horizons similar as to differentiating characteristics, including texture and arrangement in the soil profile, and developed from a particular kind of parent material.

Water-holding capacity. In this report, water-holding capacity is interchangeably termed "moisture-holding capacity," "available water-holding capacity," "available water," and "available moisture-holding capacity." The meaning of all terms is the same—the amount of moisture a soil holds that roots can withdraw. In this report, the water-holding capacity of the soils is expressed in relative terms as follows:

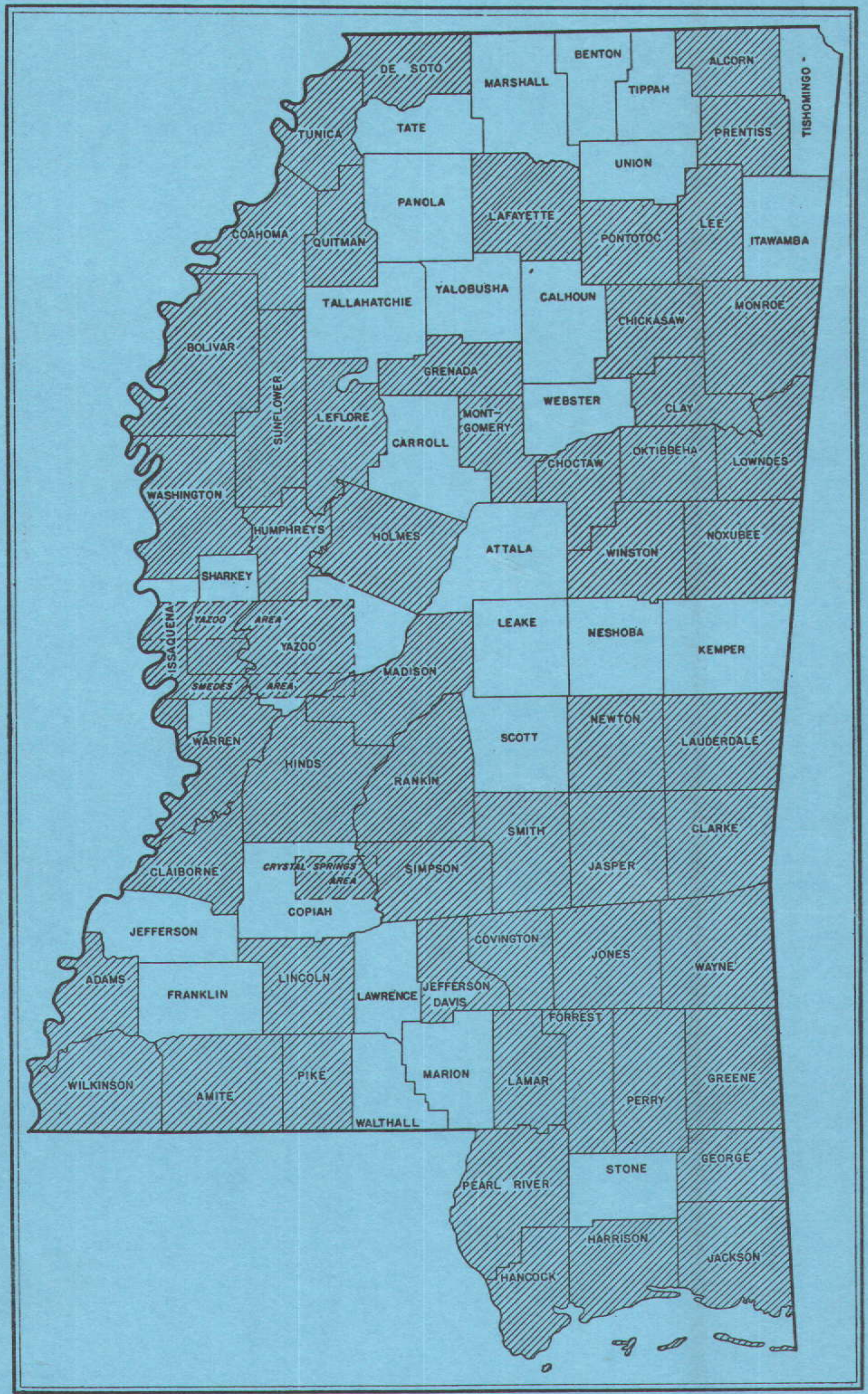
Very high	12 or more inches of water per 60 inches of soil depth.
High	9 to 12 inches of water per 60 inches of soil depth.
Moderate	6 to 9 inches of water per 60 inches of soil depth.
Low	3 to 6 inches of water per 60 inches of soil depth.
Very low	Less than 3 inches of water per 60 inches of soil depth.

Woodland. (*See* Forest land.)

GUIDE TO MAPPING UNITS AND CAPABILITY UNITS

[See table 1, p. 13, for estimated productivity ratings of each soil, and table, 7 p. 30, for approximate acreage and proportionate extent of the soils. See pp. 16 to 26 for information on engineering properties of the soils]

Map symbol	*Mapping unit*	*Page*	*Capability unit*	*Page*
	Alligator clay:			
Aa	Level phase	31	19(IIIw-11)	12
Ab	Nearly level phase	31	17(IIIs-4)	11
Ac	Gently sloping phase	31	17(IIIs-4)	11
	Alligator silty clay loam:			
Ad	Level phase	31	18(IIIw-5)	12
Ae	Nearly level phase	31	10(IIs-4)	9
Af	Alluvial land	31	(None)	
	Beulah very fine sandy loam:			
Ba	Nearly level phase	31	7(IIs-1)	8
Bb	Gently sloping phase	32	7(IIs-1)	8
Bc	Nearly level moderately shallow phase.	32	2(I-2)	5
Bd	Bosket silty clay loam, nearly level phase.	33	12(IIs-6)	9
	Bosket very fine sandy loam:			
Be	Nearly level phase	32	2(I-2)	5
Bf	Gently sloping phase	32	5(IIe-2)	7
Bg	Nearly level moderately shallow phase.	33	2(I-2)	5
Bh	Bowdre silty clay, nearly level phase.	33	8(IIs-2)	8
Bk	Bowdre silty clay loam, nearly level phase.	33	12(IIs-6)	9
Bp	Borrow pits	33	(None)	
Ca	Commerce silty clay loam, nearly level phase.	34	12(IIs-6)	9
	Commerce silt loam:			
Cb	Nearly level phase	33	1(I-1)	4
Cd	Nearly level shallow phase	34	3(I-3)	6
Ce	Commerce very fine sandy loam.	34	1(I-1)	4
Cf	Commerce very fine sandy loam, moderately shallow phase.	34	1(I-1)	4
Cg	Crevasse sandy loams and loamy sands.	34	22(IVs-1)	13
Da	Dowling clay	35	21(IVw-1)	13
Db	Dowling soils	35	20(IIIw-13)	12
Dc	Dubbs silt loam, nearly level phase.	35	1(I-1)	4
Dd	Dubbs very fine sandy loam, nearly level phase.	35	1(I-1)	4
	Dundee silt loam:			
De	Nearly level phase	36	1(I-1)	4
Df	Gently sloping phase	37	4(IIe-1)	7
	Dundee silty clay:			
Dg	Nearly level phase	37	8(IIs-2)	8
Dh	Gently sloping phase	37	16(IIIs-2)	11
	Dundee silty clay loam:			
Dk	Nearly level phase	37	12(IIs-6)	9
Dm	Gently sloping phase	37	6(IIe-4)	7
Dn	Sloping phase	37	14(IIIe-3)	10
Do	Nearly level shallow phase	37	10(IIs-4)	9
	Dundee very fine sandy loam:			
Dp	Nearly level phase	36	1(I-1)	4
Dr	Gently sloping phase	36	4(IIe-1)	7
Ds	Nearly level shallow phase	36	3(I-3)	6
Dt	Nearly level moderately shallow phase.	36	1(I-1)	4
Fa	Forestdale silt loam, nearly level phase.	38	9(IIs-3)	8
	Forestdale silty clay:			
Fb	Nearly level phase	38	17(IIIs-4)	11
Fc	Gently sloping phase	38	17(IIIs-4)	11
	Forestdale silty clay loam:			
Fd	Nearly level phase	37	10(IIs-4)	9
Fe	Gently sloping phase	37	15(IIIe-5)	10
Mh	Mhoon silty clay loam	38	10(IIs-4)	9
Pe	Pearson silt loam, nearly level phase.	38	1(I-1)	4
Ro	Robinsonville very fine sandy loam.	39	2(I-2)	5
	Sharkey clay:			
Sa	Level phase	40	19(IIIw-11)	12
Sb	Nearly level phase	39	17(IIIs-4)	11
Sc	Gently sloping phase	40	17(IIIs-4)	11
Sd	Sharkey silty clay loam, nearly level phase.	40	10(IIs-4)	9
Se	Sharkey very fine sandy loam, nearly level overwash phase.	40	11(IIs-5)	9
So	Souva silt loam	40	13(IIw-3)	10
Sw	Swamp	41	(None)	
	Tunica clay:			
Ta	Nearly level phase	41	8(IIs-2)	8
Tb	Gently sloping phase	41	16(IIIs-2)	11
Tc	Tunica silty clay loam, nearly level phase.	41	12(IIs-6)	9



Areas surveyed in Mississippi shown by shading.

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