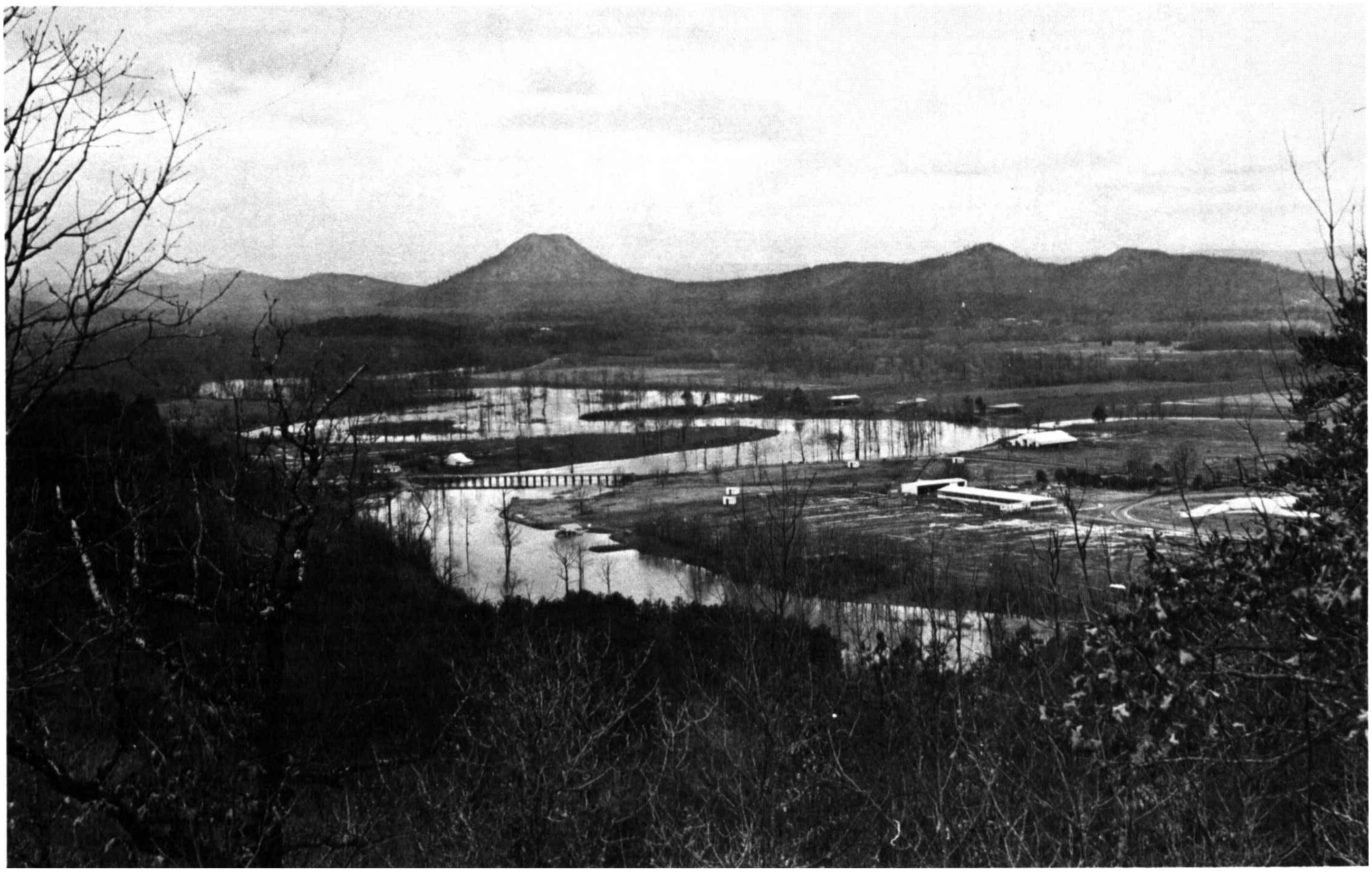
SOIL SURVEY OF

Pulaski County, Arkansas



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Arkansas Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1966–71. Soil names and descriptions were approved in 1972. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1971. This survey was made cooperatively by the Soil Conservation Service and the Arkansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Pulaski Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Pulaski County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification and woodland group of each. It also shows the page where each soil is described.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability grouping and the woodland groups.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the sections "Town and Country Planning," and "Recreational Use."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in Pulaski County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county in the section "General Nature of the County."

Cover: Looking west from Little Rock toward the Little Maumelle River and Pinnacle Mountain. Soil association 10 is along the Little Maumelle River, and Pinnacle Mountain is in association 3.

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SOIL SURVEY OF PULASKI COUNTY, ARKANSAS

BY GEORGE J. HALEY, RANDLE O. BUCKNER, AND DORRIS F. FESTERVAND, SOIL CONSERVATION SERVICE

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

PULASKI COUNTY is in the central part of Arkansas (fig. 1). It is almost triangular. The area of the county is 489,408 acres, or about 765 square miles, including about 1,298 acres of water. Little Rock is the county seat, as well as the State capital.

In 1970 the population of the county was 287,189. Little Rock had a population of 132,483, North Little Rock 60,040, and Jacksonville 19,832.

Farming is an important enterprise in the eastern part of the county, and forestry is important in the western part. Manufacturing, construction, government, defense, transportation, merchandising, banking, and supporting businesses are the most important factors in the economy of the county. Urban expansion is proceeding rapidly in the Little Rock metropolitan area. Outside the incorporated areas, many tracts are now held for future urban expansion. Most of these areas are idle and have been withdrawn from farm use. There are many small hobby farms. Most rural residents are employed full time or part time in businesses in the metropolitan area.

General Nature of the County

This section discusses, in a general way, how the land is used, and then, in more detail, farming, physiography and drainage, and climate in Pulaski County.

Land Use

About 25 percent of the county is taken up by areas of water, mine pits and dumps, and urban and built-up areas. In addition, transportation facilities, nonfarm rural housing, and reserved areas such as Camp Joseph T. Robinson, Little Rock Air Force Base, and Maumelle New Town make up many thousands of acres in the county.

Excluding the urban areas, the mountains in the western part and the hills and ridges in the northern part make up about 30 percent of the land in the county. The valleys in uplands, together with the coastal plain area, make up about 20 percent of the land area, and the bottom lands of the Arkansas River make up about 25 percent.

The elevation above sea level ranges from 213 feet at the normal waterline of the Arkansas River at the south county line to 1,068 feet atop Shinall Mountain. Most of the higher points in the county are lower than 850 feet, and north of the Arkansas River most are lower than 500 feet. The elevation of the valleys and the coastal plain area ranges from about 250 feet in the southeastern part of the county to about 450 feet in the western part. The highest part of the bottom lands of the Arkansas River is about 270 feet, but most of this area is between 220 and 250 feet higher than the Gulf of Mexico.

Most areas of the soils on mountains, hills, and ridges are too steep or too stony for intensive farming. They are used mainly for production of wood crops, as wildlife habitat, and for grazing of livestock. Some of the less sloping soils that are not stony are suitable for improved pasture. Although the limitations of the soils generally are severe, many tracts in this area have been developed for urban uses.

The rest of the soils in the county are level to moderately sloping soils that formed in valley fill and in coastal plain and alluvial sediment. Most of the urban development is in this part of the county. Except for the soils on the bottom lands of the Arkansas River, most of this area that is not developed for urban uses is used for producing livestock forage and wood crops. The less sloping soils are suited to cultivation, but there is little row cropping in the county except on the bottom lands along rivers.

Farming

Early settlers in Pulaski County farmed the soils that had good natural drainage and were above the flood plain of the

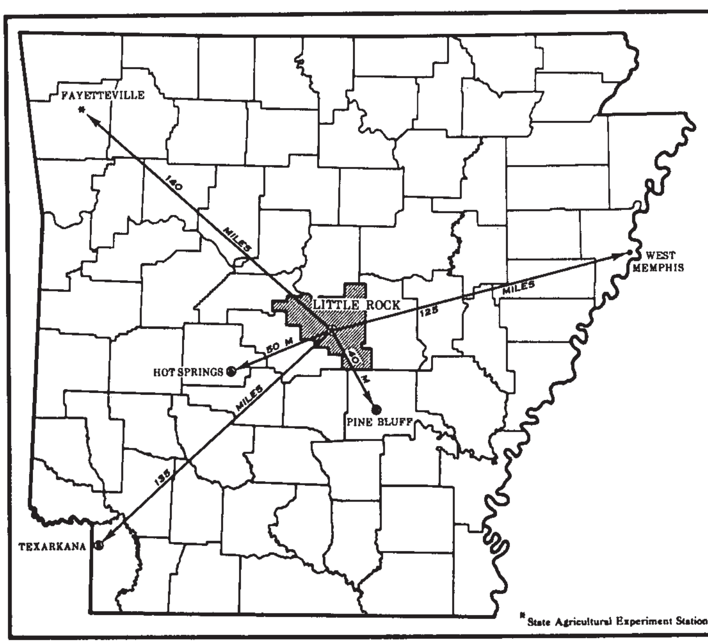

Figure 1.—**Location of Pulaski County in Arkansas.**

TABLE 1.—*Temperature and precipitation*

[All data from Little Rock. Period of record, 1942–71]

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Two years in 10 will have— Maximum temperature equal to or higher than—	Temperature: Two years in 10 will have— Minimum temperature equal to or lower than—	Precipitation: Average total	Precipitation: One year in 10 will have— Less than—	Precipitation: One year in 10 will have— More than—	Precipitation: Average number of days with snow cover of 1 inch or more
	°F	*°F*	*°F*	*°F*	*Inches*	*Inches*	*Inches*	
January	50.6	30.5	78	9	5.22	1.05	8.06	1
February	54.6	34.1	79	15	4.33	1.55	7.19	1
March	62.7	40.9	85	20	4.81	2.14	8.07	(1)
April	73.5	51.2	89	34	4.93	1.81	7.58	0
May	81.5	59.5	93	43	5.28	1.60	9.67	0
June	89.7	68.0	101	54	3.61	.63	7.20	0
July	92.7	71.1	104	58	3.34	1.77	5.54	0
August	92.4	70.1	104	58	2.82	.62	6.01	0
September	86.3	62.2	100	47	3.23	1.07	7.02	0
October	76.0	50.2	91	32	2.88	.31	5.57	0
November	61.3	37.6	83	21	4.12	1.54	6.84	(1)
December	52.1	31.7	77	14	4.09	1.91	7.15	(1)
Year	72.8	52.6	-----	-----	48.66	-----	-----	2

[1] Less than one-half day.

Arkansas River, chiefly in the valleys on uplands. The early settlers were subsistence farmers, but they soon started to grow cotton as the main cash crop. Subsequently, those people engaged in intensive farming migrated to the more fertile, older soils on natural levees that were above the normal overflow level of the river, then spread out to include the better drained soils on the flood plain, and more recently to include the more poorly drained soils. The steep, stony ridges and mountains were left as woodland. They were little used except as range for livestock and as wildlife habitat, until a commercial demand for wood products developed.

Farming has become more diversified. It is generally more intensive on the soils on bottom lands and less intensive on the soils on uplands. In the upland areas, beef and dairy cattle, hogs, and laying hens now provide most of the farm income. Some farms have small acreages that produce fruit and berry crops.

On the bottom lands of the Arkansas River, flood control, improved crop varieties, mechanization, insecticides, and other technological advances have led to expansion of crops and pasture into most of the area. On many tracts the natural drainage has been improved to attain a reliable growth of crops on wet soils. In 1969, 46 farms had irrigation systems to supplement rainfall.

On the farms on bottom lands, the most important crop is soybeans, and cotton is second. Wheat and other small grain, including rice, and corn, grain sorghum, and alfalfa, are also grown. Some farmers grow spinach, okra, green beans, melons, and other truck crops, and there are several commercial pecan groves.

According to the U.S. Census of Agriculture for 1969, about 34 percent of the land area of the county was in farms, a decrease of nearly 2 percent from that in 1964. The rest of the area was mainly cities and built-up areas, transportation facilities, public land in Camp Joseph T. Robinson and Little Rock Air Force Base, tracts reserved for urban expansion, and commercial forest land.

Between 1964 and 1969, the number of farms decreased by 28 percent, or from 876 farms to 640. The average size of the farms increased by 30 percent, or from 202 acres to 263. Of the net loss in the number of farms, 202 of them, or 86 percent, were smaller than 100 acres.

Of the farm operators in the county in 1969, 415 were full owners, 131 were part owners, and 94 were tenants. Of these operators, 367, or about 57 percent, held jobs off the farm; and 266, or about 42 percent, of the operators worked off the farm 200 days or more.

According to the U.S. Census of Agriculture, the acreage of principal crops and pasture in 1964 and 1969 was as follows:

	Acres (1964)	Acres (1969)
Crop:		
Soybeans for beans	37,211	46,265
Cotton	12,825	11,610
Wheat	3,468	1,999
Other small grain, including rice	3,160	3,154
Corn for grain	834	294
Sorghum for grain or seed	499	392
Truck crops, including potatoes	678	462
Fruits, nuts, and berries	770	668
Cropland pastured	13,416	26,367
Hay	9,704	7,720

The number of livestock in the county in 1964 and 1969 was as follows:

	Number (1964)	Number (1969)
Livestock:		
All cattle and calves on farms and sold	31,523	31,867
Milk cows	1,854	1,179
Hogs and pigs on farms and sold	5,013	3,328
Horses and ponies on farms and sold	No data	812
Chickens 3 months old or older, on farms and sold	230,840	122,687

Physiography and Drainage

The Arkansas River divides the county diagonally from northwest to southeast. Bottom land is in a narrow strip parallel to the river as far downstream as Little Rock, where the river debouches onto a lowland plain. The many oxbow lakes on this plain are evidence that the river has meandered from northeast to south. In addition, there are many sloughs and bayous. The main drainageways are Ink, Plum, and Pennington Bayous.

The flow of the Arkansas River is partly controlled by large flood-control impoundments in its upstream watershed. A series of lakes and dams form navigable pools, and the river is open year-round to barge traffic. This river provides recreation in the form of fishing, boating, and waterfowl hunting. It yields sand and gravel in quantities large enough to be profitably dredged. All the streams in Pulaski County eventually drain into the Arkansas River.

The alluvial soils on lowlands are level to undulating, and some of these soils are subject to flooding. The most fertile soils in the county, Keo, Norwood, and Rilla, formed on these bottom lands.

Undulating uplands formed in coastal plain sediment and terraces of the Arkansas River lie between the eastern bottom lands and the foothills of the hilly uplands. Most of this area is already a part of, or is in the path of, urban development. This area of loamy and clayey unconsolidated sediment is level to moderately sloping, and the dominant gradient is less than 8 percent. Leadvale, Smithdale, and Tiak are the main soils on the sloping parts, and Amy and Wrightsville soils are on the flats. This area is drained by streams that flow out of the hilly uplands.

The topography of the hilly or mountainous part of the county that lies generally south of Lake Maumelle is that of nearly parallel ridges and valleys that trend from the northwest to the southeast as Shinall Mountain. Westward from this point, the trend is nearly east and west. Intense folding and faulting were major factors in shaping the landscape in this area. The rocks are tilted, and some are nearly vertical. A series of cone-shaped mountains, known as Maumelle Pinnacles, extends westward from the mouth of Big Maumelle River. Together with Shinall Mountain, the highest point in the county, these mountains are striking features of the landscape. With few exceptions, valleys in this area are quite narrow, as are the ridgetops and mountaintops. There is a relatively small amount of arable land in this area. The principal streams that drain this area are the Big Maumelle and Little Maumelle Rivers and Fourche Creek.

In the area north of Lake Maumelle, and north of the Arkansas River, the mountains and ridges have lower elevations than they have to the south. Folding and faulting have been less acute. Many of the broader ridges have gently rolling tops and a significant amount of arable land. The valleys in this area also are broader and commonly have gentler slopes than the valleys to the south. The principal streams are White Oak Bayou and Bayou Meto.

Most of the tributary streams in the uplands are intermittent, but some flow the year around. Livestock water is obtained from the creeks and from wells and ponds. Domestic water supplies are from wells, though in most places the ground water supply is insufficient for irrigation. Water for irrigation on the bottom lands is obtained from deep wells, from oxbow lakes, and from surface water impounded in reservoirs.

Climate[1]

The topography of Pulaski County has a limited effect upon the climate. Air moving downslope from the higher elevations is warmed slightly, which results in somewhat higher temperatures at lower elevations. There is slightly more rainfall at the higher elevations, because of the lifting effect imparted to moist air by the ridges and mountains.

The climate of the county is affected by exposure to all of the North American airmass types. Winters generally are mild. Although polar and arctic-type outbreaks are common, they generally are short. Summers are hot, and there are long periods of high humidity. Table 1 is a summary of temperatures and precipitation at Little Rock, which are considered representative of those for the county.

Winters are relatively free of severe cold, although a low of 10° F frequently occurs in January, the coldest month. The lowest temperature ever recorded in the county was −13° in February 1899. Snowfall averages 5.7 inches per year, almost half of which falls in January. Heavy snowfall occurs occasionally but remains on the ground for only a few days. The greatest monthly snowfall of record was 12 inches in January 1966. There have been years when only traces were recorded. The average daily temperature in winter is 41°, so outdoor work can be done during most of the winter.

Summers are hot and humid. The average daily temperature is 82°. July and August are the hottest months. A high temperature of 100° is frequently exceeded. The highest temperature recorded was 110° in August 1936.

The average length of the growing season is 233 days. The average date of the first freezing temperature in fall is November 9, and the average date of the last freeze in spring is March 21. The earliest freezing temperature in fall occurred on October 21, and the latest in spring on April 13. November 19 is the average date of the first 28° reading in fall, and the latest in spring is March 8. The earliest that a temperature of 28° has been recorded in fall is November 2, and the latest in spring is April 7.

Precipitation is fairly well distributed throughout the year and is generally adequate for most crops. Spring is the wettest season, and May is normally the wettest month. During the 3 months of March, April, and May, slightly more than 15 inches of rainfall, or nearly 31 percent of the annual total, commonly occurs. August, September, and October are the driest months, but about 3 inches of rainfall in each of these months can be expected in a normal year. Winter and spring rains are associated with frontal systems and are of a general, or widespread, character. Summer and fall rains are mainly thundershowers from convective clouds. The thundershowers commonly are of relatively small extent, but they occasionally produce very heavy rainfall.

The evaporation rate in summer may be as high as one-third inch per day. A 1-inch rain can be dissipated within 3 or 4 days. Thus, periods of abundant sunshine and high temperatures may result in a significant loss of soil moisture. Short periods of drought occur frequently. Severe to extreme droughts are rare. They occur on an average of once every 10 to 15 years.

Thunderstorms occur on about 56 days each year and are sometimes accompanied by large hail and damaging wind. In the 10-year period from 1958 to 1968, hail three-fourths

[1] By ELDEN V. JETTON, meteorologist for Arkansas, National Weather Service, U.S. Department of Commerce.

inch in diameter or larger occurred 13 times, and windstorms that caused damage of $10,000 or more occurred 12 times. In the same period, five tornadoes went through the county.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Pulaski County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Mountainburg and Carnasaw, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Carnasaw gravelly silt loam, 3 to 8 percent slopes, is one of several phases within the Carnasaw series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Pulaski County, soil complexes and soil associations.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Guthrie-Leadvale complex, undulating, is an example.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Sallisaw-Leadvale association, undulating, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Urban land is a land type in this county.

Some mapping units include soils unlike any known series. Such soils are named according to nomenclature from a higher level of the soil classification system. Umbraqualfs, clayey, is an example in this county.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Pulaski County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Pulaski County are discussed in the following pages.

The soil associations in this survey have been grouped according to four general kinds of landscapes for the purpose of making broad soil interpretations. Each of the broad groups, and the soil associations in them, is described in the following pages. The terms for texture used in the title for several of the associations apply to the texture of the surface layer. For example, in the title of association 10, the words "clayey" and "loamy" refer to the texture of the surface layer.

Soils Formed in Material Weathered From Predominantly Level-Bedded, Acid Sandstone and Shale, and in Valley Fill Washed Mainly From Local Highlands

The soils in this group of associations make up about 27 percent of the county. They are on uplands in the Arkansas Valley and Ridges land resource area and extend across the northern part of the county. They are well-drained to poorly drained loamy and stony soils. They formed in material weathered from sandstone and shale and in alluvium mainly from that material.

The soils in this group are used mainly for livestock farms or hobby farms or are in investment tracts held for future urban development.

1. Linker-Mountainburg association

Well-drained, gently sloping to steep, moderately deep and shallow, loamy and stony soils on hills, mountains, and ridges.

This association extends across the northern part of the county. The major soils are on the top and sides of hills and mountains, on benches, and on low ridges in valleys.

This association makes up about 16 percent of the county. Linker soils make up about 45 percent of the association, and Mountainburg soils about 26 percent. The remaining 29 percent is Urban land; rock outcrops; shallow soils of stony silt loam underlain by shale; moderately deep, stony soils that have a clayey subsoil that is underlain by shale; and pockets of deep, loamy, cobbly soils that formed in material that has washed or rolled downhill from the Linker and Mountainburg soils.

Linker soils have a surface layer of dark yellowish-brown gravelly fine sandy loam or stony fine sandy loam. The upper part of the subsoil is strong-brown fine sandy loam, the middle part is yellowish-red clay loam, and the lower part is mottled clay loam. The subsoil is underlain by sandstone bedrock.

Mountainburg soils have a surface layer and a subsurface layer of dark grayish-brown and brown fine sandy loam that is stony. The upper part of the subsoil is yellowish-red gravelly fine sandy loam, and the lower part is yellowish-red gravelly sandy clay loam. Below the subsoil is sandstone bedrock.

The soils in this association generally are poorly suited or unsuited to farming because of slope, a stony surface layer, and shallow depth to bedrock. Most areas are wooded. Cleared areas are used mainly for pasture. Many areas have been developed for urban uses, and others are now held for future urban development. Limitations are moderate to severe for most urban uses because of shallow depth to bedrock and slope. Limitations are severe for septic tank absorption fields.

2. Leadvale-Guthrie-Linker association

Poorly drained to well drained, level to gently sloping, deep and moderately deep, loamy soils in valleys and on tops of low mountains

This association extends across the northern part of the county. It makes up about 11 percent of the county. Leadvale soils make up about 56 percent of the association, Guthrie soils about 19 percent, and Linker soils about 14 percent. The remaining 11 percent is Amy soils, Urban land, and areas of water.

Leadvale soils are in valleys and on sloping parts of the top of low mountains. These soils are moderately well drained. The surface layer is dark yellowish-brown silt loam. The upper part of the subsoil is strong-brown, friable silt loam, and the lower part is a firm, brittle, mottled fragipan of silt loam and silty clay loam.

Guthrie soils are on stream terraces in valleys and in depressions atop low mountains. These soils are poorly drained. The surface layer is brown silt loam, and the subsurface layer is gray, mottled silt loam. The upper part of the subsoil is light-gray, mottled, friable silt loam; the middle part is a firm, brittle, mottled fragipan of silty clay loam, and the lower part is mottled, friable silt loam.

Linker soils are in valleys and on sloping parts of the top of low mountains. These soils are well drained. The surface layer is dark yellowish-brown gravelly fine sandy loam. The upper part of the subsoil is strong-brown fine sandy loam, the middle part is yellowish-red clay loam, and the lower part is mottled clay loam. Below the subsoil is sandstone bedrock.

The soils in this association are suited to farming, although some areas need surface drainage for efficient management, and others need measures that help to control erosion. Most areas are in pasture, and many have been developed for urban uses. Scattered small tracts are woodland. Limitations are moderate to severe for most urban uses because of soil wetness, low bearing capacity, or shallow depth to bedrock. Limitations are severe for septic tank absorption fields because of wetness, a slow percolation rate, or shallow depth to bedrock.

Soils Formed in Material Weathered From Predominantly Folded and Fractured, Acid Shale, Sandstone, and Quartzite, and in Valley Fill Washed Mainly From Local Highlands

The soils in this group of associations make up about 26 percent of the county. They are in the Ouachita Mountains in the western part of the county. They are well drained and moderately well drained loamy and stony soils. They formed in material weathered from shale, sandstone, and quartzite, and in alluvium mainly from that material.

The soils in this group are used mainly for wood crops. Scattered throughout much of the area are small beef farms and hobby farms. The eastern part of the area has been developed for urban uses, and this development is rapidly expanding westward.

3. Carnasaw-Mountainburg association

Well-drained, gently sloping to steep, moderately deep and shallow, loamy and stony soils on hills, mountains, and ridges

This association is in the western part of the county. The major soils are on the top and sides of hills and mountains, on benches, and on low ridges in valleys.

This association makes up about 22 percent of the county. Carnasaw soils make up about 63 percent of the association and Mountainburg soils about 13 percent. The remaining 24 percent is Urban land; areas of rock outcrop; Sallisaw soils; soils that are similar to Carnasaw soils but have bedrock at a depth of less than 30 inches; and soils that are similar to Mountainburg soils but silty throughout and underlain by shale.

Carnasaw soils have a surface layer of very dark grayish-brown gravelly silt loam and a subsurface layer of yellowish-brown gravelly silt loam. The upper part of the subsoil is yellowish-red silty clay, the middle part is mottled clay and silty clay, and the lower part is mottled silty clay loam. The underlying material is tilted, fractured shale.

Mountainburg soils have a surface layer and a subsurface layer of dark grayish-brown and brown fine sandy loam that is stony. The upper part of the subsoil is yellowish-red gravelly or stony fine sandy loam, and the lower part is yellowish-red gravelly sandy clay loam. In places the subsoil is stony throughout. Below the subsoil is sandstone or quartzite bedrock.

The soils in this association generally are poorly suited or unsuited to farming because of slope, shallow depth to bedrock, a stony surface layer, or a clayey subsoil. Most areas are wooded. Cleared areas are used mainly for pasture. Many areas have been developed for urban uses, and others are now held for future urban development. Limitations are severe for most urban uses and for septic tank absorption fields because of slope, shallow depth to bedrock, and a slow percolation rate.

4. Sallisaw-Leadvale association

Well drained and moderately well drained, nearly level and gently sloping, deep, loamy soils in valleys

This association is in the western part of the county. The major soils are intermingled on stream terraces along upland drainageways in narrow valleys.

This association makes up about 4 percent of the county. Sallisaw soils make up about 47 percent of the association and Leadvale soils about 33 percent. The remaining 20 percent is Urban land, areas of shale outcrop, gravel bars along streams, and Amy and Rexor soils.

Sallisaw soils are well drained. The surface layer is dark-brown gravelly silt loam. The upper part of the subsoil is brown and yellowish-red silt loam, the middle part is yellowish-red gravelly silt loam, and the lower part is mottled gravelly silt loam. The underlying material is also mottled gravelly silt loam.

Leadvale soils are moderately well drained. The surface layer is dark yellowish-brown silt loam. The upper part of the subsoil is strong-brown, friable silt loam, and the lower part is a firm, brittle, mottled fragipan of silt loam and silty clay loam.

The soils in this association are suited to farming, but most areas need measures that help to control erosion. Most areas are used for pasture, although there are some large wooded tracts, and many tracts have been developed for urban uses. Limitations are slight to moderate for most urban uses but are severe for septic tank absorption fields on Leadvale soils because of a slow percolation rate.

Soils Formed on Uplands in Sediment Deposited in an Old Coastal Embayment, and in Local Sediment Washed From These and Nearby Uplands

The soils in this group of associations make up about 17 percent of the county. They are in areas on the Southern Coastal Plain and extend diagonally across the county through Jacksonville, North Little Rock, and Little Rock. They formed in stratified sediment deposited on the bottom of a shallow coastal embayment many thousands of years ago, and in recent alluvium washed from this material and from nearby uplands.

Extensive areas of soils in this group have been developed for urban uses, and others are held for further urban expansion. Some tracts are wooded. Scattered about the urban fringe are small general farms and hobby farms.

5. Amy association

Poorly drained, predominantly level, deep, loamy soils, on broad upland flats

This association is in the northeastern and south-central parts of the county. It makes up about 4 percent of the county. Amy soils make up about 58 percent of the association. The remaining 42 percent is Leadvale, Smithdale, and Tiak soils and Urban land.

Amy soils are poorly drained. The surface layer is brown silt loam. The subsurface layer is gray, mottled silt loam. The subsoil is gray, mottled silt loam and silty clay loam. The underlying material is light-gray, mottled silty clay loam.

Where the soils in this association are adequately drained, they are suited to farming, but they are better suited to pasture and woodland. Most of the areas are wooded, but many tracts have been developed for urban uses. Because of soil wetness, a slow percolation rate, and low bearing capacity, this association has severe limitations for septic tank absorption fields and for most urban uses.

6. Amy-Rexor association

Poorly drained and well drained, level to gently undulating, deep, loamy soils on flood plains of local drainageways

This association is in the northeastern and south-central parts of the county. It makes up about 2 percent of the county. Amy soils make up about 55 percent of the association, and Rexor soils about 40 percent. The remaining 5 percent is Leadvale and Guthrie soils and areas of water.

Amy soils are poorly drained. The surface layer is brown silt loam. The subsurface layer is gray, mottled silt loam. The subsoil is gray, mottled silt loam and silty clay loam.

The underlying material is light-gray, mottled silty clay loam.

Rexor soils are well drained. The surface layer is dark grayish-brown and dark yellowish-brown silt loam. The upper part of the subsoil is strong-brown silt loam, the middle part is dark-brown, mottled silt loam, and the lower part is mottled silt loam.

The soils in this association are poorly suited to farming. They are unsuited to tilled crops, because frequent flooding is a severe hazard. Most areas are wooded. Cleared areas are used mainly for pasture. Urban development has expanded into parts of this association. Limitations are severe for urban uses and for septic tank absorption fields because of frequent flooding.

7. *Urban land-Smithdale-Leadvale association*

Built-up areas, and well drained and moderately well drained, nearly level to moderately sloping, deep, loamy soils on uplands

This association is mainly in the south-central part of the county. It makes up about 8 percent of the county. Urban land makes up about 33 percent of the association, Smithdale soils about 31 percent, and Leadvale soils about 23 percent. The remaining 13 percent is Amy, Saffell, and Tiak soils and areas of mine spoil and pits.

Urban land consists of areas that are covered with works and structures, such as office buildings, service buildings, hotels and motels, industrial buildings and yards, streets and sidewalks, parking lots, railroads, shopping centers, and closely spaced residences. Most areas that are not covered by works and structures have been cut, filled, graded, and compacted, and as a result, the characteristics of the original soil have been severely altered. Variable amounts of fill have been brought in from both local and distant sources.

Smithdale soils are well drained. The surface layer is brown fine sandy loam. The upper part of the subsoil is red clay loam, and the lower part is red sandy loam with splotches of strong brown.

Leadvale soils are moderately well drained. The surface layer is dark yellowish-brown silt loam. The upper part of the subsoil is strong-brown, friable silt loam, and the lower part is a firm, brittle, mottled fragipan of silt loam and silty clay loam.

The soils in this association are suited to farming, but many of the areas have been developed for urban uses. Other tracts are used for pasture or as woodland, or are idle and held for future urban development. Limitations are slight to moderate for most urban uses, but are severe for septic tank absorption fields on Leadvale soils because of a slow percolation rate.

8. *Wrightsville-Leadvale association*

Poorly drained and moderately well drained, level to gently sloping, deep, loamy soils on broad uplands flats

This association is in a single area in the south-central part of the county. It makes up about 3 percent of the county. Wrightsville soils make up about 56 percent of the association, and Leadvale soils about 21 percent. The remaining 23 percent is mainly Urban land, Amy soils, and areas of water.

Wrightsville soils formed in loamy material and in the underlying clayey material. These soils are poorly drained. The surface layer is yellowish-brown silt loam. The subsurface layer is light-gray, mottled silt loam. The subsoil is gray and light brownish-gray, mottled silty clay and clay through which extend tongues of white silt. The underlying material is dark-red clay.

Leadvale soils formed in loamy material. These soils are moderately well drained. The surface layer is dark yellowish-brown silt loam. The upper part of the subsoil is strong-brown, friable silt loam, and the lower part is a firm, brittle, mottled fragipan of silt loam and silty clay loam.

The soils in this association are suited to farming, although most areas need surface drainage for efficient farm management. The rest need measures that help to control erosion. Most of the areas are wooded. A few areas are used for pasture, and some tracts have been developed for urban uses or are held for future development. Most of the areas have severe limitations for urban uses because of soil wetness and low bearing capacity. These limitations generally are moderate in areas of Leadvale soils. Because of a slow percolation rate and soil wetness, limitations are severe for septic tank absorption fields.

Soils Formed in Alluvium Deposited by Large Rivers

The soils in this group of associations make up about 30 percent of the county. They are well-drained to poorly drained loamy and clayey soils. They formed on natural levees and in back swamps in sediment deposited chiefly by the Arkansas River.

The soils in this group are used mainly for crops and pasture. Few large wooded areas remain. Some tracts have been developed for urban uses.

9. *Rilla-Keo association*

Well-drained, level to gently sloping, deep, loamy soils on bottom lands

This association extends from the northwest to the east-central and southeastern parts of the county. It makes up about 15 percent of the county. Rilla soils make up about 34 percent of the association, and Keo soils about 29 percent. The remaining 37 percent is Moreland, Norwood, and Perry soils, clayey Umbraqualfs, Urban land, and areas of water.

Rilla soils are on old natural levees. These soils have a surface layer of brown silt loam. The upper part of the subsoil is reddish-brown silt loam, the middle part is yellowish-red silty clay loam, and the lower part is yellowish-red silt loam. Beneath the subsoil is pink very fine sandy loam underlain by yellowish-red silt loam.

Keo soils are on young natural levees. These soils have a surface layer of dark-brown silt loam. The upper part of the subsoil is dark-brown loam, the middle part is dark-brown silt loam, and the lower part is dark reddish-brown silt loam. The underlying material is stratified, dark reddish-brown and reddish-brown silt loam and very fine sandy loam.

The soils in this association are well suited to farming, and most of the acreage is cultivated. This association is within the major area of soybean and cotton farming. If it is well managed, crops that leave a large amount of residue can be grown year after year. Farms range from about 100 acres to several thousand acres in size and are highly mechanized. Most farms are operated by the owners. There are a few areas of pasture for beef cattle. Some areas in this association have been developed for urban uses. Limitations are generally slight to moderate for most urban uses and for septic tank absorption fields, but they are severe for most nonfarm uses where there is a hazard of flooding.

10. Perry-Norwood association

Poorly drained and well drained, level, deep, clayey and loamy soils on bottom lands

This association extends from the northwest to the east-central and southeastern parts of the county. It makes up about 11 percent of the county. Perry soils make up about 45 percent of the association, and Norwood soils about 31 percent. The remaining 24 percent is Moreland, Keo, and Bruno soils, Umbraqualfs, clayey, Urban land, and areas of water.

Perry soils formed in clayey sediment in slightly depressed back-swamp areas. These soils are poorly drained. The surface layer is dark yellowish-brown clay. The upper part of the subsoil is dark-gray and gray, mottled clay, and the lower part is dark reddish-brown clay that is mottled below a depth of 61 inches.

Norwood soils formed in loamy sediment on young natural levees. These soils are well drained. The surface layer is dark-brown silty clay loam. The underlying material is brown to dark reddish-brown, thinly stratified silty clay loam, silt loam, and very fine sandy loam.

The soils in this association are suited to farming, and most of the acreage is cultivated. This association is within the major area of soybean, cotton, and rice farming. The Perry soils need surface drainage for efficient farm management. Crops that leave a large amount of residue can be grown year after year. Farms range from about 100 acres to several thousand acres in size and are highly mechanized. Most farms are operated by the owners. There are a few areas of pasture for beef cattle. Some areas within this association have been developed for urban uses. On the Perry soils, limitations are severe for most urban uses and septic tank absorption fields because of soil wetness, a slow percolation rate, and low bearing capacity. On the Norwood soils, limitations are generally slight to moderate for urban uses and septic tank absorption fields, but limitations are severe for most nonfarm uses where there is a hazard of flooding.

11. Bruno-Crevasse association

Excessively drained, level to nearly level, deep, loamy and sandy soils on bottom lands

This association is in relatively small areas that extend diagonally across the county from the northwest to the southeast. The soils formed in loamy and sandy sediment deposited on young natural levees along the Arkansas River.

This association makes up about 4 percent of the county. Bruno soils make up about 48 percent of the association, and Crevasse soils about 32 percent. The remaining 20 percent is Keo and Norwood soils, Urban land, and areas of water.

Bruno soils have a surface layer of dark-brown fine sandy loam. The upper part of the underlying material is brown sandy loam; next is pale-brown fine sand; below is dark-brown silt loam and light yellowish-brown and brown loamy fine sand.

Crevasse soils have a surface layer of yellowish-brown fine sand. The underlying material is yellowish-brown sand.

The soils in this association are poorly suited to most crops because of low available water capacity and a hazard of flooding in some tracts. Some areas are used for pasture, others are wooded, and some tracts have been developed for urban uses. Limitations are generally slight to moderate for most urban uses, but where there is a hazard of flooding limitations are severe both for urban uses and for septic tank absorption fields. Where the limitations are slight for septic tank absorption fields, areas are protected from flooding, provided a hazard of ground water contamination does not exist.

Descriptions of the Soils

This section describes the soil series and mapping units in Pulaski County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile; that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Umbraqualfs, clayey, for example, do not belong to a soil series, but nevertheless are listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and woodland group in which the mapping unit has been placed. The page for the description of each mapping unit can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 2. Many of the terms used in describing the soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*11*)[2]

Amy Series

The Amy series consists of poorly drained, level soils on broad upland flats and on flood plains of local drainageways. These soils formed in loamy sediment in valleys and on the coastal plain. The native vegetation is mixed pine and hardwoods on the upland flats and hardwoods on the flood plains.

[2] Italic numbers in parentheses refer to Literature Cited, p. 63.

TABLE 2.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Amy silt loam	8,500	1.7
Amy silt loam, frequently flooded	8,180	1.7
Amy complex, undulating	3,030	.6
Amy-Urban land complex	3,430	.7
Bruno fine sandy loam	9,690	2.0
Bruno-Urban land complex	790	.1
Carnasaw gravelly silt loam, 3 to 8 percent slopes	2,350	.5
Carnasaw gravelly silt loam, 8 to 12 percent slopes	980	.2
Carnasaw-Urban land complex, 3 to 8 percent slopes	10,750	2.2
Carnasaw-Urban land complex, 8 to 12 percent slopes	5,190	1.1
Carnasaw-Mountainburg association, undulating	21,510	4.4
Carnasaw-Mountainburg association, steep	62,860	12.8
Crevasse fine sand	6,810	1.4
Guthrie-Leadvale complex, undulating	15,450	3.2
Keo silt loam	19,940	4.1
Keo-Urban land complex	3,610	.7
Latanier silty clay	6,770	1.4
Leadvale silt loam, 1 to 3 percent slopes	24,700	5.1
Leadvale silt loam, 3 to 8 percent slopes	15,100	3.1
Leadvale-Urban land complex, 1 to 3 percent slopes	10,130	2.1
Leadvale-Urban land complex, 3 to 8 percent slopes	4,510	.9
Linker gravelly fine sandy loam, 3 to 8 percent slopes	20,770	4.2
Linker-Urban land complex, 3 to 8 percent slopes	7,890	1.6
Linker-Mountainburg association, moderately steep	42,730	8.7
Moreland silty clay	10,480	2.1
Mountainburg stony fine sandy loam, 3 to 12 percent slopes	5,520	1.1
Mountainburg-Urban land complex, 3 to 12 percent slopes	3,620	.7
Mountainburg-Urban land complex, 12 to 40 percent slopes	3,420	.7
Norwood silty clay loam	20,420	4.2
Perry clay	31,100	6.4
Perry-Urban land complex	1,680	.3
Rexor silt loam, frequently flooded	4,150	.9
Rexor-Urban land complex, frequently flooded	190	(1)
Rilla silt loam, 0 to 1 percent slopes	16,560	3.4
Rilla silt loam, 3 to 5 percent slopes	5,870	1.2
Rilla-Perry complex, undulating	3,420	.7
Rilla-Urban land complex, 0 to 1 percent slopes	4,190	.8
Saffell-Urban land complex, 3 to 8 percent slopes	860	.2
Sallisaw gravelly silt loam, 1 to 3 percent slopes	4,930	1.0
Sallisaw gravelly silt loam, 3 to 8 percent slopes	690	.1
Sallisaw-Urban land complex, 3 to 8 percent slopes	1,690	.3
Sallisaw-Leadvale association, undulating	6,640	1.4
Smithdale fine sandy loam, 3 to 8 percent slopes	8,220	1.7
Smithdale fine sandy loam, 8 to 12 percent slopes	1,630	.3
Smithdale-Urban land complex, 3 to 8 percent slopes	7,670	1.6
Tiak fine sandy loam, 1 to 3 percent slopes	1,840	.4
Tiak-Urban land complex, 3 to 8 percent slopes	1,950	.4
Umbraqualfs, clayey	1,540	.3
Urban land	12,820	2.6
Wrightsville silt loam	8,120	1.7
Wrightsville-Urban land complex	860	.2
Mine spoil, pits, and quarries	2,360	.5
All water	1,298	.3
Total	489,408	100.0

[1] Less than 0.1 percent.

In a representative profile the surface layer is brown silt loam about 6 inches thick. The subsurface layer is gray, mottled silt loam about 6 inches thick. The upper part of the subsoil is gray, mottled silt loam about 8 inches thick, and the lower part is gray, mottled silty clay loam about 34 inches thick. The underlying material is light-gray, mottled silty clay loam.

Amy soils are low in natural fertility. Permeability is slow, and available water capacity is high.

Where these soils are adequately drained, they are suited to use as pasture. Areas that are not subject to flooding are suited to crops. Most areas of these soils are wooded, but many tracts have been developed for urban uses.

Representative profile of Amy silt loam in a moist, wooded spot in an area of Amy-Urban land complex, in the NE¼ SW¼SE¼ sec. 6, T. 1 S., R. 12 W:

O1—1 inch to 0, leaves and other decomposing vegetation.

A1—0 to 6 inches, brown (10YR 5/3) silt loam; weak, medium, subangular blocky structure; friable; many fine roots; common fine pores; strongly acid; clear, smooth boundary.

A2g—6 to 12 inches, gray (10YR 6/1) silt loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few fine roots; many fine pores; very strongly acid; gradual, irregular boundary.

B21tg—12 to 20 inches, gray (10YR 6/1) silt loam; many, medium, prominent, yellowish-red (5YR 5/8) mottles; moderate, medium, subangular blocky structure; friable; few fine roots; many fine pores; few, thin, patchy clay films on faces of peds; very strongly acid; gradual, irregular boundary.

B22tg—20 to 40 inches, gray (10YR 6/1) silty clay loam; many, medium, distinct, brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) mottles; thin, patchy clay films on faces of peds; few fine roots; common fine pores; few black accretions; very strongly acid; gradual, irregular boundary.

B23tg—40 to 54 inches, gray (10YR 6/1) silty clay loam; many, medium, distinct, brown (7.5YR 4/4) mottles; moderate medium, subangular blocky structure; friable; thin, patchy clay films on faces of peds; few fine roots; common fine pores; common black accretions; very strongly acid; gradual, irregular boundary.

C—54 to 72 inches, light-gray (N 7/0) silty clay loam; many, medium, prominent, strong-brown (7.5YR 5/6), reddish-yellow (7.5YR 6/8), and yellowish-red (5YR 5/8) mottles; massive; firm; few roots; common fine pores; very strongly acid.

The A1 horizon is dark grayish brown, brown, grayish brown, or gray. The A2g horizon is gray or light brownish gray. The B2tg horizon is gray or light-gray silt loam or silty clay loam. The C horizon is light-gray or gray silty clay loam or silt loam. Except where it has been limed, the profile is strongly acid or very strongly acid throughout.

Amy soils are near Leadvale, Rexor, Smithdale, and Wrightsville soils. They are grayer below the A1 horizon or the Ap horizon than Leadvale, Rexor, and Smithdale soils, and they are more poorly drained. Amy soils have less clay in the B horizon than Wrightsville soils.

Amy silt loam (Am).—This soil is on broad upland flats. Slopes are less than 1 percent. Areas of this soil range from about 20 to 600 acres in size. This soil has the profile described as representative for the series. Included in mapping are a few areas of Leadvale, Smithdale, and Wrightsville soils.

Runoff is slow, and wetness is a severe limitation. Farming operations are delayed several days after rains unless a surface drainage system is installed. Good management that includes adequate drainage permits clean-tilled crops that leave a large amount of residue to be safely grown year after year.

This soil is suited to crops. Most areas, however, are wooded. Cleared areas are mostly in pasture. This soil is suited to soybeans and grain sorghum. Winter small grain can be grown where surface drainage is adequate. Suitable pasture plants are bermudagrass, bahiagrass, tall fescue, dallisgrass, annual lespedeza, white clover, and sericea lespedeza. Capability unit IIIw-1; woodland group 2w9.

Amy silt loam, frequently flooded (Ao).—This soil is on flood plains of local drainageways. Slopes are less than 1 percent. Areas of this soil range from about 20 to 500 acres in size. Included in mapping are a few areas of Rexor soils and areas of a soil on low, rounded mounds similar to those in areas of Amy complex, undulating.

This soil is subject to severe flooding, and it is therefore not suited to cultivation. It is fairly well suited to pasture during the warm season. It is not suited to pasture in winter or in spring, because it generally is flooded during those periods. It is better suited to bermudagrass than to most other pasture plants. This soil is mainly used as woodland. Capability unit Vw-1; woodland group 2w9.

Amy complex, undulating (ApB).—The soils in this complex are in valleys, on coastal plain uplands, and on flood plains of local drainageways. Areas of this complex range from about 10 to 300 acres in size. Slopes range from 0 to 3 percent. This complex is made up of nearly level Amy soils in areas between low mounds and of somewhat poorly drained to moderately well drained soils on rounded mounds. The mounds are 2 to 3 feet high and 65 to 100 feet in diameter. Amy soils make up about 60 to 70 percent of the complex, and the soils on mounds make up 30 to 40 percent. An Amy soil in this complex has a profile similar to the one described as representative for the Amy series. The soils on the mounds have a variable profile, but they generally are brownish, acid, loamy material throughout. Included in mapping are a few areas of Leadvale soils.

Wetness is a severe limitation to use of the Amy soils in this complex. Farming operations are delayed several days after rains unless surface drains are installed. The mounds limit the use of some farm equipment. In areas that are not frequently flooded, good management that includes adequate drainage permits growing year after year those kinds of clean-tilled crops that leave a large amount of residue. Many tracts on flood plains are occasionally flooded. Frequently flooded areas are not suited to crops.

The soils in this complex are mainly used as pasture and meadow (fig. 2). They are suited to such crops as soybeans and grain sorghum, except in frequently flooded areas. Winter small grain can be grown where surface drainage is adequate. Suitable pasture plants are bermudagrass, bahiagrass, tall fescue, white clover, annual lespedeza, and sericea lespedeza. Where these soils are frequently flooded, they are better suited to bermudagrass than to most other pasture plants. Capability units IVw-1 (nonflooded and occasionally flooded areas on uplands) and Vw-1 (frequently flooded areas); woodland group 2w9.

***Figure 2.*—Areas of bermudagrass pasture on Amy complex, undulating.**

Amy-Urban land complex (Au).—In this complex are poorly drained, level Amy soils and areas of material derived from Amy soils that has been modified by urban development. Areas generally range from about 20 to 600 acres in size. Amy soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest. Included in mapping are areas of Leadvale soils, small areas of a soil that is frequently flooded, and areas of soils on low, rounded mounds.

Runoff is slow on Amy soils. A seasonal perched water table keeps these soils saturated during wet seasons.

These soils are suited to landscaping plants that can tolerate wetness. Limitations are severe for most urban uses because of wetness, the seasonal perched water table, a slow percolation rate, and low bearing capacity. Not assigned to a capability unit or to a woodland group.

Bruno Series

The Bruno series consists of excessively drained, level to nearly level soils on young natural levees along the Arkansas River. These soils formed in stratified loamy and sandy sediment carried from the west by the Arkansas River. The native vegetation is hardwoods.

In a representative profile the surface layer is dark-brown fine sandy loam about 6 inches thick. The upper 10 inches of the underlying material is brown sandy loam; the next 7 inches is pale-brown fine sand; the next 2 inches is dark-brown silt loam; the next 27 inches is light yellowish-brown loamy fine sand; and below this is a layer of brown loamy fine sand.

Bruno soils are low in natural fertility. Permeability is rapid, and available water capacity is low. Response to fertilizer is poor. The surface layer is easy to till and can be cultivated over a wide range of moisture content. Most areas are used for pasture. A few small areas are used for crops. Some tracts are wooded, and others have been developed for urban uses.

Representative profile of a Bruno fine sandy loam, in a moist pasture in the NE¼NE¼NW¼ sec. 36, T. 1 N., R. 11 W.:

Ap—0 to 6 inches, dark-brown (10YR 3/3) fine sandy loam; weak, medium, granular structure; friable; many fine roots; mildly alkaline; gradual, smooth boundary.

C1—6 to 16 inches, brown (7.5YR 5/4) sandy loam; single grained to weak, platy structure inherited from rock; friable; common bedding planes; many fine roots; moderately alkaline; gradual, smooth boundary.

C2—16 to 23 inches, pale-brown (10YR 6/3) fine sand; single grained; loose; many bedding planes; common fine roots; mildly alkaline; abrupt, smooth boundary.

C3—23 to 25 inches, dark-brown (7.5YR 4/4) silt loam; massive to weak, platy structure inherited from rock; friable; common bedding planes; few fine roots; mildly alkaline; calcareous; abrupt, smooth boundary.

C4—25 to 52 inches, light yellowish-brown (10YR 6/4) loamy fine sand; single grained; very friable; many bedding planes; mildly alkaline; abrupt, smooth boundary.

C5—52 to 72 inches, brown (10YR 5/3) loamy fine sand; few strong-brown (7.5YR 5/6) streaks; single grained; very friable; many bedding planes; few black organic-matter accumulations; mildly alkaline.

The A horizon is dark yellowish brown, dark brown, brown, or strong brown. The C horizon is brownish-yellow to pale-brown or dark-brown fine sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, and silt loam. Reaction is medium acid to moderately alkaline throughout.

Bruno soils are near Crevasse and Norwood soils. They contain less sand and are more stratified than Crevasse soils and contain more sand than Norwood soils.

Bruno fine sandy loam (Bs).—This soil is on natural levees along the Arkansas River. Slopes range from 0 to 2 percent. Some tracts are subject to occasional flooding. Areas range from about 80 to 800 acres in size. This soil has the profile described as representative for the series. Included in mapping are a few spots of Crevasse and Norwood soils and Urban land.

Available water capacity is low. Droughtiness is therefore a severe limitation.

This soil is poorly suited to cultivation and fairly well suited to pasture. Suitable crops are winter small grain and grain sorghum. Suitable pasture plants are bermudagrass, bahiagrass, johnsongrass, and crimson clover. Capability unit IIIs-1; woodland group 2s5.

Bruno-Urban land complex (Bu).—This complex consists of Bruno soils and of areas of material, mainly from Bruno soils, that have been modified by urban development. These soils are on natural levees along the Arkansas River. Areas generally range from about 30 to 150 acres in size. Some tracts are subject to occasional flooding. Bruno soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Crevasse and Norwood soils.

Runoff is slow on the Bruno soil. Permeability is rapid, and available water capacity is low.

The Bruno soils are suited to a wide selection of landscaping plants, but, because they are droughty, frequent irrigation is needed for satisfactory growth of most ornamental plants. These soils are slightly to moderately limited for most urban uses, and they are severely limited for these uses where flooding is a hazard. Not assigned to a capability unit or to a woodland group.

Carnasaw Series

The Carnasaw series consists of well-drained, gently sloping to steep soils on the top, sides, and foot slopes of mountains, on benches, and on low ridges in the valleys. The soils formed in a thin layer of loamy material and in the underlying clayey material that weathered from shale. The native vegetation is mixed pine and hardwoods.

In a representative profile the surface layer is very dark grayish-brown gravelly silt loam about 2 inches thick. The subsurface layer is yellowish-brown gravelly silt loam about 4 inches thick. The subsoil extends to a depth of 49 inches. The upper 6 inches is yellowish-red silty clay; the next 11 inches is yellowish-red, mottled clay; the next 15 inches is light olive-brown, mottled silty clay; and the lower 11 inches is mottled silty clay loam. The underlying material is shale.

Carnasaw soils are low in natural fertility. Permeability is slow, and available water capacity is medium to high. Response to fertilizer is good. The surface layer is somewhat difficult to till because of its high content of coarse fragments.

Gently sloping areas of these soils are poorly suited to cultivation, even if erosion control measures are installed. Few areas are used for crops. Most areas are in mixed pine and hardwood trees. Some cleared areas are used for pasture, but many areas have been developed for urban uses. Other areas are idle and are held for future urban development.

Representative profile of a Carnasaw gravelly silt loam, in a moist, wooded spot in an area of Carnasaw-Urban land complex, 3 to 8 percent slopes, in the SE¼SE¼SE¼ sec. 5, T. 1 N., R. 13 W.:

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) gravelly silt loam; weak, fine, granular structure; friable; common fine roots; many angular sandstone and quartzite fragments ¼ inch to 3 inches in diameter; medium acid; abrupt, smooth boundary.

A2—2 to 6 inches, yellowish-brown (10YR 5/8) gravelly silt loam; streaks of very dark grayish-brown (10YR 3/2) and yellowish-red (5YR 5/6) material from horizons above and below; weak, fine, subangular blocky structure; friable; common fine roots; many angular sandstone and quartzite fragments ¼ to 1 inch in diameter; strongly acid; clear, smooth boundary.

B21t—6 to 12 inches, yellowish-red (5YR 4/6) silty clay; moderate, medium, subangular blocky structure; firm; common fine roots; common sandstone fragments ¼ to 1 inch in diameter; few fine pores; continuous clay films on faces of most peds; strongly acid; gradual, irregular boundary.

B22t—12 to 23 inches, yellowish-red (5YR 5/6) clay; common, coarse, prominent yellowish-brown (10YR 5/6) mottles; strong, medium, subangular blocky structure; firm; few sandstone fragments ¼ to 1 inch in diameter; continuous clay films on faces of peds; few fine roots; few fine pores; very strongly acid; gradual, irregular boundary.

B23t—23 to 38 inches, light olive-brown (2.5YR 5/4) silty clay; common, fine and medium, prominent, red (2.5YR 4/8) mottles; moderate, medium, angular blocky structure; firm; continuous clay films on faces of most peds; few fine roots; common sandstone fragments ¼ inch to 2 inches in diameter; very strongly acid.

B24t—38 to 49 inches, mottled gray (N 5/0), red (2.5YR 4/8), and strong-brown (7.5YR 5/8) silty clay loam; moderate, medium, blocky structure; firm; patchy clay films on faces of peds and on surfaces of coarse fragments; about 30 percent, by volume, interbedded, partially weathered sandstone and shale; extremely acid.

C—49 inches, shale.

The A1 horizon is very dark grayish-brown, dark grayish-brown, brown, or dark-brown silt loam or gravelly silt loam. The Ap horizon, where present, is dark grayish brown to brown. The A2 horizon is brown, yellowish-brown, or light yellowish-brown silt loam or gravelly silt loam. Content of coarse fragments in the A horizon ranges from 0 to 30 percent, by volume. The B21t, B22t, and B23t horizons are 0 to 10 percent, by volume, coarse fragments. The B21t horizon is strong-brown, reddish-yellow, or yellowish-red silty clay loam or silty clay. In some places the B22t horizon is mottled in shades of brown or yellow. The B23t and B24t horizons are mottled in shades of gray, red, yellow, and brown. Texture is silty clay loam or silty clay. The B24t horizon is gravelly in many places. It is 10 to 30 percent, by volume, coarse fragments. Depth to the tilted, weathered, interbedded shale, sandstone, and quartzite bedrock ranges from 30 to 60 inches. The A horizon is medium acid to strongly acid; the B21t, B22t, and B23t horizons are very strongly acid or strongly acid, and the B24t horizon is strongly acid to extremely acid.

Carnasaw soils are near Mountainburg and Sallisaw soils. They have more clay in the B horizon than Mountainburg and Sallisaw soils. They are deeper over bedrock and have fewer coarse fragments than Mountainburg soils. They are shallower to bedrock than Sallisaw soils.

Carnasaw gravelly silt loam, 3 to 8 percent slopes (CaC).—This soil is on the top, sides, and foot slopes of mountains, on benches, and on low ridges in valleys. Areas range from about 40 to 200 acres in size. Included in mapping are a few small areas of Mountainburg and Sallisaw soils.

Runoff is medium, and the hazard of erosion is very severe if this soil is cultivated. Good management that includes contour cultivation and terraces permits growing an occasional clean-tilled crop that leaves a large amount of residue, provided the cropping system used is one that keeps close-growing crops on the soil most of the time.

This soil is used mainly for pasture or meadow. Suitable pasture plants are bahiagrass, bermudagrass, white clover, sericea lespedeza, and annual lespedeza. This soil is better suited to winter small grain than to other crops. It is fairly well suited to peaches, apples, pears, and similar fruit crops. Capability unit IVe-1; woodland group 3o1.

Carnasaw gravelly silt loam, 8 to 12 percent slopes (CaD).—This soil is on the top and foot slopes of mountains, on benches, and on low ridges in valleys. Individual areas range from about 40 to 200 acres in size. Included in mapping are a few small spots of Mountainburg soils.

Runoff is rapid, and the hazard of erosion is severe.

This soil is not suited to clean-tilled crops. It is better suited to pasture or woodland. Suitable pasture plants are bahiagrass, bermudagrass, white clover, sericea lespedeza, and annual lespedeza. Capability unit VIe-1; woodland group 3o1.

Carnasaw-Urban land complex, 3 to 8 percent slopes (CbC).—In this complex are Carnasaw and Mountainburg soils and areas of material derived mainly from Carnasaw and Mountainburg soils that has been modified by urban development. Areas generally range from about 100 to 800 acres in size. Carnasaw and Mountainburg soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest. A Carnasaw soil in this complex has a profile similar to that described as representative for the Carnasaw series, but depth to the tilted interbedded shale, sandstone, and quartzite bedrock ranges from 10 to 60 inches.

Included with this complex in mapping are areas of soils that are steeper than 8 percent, spots of Sallisaw soils, and spots of soils that are similar to Carnasaw soils but are less than 30 inches deep over bedrock. Also included are spots of soils that are similar to Mountainburg soils but are underlain by shale.

Runoff is medium to rapid on the Carnasaw and Mountainburg soils, and the hazard of erosion is severe if these soils are not protected by vegetation. Where these soils are shallow, they have low available water capacity and need frequent irrigation for satisfactory growth of many ornamental plants.

These soils are fairly well suited to a wide selection of landscaping plants, but shallow depth to bedrock limits the rooting depth for many kinds of plants. These soils are severely limited for most urban uses by their high content of coarse fragments and their shallow depth to bedrock. Also, the Carnasaw soils are severely limited by moderate to high shrink-swell potential, low bearing capacity, and slow percolation rate. Not assigned to a capability unit or woodland group.

Carnasaw-Urban land complex, 8 to 12 percent slopes (CbD).—In this complex are Carnasaw and Mountainburg soils and areas of material, mainly from Carnasaw and Mountainburg soils, that have been modified by urban development. Most areas range from about 100 to 800 acres in size. Carnasaw and Mountainburg soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest. Depth to the tilted, interbedded shale, sandstone, and quartzite bedrock ranges from 10 to 60 inches.

Included with this complex in mapping are spots of rock outcrop, small areas of soils that have slopes of as much as 40 percent, and spots of soils similar to Carnasaw soils but less than 30 inches deep over bedrock. Also included are spots of soils that are similar to Mountainburg soils but are underlain by shale.

Runoff is rapid on the Carnasaw and Mountainburg soils, and the hazard of erosion is severe if these soils are not protected by vegetation. In small shallow areas, available water capacity is low and frequent irrigation is needed for satisfactory growth of many ornamentals.

The soils in this complex are fairly well suited to a wide selection of landscaping plants, but depth to bedrock limits the rooting depth for some kinds of plants. These soils are severely limited for most urban uses because of their high content of coarse fragments and their shallow depth to bedrock. Also, the Carnasaw soils are severely limited by a moderate to high shrink-swell potential, low bearing capacity, and slow percolation rate. Not assigned to a capability unit or to a woodland group.

Carnasaw-Mountainburg association, undulating (CMC).—The soils in this association are on the top, sides, and foot slopes of mountains, on benches, and on low ridges in valleys. Slopes range from 3 to 12 percent. Although the soils are in areas large enough to be mapped separately, they were not separated in mapping because of their poor accessibility and their low intensity of use. The soils are in an irregular pattern because of faulting and folding of the parent bedrock, but they occur in about the same relative proportions in each area. About 65 percent of this association is Carnasaw gravelly silt loam and silt loam, and 25 percent is Mountainburg stony fine sandy loam. The remaining 10 percent is small areas of rock outcrop, soils that are similar to Carnasaw soils but have bedrock at a depth of less than 30 inches, and soils that are similar to Mountainburg soils but

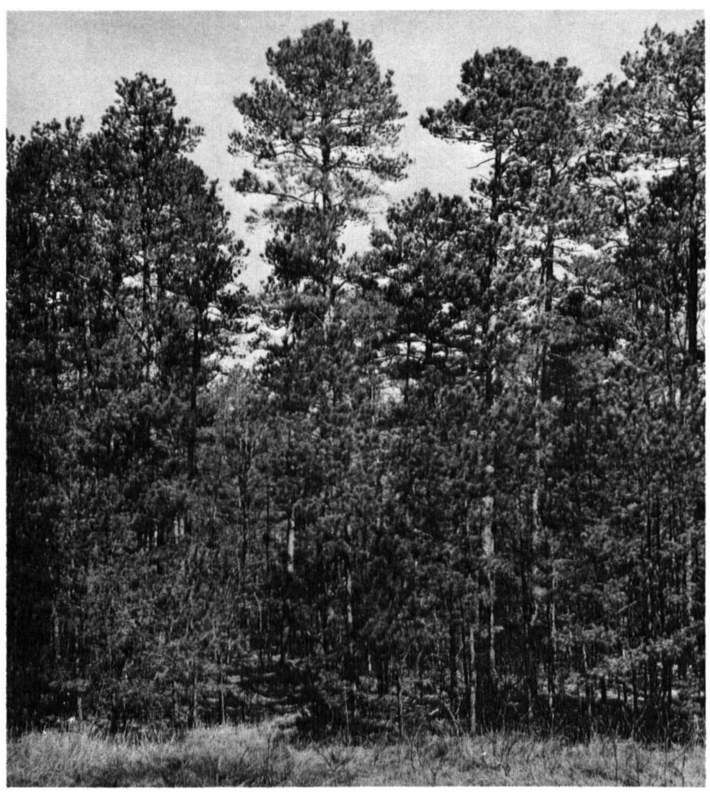

Figure 3.—**Stand of shortleaf pine on a Carnasaw soil in an area of Carnasaw-Mountainburg association, undulating.**

are silty throughout and are underlain by shale. Areas of this association range from 100 to 800 acres in size.

Runoff is medium to rapid, and the hazard of erosion is severe to very severe. The irregular slopes make management of pasture difficult.

The soils in this association generally are not suitable for cultivation. The Carnasaw soils are fairly well suited to pasture, and the Mountainburg soils are poorly suited to pasture. Stones on the surface, droughtiness of Mountainburg soils, and irregular slopes make management of pasture difficult. This association is better suited to wildlife habitat and woodland than to most other uses (fig. 3). A few small areas of this association are used as pasture. Suitable pasture plants are bahiagrass, bermudagrass, white clover, sericea lespedeza, and annual lespedeza. Carnasaw soils are in capability unit IVe-1 and in woodland group 3o1; Mountainburg soils are in capability unit VIs-1 and in woodland group 5x3.

Carnasaw-Mountainburg association, steep (CMF).—The soils in this association are on the top and sides of mountains and on ridges. Slopes range from 12 to 40 percent. Although the soils are in areas large enough to be mapped separately, they were not separated in mapping because of their poor accessibility and their low intensity of use. The soils are in an irregular pattern because of faulting and folding of the parent bedrock, but they occur in about the same relative proportions in each area. About 65 percent of this association is Carnasaw gravelly silt loam, and 20 percent is Mountainburg stony fine sandy loam. The remaining 15 percent is small areas of rock outcrop, soils that are similar to Carnasaw soils but have bedrock at a depth of less than 30 inches, and soils that are similar to Mountainburg soils but are silty throughout and underlain by shale. Areas of this association range from 100 to 800 acres in size.

Runoff is very rapid, and the hazard of erosion is very severe.

The soils in this association generally are not suited to cultivation and are poorly suited to pasture. This association is better suited to wildlife habitat or to woodland. Carnasaw soils are in capability unit VIIe-1 and in woodland group 3r3; Mountainburg soils are in capability unit VIIs-1 and in woodland group 5x3.

Crevasse Series

The Crevasse series consists of excessively drained, level and nearly level soils on young natural levees along the Arkansas River. These soils formed in sandy sediment carried from the west by the Arkansas River. Most areas lack vegetation, but some are vegetated with cottonwood and willow trees.

In a representative profile the surface layer is yellowish-brown fine sand about 15 inches thick. The underlying material is yellowish-brown sand.

Crevasse soils are low in natural fertility. Permeability is rapid, and available water capacity is low.

Little use is made of these soils. Cottonwood and willow trees grow on some tracts, but most of the areas are river-washed sand that is almost bare of vegetation.

Representative profile of Crevasse fine sand, on an unvegetated sand bar in the NE¼SW¼SE¼ sec. 24, T. 2 N., R. 13 W.:

A—0 to 15 inches, yellowish-brown (10YR 5/4) fine sand; single grained; loose; mildly alkaline; diffuse boundary.

C—15 to 72 inches, yellowish-brown (10YR 5/4) sand; single grained; loose; mildly alkaline.

The A horizon is dark brown to yellowish brown. The C horizon is brown or yellowish brown. It is loamy fine sand to sand. Reaction is slightly acid to mildly alkaline throughout.

Crevasse soils are near Bruno and Norwood soils. They are more sandy than those soils.

Crevasse fine sand (Cr).—This soil is on young natural levees along the Arkansas River. Slopes range from 0 to 2 percent. Areas range from about 60 to 500 acres in size. Included in mapping are a few spots of Bruno and Norwood soils.

Available water capacity is low, and this soil is very severely limited by droughtiness. Most areas are subject to occasional or frequent flooding.

This soil is poorly suited to farming. Cottonwood and willow trees and patches of bermudagrass grow on some small areas, but most of the areas are not vegetated. Bermudagrass and johnsongrass are better suited than other pasture plants. Most of the area is idle or is used for wildlife habitat and recreation. Capability unit IVs-1; woodland group 3s6.

Guthrie Series

The Guthrie series consists of poorly drained, level soils on stream terraces, in depressions on the top of mountains, and on the coastal plain. These soils formed in loamy sediment washed mainly from uplands of weathered sandstone and shale. The native vegetation is chiefly mixed hardwoods and pines.

In a representative profile the surface layer is brown silt loam about 2 inches thick. The subsurface layer is gray, mottled silt loam about 4 inches thick. The subsoil extends to a depth of 72 inches or more. The upper 10 inches is light-gray, mottled, friable silt loam; the middle 30 inches is a firm, brittle, mottled fragipan of silty clay loam; and the lower part is mottled, friable silt loam.

Guthrie soils are low in natural fertility. Permeability is slow, and available water capacity is medium. The firm, brittle layer in the subsoil restricts root penetration and slows the movement of water through the soil. Response to fertilizer is good. The surface layer is easy to till but contains excess water for long periods after a rain.

When they are drained and well managed, these soils are suited to cultivation. Most of the areas are used for pasture or meadow.

Representative profile of Guthrie silt loam, in a moist, wooded area of Guthrie-Leadvale complex, undulating, in the NE¼NW¼SW¼ sec. 20, T. 4 N., R. 11 W.:

A1—0 to 2 inches, brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; many fine roots; medium acid; abrupt, smooth boundary.

A2—2 to 6 inches, gray (10YR 6/1) silt loam; many, medium, distinct mottles of brownish yellow (10YR 6/8) and many, fine, distinct mottles of strong brown (7.5YR 5/8); thick platy structure parting to moderate, medium, subangular blocky; friable; few fine and large roots; common fine holes; medium acid; clear, wavy boundary.

B2g—6 to 16 inches, light-gray (10YR 7/1) silt loam; many, medium, distinct mottles of brownish yellow (10YR 6/6) and many, fine, distinct mottles of strong brown (7.5YR 5/8); moderate, medium, subangular blocky structure; friable; patchy clay films on faces of peds; very strongly acid; gradual, wavy boundary.

Bx1—16 to 28 inches, mottled, light brownish-gray (10YR 6/2), brownish-yellow (10YR 6/6), and strong-brown (7.5YR 5/8) silty clay loam; moderate, medium, subangular blocky structure; firm; brittle; patchy clay films on faces of peds; few fine roots; many fine and medium pores; many, medium, dark concretions; very strongly acid; abrupt, wavy boundary.

Bx2—28 to 46 inches, mottled, very dark gray (10YR 3/1), brownish-yellow (10YR 6/8), and red (2.5YR 4/8) silty clay loam; moderate, medium, subangular blocky structure; firm; brittle; patchy dark-brown (10YR 3/3) clay films on faces of peds; many fine and medium pores; many, medium, dark concretions; very strongly acid; abrupt, wavy boundary.

B′21tg—46 to 56 inches, mottled, dark-gray (N 4/0), yellowish-red (5YR 5/8), and brownish-yellow (10YR 6/6) silt loam; moderate, coarse, angular blocky structure; friable; continuous clay films on faces of peds; common fine roots; many fine pores; very strongly acid; clear, wavy boundary.

B′22tg—56 to 62 inches, mottled, gray (10YR 6/1), yellowish-brown (10YR 5/8), and yellowish-red (5YR 5/8) silt loam; weak, medium, angular blocky structure; friable; patchy clay films on faces of peds; many fine pores; few sandstone fragments as much as 1 inch in diameter; very strongly acid; gradual, wavy boundary.

B′23tg—62 to 72 inches, gray (10YR 6/1) silt loam; many, medium, distinct mottles of brownish yellow (10YR 6/8), strong brown (7.5YR 5/8), and yellowish red (5YR 5/8); weak, medium, angular blocky structure; friable; patchy clay films on faces of peds; many fine pores; about 10 percent, by volume, is sandstone and shale fragments as much as 7 inches in diameter; very strongly acid.

The Ap or A1 horizon is dark grayish brown or brown to light brownish gray. The A2 horizon is light gray to grayish brown. The B2tg horizon is light-gray, gray, or light brownish-gray silt loam or silty clay loam. Depth to the Bx horizon is 15 to 30 inches. It is silt loam or silty clay loam. The B2 horizon is silt loam or silty clay loam. The A horizon is very strongly acid to slightly acid, and the horizons below are very strongly acid or strongly acid.

These soils are slightly less leached, have patchy clay films, and contain slightly less total clay in the horizon above the fragipan than is defined as within the range for the series, but these differences do not alter their usefulness and behavior.

Guthrie soils are near Leadvale soils. They are grayer and more poorly drained than Leadvale soils.

Guthrie-Leadvale complex, undulating (GeB).—The soils in this complex are in valleys, in depressions, on the top of low mountains, and on the coastal plain. Slopes range from 0 to 3 percent. Areas of this association range from about 15 to 800 acres in size. About 65 to 70 percent of this association is Guthrie soils, and 30 to 35 percent is Leadvale soils. Guthrie soils are on level areas between mounds, and Leadvale soils are on low, rounded mounds. The mounds are 65 to 100 feet in diameter and 2 to 3 feet higher than areas of the Guthrie soils. Included in mapping are spots of Amy soils.

The soils in this complex are suited to crops, but wetness is a very severe hazard in level areas and erosion is a moderate hazard in nearly level areas. Farming operations are delayed several days after rains unless surface drains are installed, and the mounds limit the use of some kinds of farm equipment. Under good management that includes adequate drainage, clean-tilled crops that leave a large amount of residue can be safely grown year after year.

The soils of this complex are used mainly for pasture and meadow. Suitable crops include soybeans and grain sorghum. Winter small grain can be grown where surface drainage is adequate. Suitable pasture plants are bermudagrass, bahiagrass, tall fescue, white clover, annual lespedeza, and sericea lespedeza. Capability unit IVw-1; woodland group 2w9.

Keo Series

The Keo series consists of well-drained, level soils on young natural levees. These soils formed in loamy alluvium deposited by the Arkansas River. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is dark-brown silt loam about 10 inches thick. The subsoil is 28 inches thick. The upper 10 inches is dark-brown loam, the middle 7 inches is dark-brown silt loam, and the lower 11 inches is dark reddish-brown silt loam. Below is dark reddish-brown silt loam and reddish-brown very fine sandy loam.

Keo soils are moderate to high in natural fertility. Permeability is moderate, and available water capacity is high. Response to fertilizer is good. Tilth is easy to maintain. These soils can be cultivated over a wide range of moisture content.

These soils are well suited to most crops and pasture plants, and nearly all areas are cleared. Some areas have been developed for urban uses.

Representative profile of Keo silt loam, in a moist, cultivated area in the NE¼NE¼SW¼ sec. 18, T. 1 S., R. 10 W.:

Ap—0 to 10 inches, dark-brown (7.5YR 4/4) silt loam, dark reddish-brown (5YR 3/4) on faces of peds; weak, fine, granular structure; friable; common fine roots; slightly acid; clear, smooth boundary.

B1—10 to 20 inches, dark-brown (7.5YR 4/4) loam; weak, medium, subangular blocky structure; friable; common fine roots; neutral; clear, smooth boundary.

B2—20 to 27 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; few fine roots; many fine pores; neutral; clear, smooth boundary.

B3—27 to 38 inches, dark reddish-brown (5YR 3/4) silt loam; weak, medium, subangular blocky structure; friable; common fine roots; many fine pores; neutral; clear, smooth boundary.

IIAb—38 to 41 inches, dark reddish-brown (5YR 3/4) silt loam; weak, medium, subangular blocky structure; friable; few fine roots; common fine accumulations of soft, dark organic matter; mildly alkaline; clear, smooth boundary.

IIIC—41 to 52 inches, reddish-brown (5YR 4/4) very fine sandy loam; massive; very friable; few fine roots; moderately alkaline; clear, smooth boundary.

IVAb—52 to 62 inches, dark reddish-brown (5YR 3/4) silt loam; weak, medium, subangular blocky structure; firm; few fine accumulations of soft, dark organic matter; moderately alkaline; calcareous.

The Ap horizon is dark brown or brown. The B1 horizon is dark-brown to reddish-brown silt loam to very fine sandy loam. The B2 and B3 horizons are dark-brown or brown to dark reddish-brown silt loam to very fine sandy loam. In some places, the underlying layers are similar to the B horizon in color and texture, but in others the texture ranges from sandy to clayey. The A and B horizons are slightly acid to mildly alkaline, and the underlying material is mildly alkaline or moderately alkaline. Bedrock is many feet below the surface.

Keo soils are near Norwood and Rilla soils. They contain less clay than Norwood soils, and they have a B horizon that Norwood soils lack. Keo soils are less acid than the Rilla soils, and they lack the B horizon of clay accumulation that is in those soils.

Keo silt loam (Ko).—This soil is on flood plains and young natural levees along the Arkansas River. Slopes are less than 1 percent. Areas range from about 40 to 800 acres in size. The profile of this soil is the one described as representative for the series. Included in mapping are a few spots of Norwood and Rilla soils.

If this soil is well managed, clean-tilled crops that leave a large amount of residue can be grown on it year after year. On tracts subject to occasional flooding, cool-season crops are likely to be damaged by floods in some years.

This soil is well suited to farming. It warms early in spring, and early planting is possible. The main crops are cotton (fig. 4) and soybeans. Some of the suitable crops are corn, winter small grain, grain sorghum, and truck crops such as tomatoes and green beans. Among the suitable pasture plants are bahiagrass, bermudagrass, dallisgrass, johnsongrass, tall fescue, annual lespedeza, crimson clover, and white clover. Capability units I-1 (protected areas) and IIw-1 (occasionally flooded areas); woodland group 2o4.

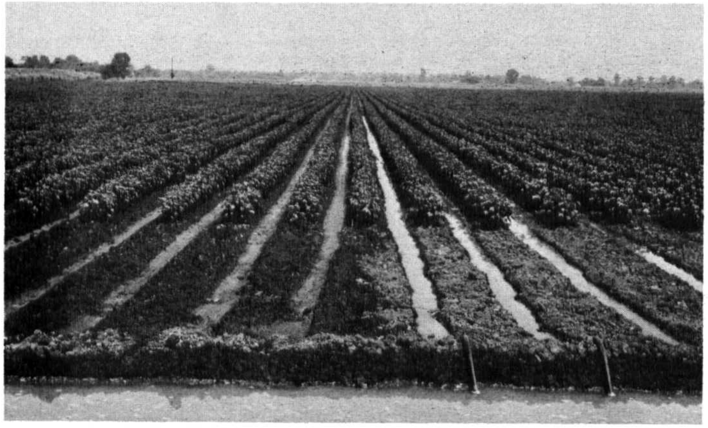

Figure 4.—**Furrow irrigation of cotton on a Keo silt loam.**

Keo-Urban land complex (Ku).—This complex consists of Keo soils and of areas of material, mainly from Keo soils, that has been modified by urban development. Keo soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Norwood and Rilla soils.

Runoff is slow on the Keo soils, but water moves readily into and through them.

These soils are well suited to a wide selection of landscaping plants. They are generally slightly to moderately limited for most urban uses, but where flooding is a hazard, the limitations are severe. Not assigned to a capability unit or to a woodland group.

Latanier Series

The Latanier series consists of somewhat poorly drained, level soils. These soils formed in thin beds of clayey sediment and the underlying loamy sediment laid down by the Arkansas River. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is dark reddish-brown silty clay about 9 inches thick. The upper part of the subsoil is dark reddish-brown silty clay about 25 inches thick. The lower part is dark-brown fine sandy loam about 5 inches thick. The underlying material is brown fine sandy loam.

Latanier soils are high in natural fertility. Permeability is very slow, and available water capacity is high. When these soils dry, they shrink and crack, and when they are wet, they expand and the cracks seal.

Where these soils are adequately drained, they are suited to most crops and pasture plants commonly grown in the county. Most areas are used for crops. A few tracts are being developed for urban uses.

Representative profile of Latanier silty clay, in a moist, cultivated area in the SW¼SW¼SE¼ sec. 10, T. 2 S., R. 11 W.:

Ap—0 to 9 inches, dark reddish-brown (5YR 3/2) silty clay; moderate, medium, subangular blocky structure; firm; plastic; many fine roots; slightly acid; gradual, wavy boundary.

B2—9 to 30 inches, dark reddish-brown (5YR 3/3) silty clay; moderate, medium, subangular blocky structure; firm; plastic; thin clay films or pressure faces on faces of peds; common fine roots; few fine pores; few charcoal fragments; common slickensides; neutral; gradual, wavy boundary.

B3—30 to 34 inches, dark reddish-brown (5YR 3/4) silty clay; moderate, medium, angular blocky structure; firm; plastic; few fine roots; few fine pores; few charcoal fragments; neutral; clear, smooth boundary.

IIB3—34 to 39 inches, dark-brown (7.5YR 4/4) fine sandy loam; weak, medium, subangular blocky structure; friable; few charcoal fragments; few fine pores; neutral; clear, smooth boundary.

IIC—39 to 56 inches, brown (7.5YR 5/4) fine sandy loam; massive; friable; neutral.

The A horizon is dark brown or dark reddish brown. The B2 horizon is dark reddish-brown or reddish-brown clay or silty clay. The B3 horizon is dark reddish-brown or reddish-brown silty clay, silty clay loam, or sandy clay loam. The IIB3 horizon is dark-brown or reddish-brown fine sandy loam, very fine sandy loam, or silt loam. In some places the IIB3 horizon is lacking. The IIC horizon is yellowish-red or brown fine sandy loam or loamy sand. The A horizon is slightly acid to mildly alkaline, and the B and C horizons are neutral to moderately alkaline in reaction. Bedrock is many feet below the surface.

Latanier soils are near Moreland, Norwood, and Perry soils. They have more clay in the upper part of the profile than Norwood soils, and less clay than Perry soils. Latanier soils formed in thinner beds of clayey sediment than Moreland and Perry soils and in the upper part of the profile are not so gray as Perry soils.

Latanier silty clay (La).—This soil is in slack-water areas on the Arkansas River flood plain. Areas range from about 40 to 300 acres in size. Included in mapping are few spots of Moreland, Norwood, and Perry soils.

Runoff is slow, and the wetness is a severe limitation. Because of its high clay content, this soil can be cultivated only within a narrow range of moisture content. Preparing a seedbed and maintaining good tilth are difficult. Farming operations are delayed several days after rains unless surface drains are provided. Clean-tilled crops that leave a large amount of residue can be safely grown year after year if this soil is adequately drained and otherwise well managed.

This soil is suited to crops, and most of it is cultivated. A few small areas are in pasture or woodland. Suitable crops are soybeans, rice, winter small grain, cotton, grain sorghum, and alfalfa. Suitable pasture plants are bermudagrass, dallisgrass, tall fescue, white clover, and vetch. Capability unit IIIw-2; woodland group 2w5.

Leadvale Series

The Leadvale series consists of moderately well drained, nearly level and gently sloping soils in valleys, on the top of low mountains in the Arkansas River Valley, and on the coastal plain. These soils formed mainly in loamy sediment washed from uplands consisting of weathered sandstone and shale. In some areas they formed in material weathered from siltstone. The native vegetation is chiefly mixed hardwoods and pines.

In a representative profile the surface layer is dark yellowish-brown silt loam about 7 inches thick. The upper 9 inches of the subsoil is strong-brown, friable silt loam. Below this, and extending to a depth of 72 inches or more, the subsoil is a firm, brittle fragipan that is mottled, very pale brown and strong-brown silt loam in the upper 8 inches and silty clay loam mottled in shades of gray and brown below.

Leadvale soils are low in natural fertility. Permeability is moderately slow, and available water capacity is medium. The firm, brittle layer in the subsoil restricts root penetration and slows movement of water through the soils. Response to fertilizer is good. These soils are easy to till.

Where erosion is controlled, these soils are suited to

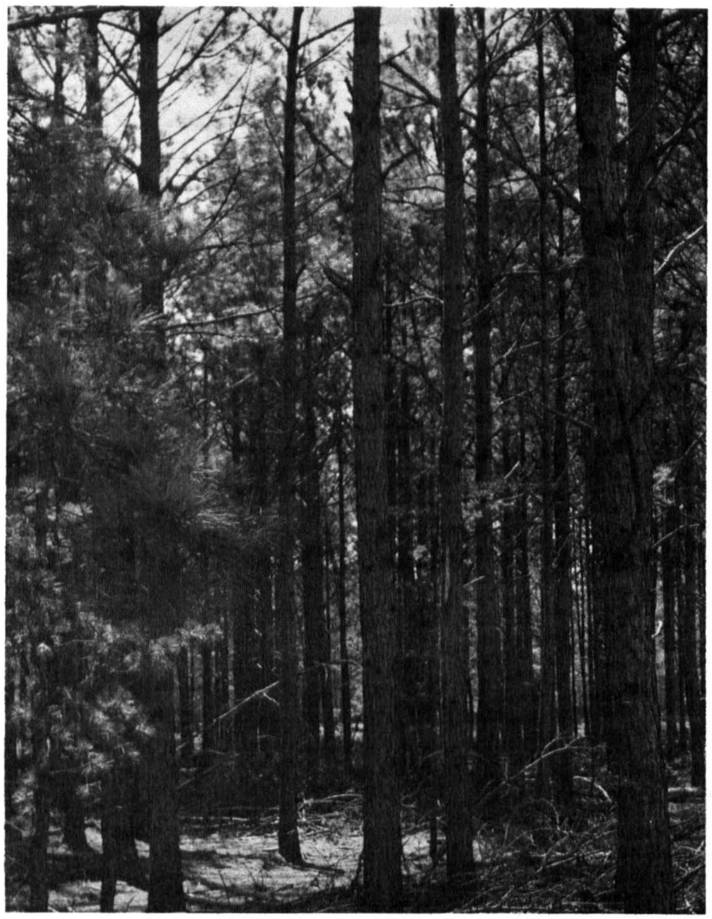

Figure 5.—**A well-managed stand of loblolly pine in an area of Leadvale silt loam, 1 to 3 percent slopes.**

cultivation. Most areas were formerly cultivated, but they are now used mainly for pasture. Some areas have been reforested (fig. 5). Many tracts have been developed for urban uses, and others are idle and are held for future urban development.

Representative profile of Leadvale silt loam, 1 to 3 percent slopes, in a moist pasture in the NE¼NE¼SE¼ sec. 31, T. 4 N., R. 11 W.:

Ap—0 to 7 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; friable; many fine roots; strongly acid; abrupt, smooth boundary.

B2t—7 to 16 inches, strong-brown (7.5YR 5/6) silt loam; weak, fine, subangular blocky structure parting to moderate, medium, subangular blocky; friable; few, thin, patchy clay films in cavities and pores and on faces of peds; common fine roots; many fine pores; strongly acid; gradual, smooth boundary.

Bx1—16 to 24 inches, mottled, very pale brown (10YR 7/4) and strong-brown (7.5YR 5/6) silt loam; moderate, med ium, sub-angular blocky structure; firm; brittle; few, thin, patchy clay films in cavities and pores and on faces of peds; few fine roots; many fine pores; many, fine, dark concretions; very strongly acid; gradual, smooth boundary.

Bx2—24 to 48 inches, mottled, light-gray (10YR 7/2), yellowish-brown (10YR 5/6), and dark-brown (10YR 3/3) silty clay loam; weak, medium, subangular blocky structure; firm; brittle; common, thin, patchy clay films in cavities and pores and on faces of peds; many medium pores; many, medium and coarse, black accretions; few sandstone pebbles; strongly acid; gradual, wavy boundary.

Bx3—48 to 72 inches, mottled, gray (10YR 6/1) and brownish-yellow (10YR 6/6) silty clay loam; weak, medium, subangular blocky structure; firm; brittle; common, thin, patchy clay films in cavities and pores and on faces of peds; few fine pores; strongly acid.

The Ap horizon is dark grayish brown, dark yellowish brown, or brown. In undisturbed areas the A1 horizon is very dark grayish-brown or dark grayish-brown silt loam 1 to 2 inches thick, and the A2 horizon is brown or yellowish-brown silt loam 3 to 7 inches thick. The B2t horizon is strong-brown, yellowish-brown, or brownish-yellow silt loam or silty clay loam. In some places the lower boundary of the B2t horizon is marked by common, medium, prominent, light-gray mottles. Depth to the Bx horizon is 16 to 33 inches. This horizon is silt loam or silty clay loam. The A horizon is very strongly acid to neutral in reaction, and the horizons below it are very strongly acid or strongly acid.

Leadvale soils are near Amy, Guthrie, Linker, Rexor, Sallisaw, Smithdale, Tiak, and Wrightsville soils. They differ from the Linker, Rexor, Sallisaw, and Smithdale soils in having a fragipan and in being more poorly drained. Leadvale soils are browner below the Ap or A1 horizon and better drained than Amy, Guthrie, and Wrightsville soils. They have a fragipan that Amy and Wrightsville soils lack. Leadvale soils are not so clayey in the B horizon as Tiak and Wrightsville soils.

Leadvale silt loam, 1 to 3 percent slopes (LeB).—This soil is in valleys, on the top of low mountains, and on the coastal plain. Areas range from about 10 to 200 acres in size. The profile of this soil is the one described as representative for the series.

Included with this soil in mapping are a few spots of Amy, Guthrie, Sallisaw, Smithdale, and Wrightsville soils.

The hazard of erosion is moderate on this soil. If this soil is contoured, cultivated, terraced on long slopes, and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown year after year. Crops can be sown without attention to row direction.

This soil is used mainly for pasture (fig. 6). Many tracts are held for future urban development. This soil is suited to such crops as soybeans, grain sorghum, winter small grain, and truck crops, all of which are grown in a few areas. Suitable pasture plants are bahiagrass, bermudagrass, tall fescue, white clover, sericea lespedeza, and annual lespedeza. Capability unit IIe-1; woodland group 3o7.

Leadvale silt loam, 3 to 8 percent slopes (LeC).—This soil is in valleys, on the top of low mountains, and on the coastal plain. Areas range from about 10 to 300 acres in size.

Included with this soil in mapping are a few spots of Linker, Sallisaw, Smithdale, and Tiak soils.

Figure 6.—**Pasture of bermudagrass and legumes on Leadvale silt loam, 1 to 3 percent slopes. The wooded hills in the background are in Carnasaw-Mountainburg association, steep.**

Runoff is medium to rapid, and the hazard of erosion is severe. If the less sloping areas of this soil are contour cultivated, terraced, and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown year after year. Intensive conservation measures are needed as slope length and gradient increase.

This soil is used mainly for pasture. Many tracts are held for future urban development. This soil is suited to cultivation, and small areas are used for crops such as soybeans, grain sorghum, winter small grain, and truck crops. Suitable pasture plants are bahiagrass, bermudagrass, tall fescue, white clover, sericea lespedeza, and annual lespedeza. Capability unit IIIe-1; woodland group 3o7.

Leadvale-Urban land complex, 1 to 3 percent slopes (LdB).—This complex consists of Leadvale soils and of areas of material, mainly from Leadvale soils, that have been modified by urban development. Areas generally range from about 10 to 250 acres in size. Leadvale soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Guthrie, Sallisaw, Smithdale, and Tiak soils.

Runoff is medium on the Leadvale soils, and the hazard of erosion is moderate if the soils are not protected by vegetation. The subsoil has a compact layer that restricts growth of roots and the movement of water through the soils.

These soils are suited to a wide selection of landscaping plants. They are moderately to severely limited for most urban uses because of their seasonal perched water table, slow percolation rate, and moderate bearing capacity. Not assigned to a capability unit or to a woodland group.

Leadvale-Urban land complex, 3 to 8 percent slopes (LdC).—This complex consists of Leadvale soils and of areas of material, mainly from Leadvale soils, that have been modified by urban development. Areas generally range from about 10 to 250 acres in size. Leadvale soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Guthrie, Linker, Sallisaw, Smithdale, and Tiak soils.

Runoff is medium to rapid on the Leadvale soils, and the hazard of erosion is severe if the areas are not protected by vegetation. The subsoil has a compact layer that restricts growth of roots and the movement of water through the soils.

These soils are suited to a wide selection of landscaping plants. They are moderately to severely limited for urban uses, because of their seasonal perched water table, slow percolation rate, and moderate bearing capacity. Not assigned to a capability unit or to a woodland group.

Linker Series

The Linker series consists of well-drained, gently sloping to moderately steep soils on the top and sides of mountains, on benches, and on low ridges in valleys. These soils formed in loamy material weathered from sandstone. The native vegetation is mixed pines and hardwoods.

In a representative profile the surface layer is dark yellowish-brown gravelly fine sandy loam about 4 inches thick. The subsoil extends to a depth of about 30 inches. The upper 5 inches is strong-brown fine sandy loam, the middle 12 inches is yellowish-red clay loam, and the lower part is mottled clay loam. Below this is sandstone bedrock.

Linker soils are low in natural fertility. Permeability is moderate, and available water capacity is medium. Response to fertilizer is good. The surface layer is easy to till and can be cultivated over a wide range of moisture content.

Where measures for control of erosion are used, gently sloping areas of these soils are suited to cultivation. Most areas were formerly cultivated but are now used for pasture and meadow. Some areas are in woodland. Many tracts have been developed for urban uses, and others are idle and held for future urban development.

Representative profile of Linker gravelly fine sandy loam, 3 to 8 percent slopes, in a moist, wooded area in the SW¼SW¼NW¼ sec. 16, R. 11 W., T. 3 N.:

A1—0 to 4 inches, dark yellowish-brown (10YR 4/4) gravelly fine sandy loam; weak, fine, granular structure; very friable; many fine roots; about 20 per, by volume, is angular sandstone fragments less than 4 inches in diameter; strongly acid; clear, smooth boundary.

B1—4 to 9 inches, strong-brown (7.5YR 5/6) fine sandy loam; weak, fine, subangular blocky structure; very friable; many medium and fine roots; common fine pores; about 5 percent, by volume, is angular sandstone fragments less than 4 inches in diameter; very strongly acid; clear, smooth boundary.

B2t—9 to 21 inches, yellowish-red (5YR 5/8) clay loam; moderate, medium, subangular blocky structure; friable; thick, patchy clay films on faces of peds and in pores; common medium and fine roots; common fine pores; few angular sandstone and shale fragments less than 2 inches in diameter; very strongly acid; abrupt, smooth boundary.

B3—21 to 30 inches, mottled, strong-brown (7.5YR 5/6), brownish-yellow (10YR 6/8), and red (2.5YR 4/8) clay loam; moderate, medium, subangular blocky structure; friable; few, thin, patchy clay films on faces of peds; few fine and medium pores; few angular sandstone fragments less than 6 inches in diameter; very strongly acid; abrupt, smooth boundary.

R—30 inches, sandstone bedrock.

The A horizon is dark grayish brown, brown, or dark yellowish brown. Content of coarse fragments ranges from 10 to 25 percent, by volume. These coarse fragments are as much as 18 inches in diameter. The B1 horizon is strong-brown to yellowish-red fine sandy loam and loam. The B2t horizon is yellowish-red or red sandy clay loam or clay loam. The B3 horizon is sandy clay loam or clay loam. Content of coarse fragments in the B horizon ranges from 0 to 15 percent, by volume. Depth to bedrock ranges from 20 to 40 inches. The A horizon is medium acid to very strongly acid, and the B horizon is very strongly acid or strongly acid.

Linker soils are near Leadvale and Mountainburg soils. Linker soils are redder in the B horizon than Leadvale soils, and they lack the fragipan of those soils. They are deeper to bedrock than Mountainburg soils.

Linker gravelly fine sandy loam, 3 to 8 percent slopes (LkC).—This soil is chiefly on the top and sides of mountains and on benches. Some tracts are in valleys. The profile of this soil is the one described as representative for the series. Areas range from about 10 to 200 acres in size.

Included with this soil in mapping are a few spots of Leadvale and Mountainburg soils.

Runoff is medium, and the hazard of erosion is severe. If the less sloping areas of this soil are contour cultivated, terraced, and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown year after year. Intensive conservation measures are needed as slope length and gradient increase.

This soil is mainly used for pasture and meadow. It is suited to farming, and suitable crops are corn, grain sorghum, soybeans, winter small grain, and truck crops. Grapes, and fruit crops such as peaches, apples, and pears are also suited to this soil. Suitable pasture plants are bahiagrass, bermudagrass, white clover, sericea lespedeza, and annual lespedeza. Capability unit IIIe-1; woodland group 4o1.

Linker-Urban land complex, 3 to 8 percent slopes (LnC).—This complex consists of Linker soils and of areas of material, mainly from Linker soils, that have been modified by urban development. Areas generally range from about 10 to 200 acres in size. Depth to bedrock ranges from 20 to 40 inches. Linker soil makes up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Leadvale and Mountainburg soils.

Runoff is medium on the Linker soils, and the hazard of erosion is severe if the soils are not protected by vegetation. The shallow depth to bedrock limits the available water capacity and restricts the rooting depth for many deep-rooted plants.

These soils are suited to a wide selection of landscaping plants. They are moderately to severely limited for most urban uses because of slope and the shallow depth to bedrock. Not assigned to a capability unit or to a woodland group.

Linker-Mountainburg association, moderately steep (LRE).—The soils in this association are on the sides of hills and mountains. Slopes range from 12 to 25 percent. The soils are in areas large enough to be mapped separately, but they were not mapped separately, because of their poor accessibility and their low intensity of use. The soils are generally in a regular pattern, and they occur in about the same relative proportions in each area. About 40 percent of the association is Linker gravelly fine sandy loam and stony fine sandy loam, and 25 percent is Mountainburg stony fine sandy loam. The remaining 35 percent is rock outcrop; shallow stony silt loams overlying shale; moderately deep, stony soils that have a clayey subsoil overlying shale; and pockets of deep, loamy, cobbly soils that formed in material that washed or rolled downhill from the Linker and Mountainburg soils. The Linker soil is in areas between sandstone ledges or benches and on foot slopes. The Mountainburg soil is on narrow sandstone ledges and benches. Areas of this association range from 100 to 500 acres in size.

A Linker soil in this association has a profile similar to the one described as representative for the Linker series, but in some areas the surface layer is stony. A Mountainburg soil in this association has a profile similar to the one described as representative for the Mountainburg series.

Runoff is rapid, and the hazard of erosion is severe to very severe.

The soils in this association are not suited to cultivation. This association is better suited to woodland and to wildlife habitat than to other uses. Linker soils are in capability unit VIe-2 and in woodland group 4o1; Mountainburg soils are in capability unit VIIs-1 and in woodland group 5x3.

Moreland Series

The Moreland series consists of somewhat poorly drained, level soils that formed in thick beds of clayey sediment laid down by the Arkansas River. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is dark reddish-brown silty clay about 8 inches thick. The subsoil is dark reddish-brown silty clay that extends to a depth of 41 inches. Below is dark reddish-brown silty clay loam about 2 inches thick and dark reddish-brown silty clay about 15 inches thick that is underlain by brown loamy sand.

Moreland soils are high in natural fertility. Permeability is very slow, and available water capacity is high. When these soils dry, they shrink and crack, and when wet, they expand and the cracks seal.

Where these soils are adequately drained, they are suited to most commonly grown crops and pasture plants. Most areas are cultivated.

Representative profile of Moreland silty clay, in a moist, cultivated area in the NE¼SE¼SW¼ sec. 17, T. 1 N., R. 10 W.:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/2) silty clay; moderate, medium, subangular blocky structure; firm; plastic; many fine roots; slightly acid; gradual, wavy boundary.

B21—8 to 19 inches, dark reddish-brown (5YR 3/3) silty clay; moderate, medium, angular blocky structure; firm; plastic; few slickensides; shiny pressure faces on peds; few charcoal fragments; neutral; gradual, wavy boundary.

B22—19 to 32 inches, dark reddish-brown (5YR 3/4) silty clay; moderate, medium, angular blocky structure; firm; plastic; common slickensides, few intersecting; shiny pressure faces on peds; few fine roots; few, fine, black concretions; neutral; gradual, wavy boundary.

B3—32 to 41 inches, dark reddish-brown (5YR 3/4) silty clay; moderate, medium, angular blocky structure; firm; plastic; few slickensides, very few intersecting; shiny pressure faces on peds; few fine roots; few fine concretions; mildly alkaline; clear, smooth boundary.

IIC—41 to 43 inches, dark reddish-brown (5YR 3/4) silty clay loam; massive; friable; mildly alkaline; clear, smooth boundary.

IIIAb—43 to 58 inches, dark reddish-brown (5YR 3/4) silty clay; massive; firm; plastic; shiny pressure faces on peds; few slickensides; few accumulations of dark organic matter; moderately alkaline; clear, smooth boundary.

IVC—58 to 72 inches, brown (7.5YR 5/4) loamy sand; single grained; loose; mildly alkaline.

The A horizon is dark brown or dark reddish brown. The B horizon is silty clay or clay. The IIC horizon is brown, dark reddish-brown, or yellowish-red fine sandy loam, sandy clay loam, or silty clay loam. The IIIAb horizon is lacking in some places. The IVC horizon is brown loamy sand or sand. In some places it is lacking within 72 inches of the surface. The A horizon is slightly acid to mildly alkaline, the B horizon is neutral to moderately alkaline, and the underlying layers are slightly acid to moderately alkaline.

Moreland soils are near Latanier, Norwood, and Perry soils. They formed in thicker beds of clay than the Latanier soils and have less clay in the upper 40 inches than Norwood soils. Moreland soils are redder in the upper part of the profile than Perry soils.

Moreland silty clay (Me).—This level soil is on flood plains along the Arkansas River. Areas range from about 40 to 300 acres in size.

Included with this soil in mapping are a few spots of Latanier, Norwood, and Perry soils.

Runoff is slow, and wetness is a severe limitation. Because of its high clay content, this soil can be cultivated only within a narrow range of moisture content. Preparing a seedbed and maintaining good tilth are difficult (fig. 7). Farming operations are delayed several days after rains unless surface drains are provided. If this soil is adequately drained, clean-tilled crops that leave a large amount of residue can be safely grown year after year.

This soil is suited to cultivation, and most areas are cultivated. A few small areas are used for pasture and as woodland. Suitable crops are soybeans, rice, winter small grain, cotton, grain sorghum, and alfalfa. Suitable pasture plants are bermudagrass, dallisgrass, tall fescue, white clover, and vetch. Capability unit IIIw-2; woodland group 2w6.

Mountainburg Series

The Mountainburg series consists of well-drained, gently sloping to steep soils on the top and sides of mountains, on

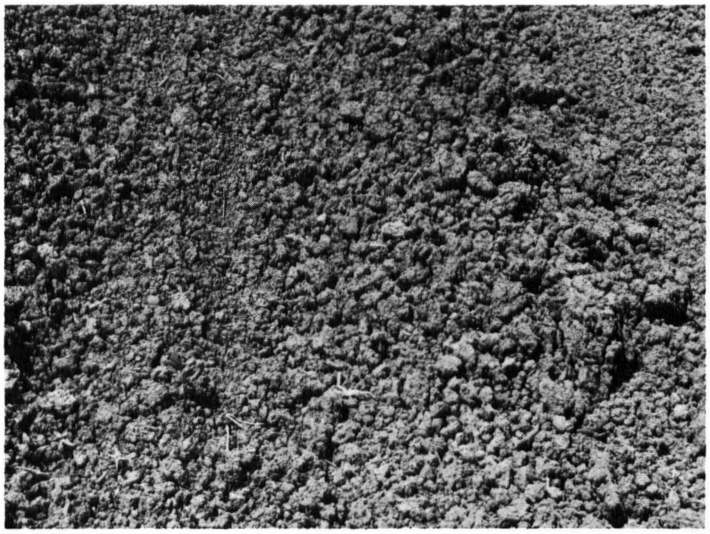

Figure 7.—**Preparing a seedbed and maintaining good tilth are difficult on Moreland silty clay because of a high content of clay in the plow layer.**

benches, and on low ridges in valleys. These soils formed in stony, loamy material weathered from sandstone, syenite, and quartzite. The native vegetation is mixed pines and hardwoods.

In a representative profile the surface and subsurface layers together are dark grayish-brown and brown fine sandy loam about 6 inches thick. They are stony. The upper part of the subsoil is yellowish-red gravelly fine sandy loam about 4 inches thick, and the lower part is yellowish-red gravelly sandy clay loam that extends to a depth of about 15 inches. Below this is sandstone bedrock.

Mountainburg soils are low in natural fertility. Permeability is moderately rapid, and available water capacity is low. Response to fertilizer is poor.

Mountainburg soils are not suited to crops. Because of their shallow depth and their high content of coarse fragments, the soils are droughty. Furthermore, surface stones and slope severely restrict the use of farm equipment. These soils are better suited to woodland and to wildlife habitat than to other uses. Most of the areas are in woodland of poor quality. Many tracts have been developed for urban uses, and others are held for future urban development.

Representative profile of Mountainburg fine sandy loam, in a moist, wooded spot in an area of Mountainburg-Urban land complex, 12 to 40 percent slopes, in the SW¼SW¼SE¼ sec. 36, T. 3 N., R. 12 W.:

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) and grayish-brown (10YR 5/2) dry fine sandy loam; weak, medium, granular structure; very friable; many fine roots; about 35 percent, by volume, is sandstone fragments as much as 24 inches in diameter; medium acid; abrupt, smooth boundary.

A2—1 to 6 inches, brown (10YR 4/3) and pale-brown (10YR 6/3) dry fine sandy loam; weak, medium, granular structure; very friable; many fine roots; about 35 percent, by volume, is sandstone fragments as much as 25 inches in diameter, medium acid; abrupt, smooth boundary.

B21t—6 to 10 inches, yellowish-red (5YR 5/8) gravelly fine sandy loam; weak, medium, subangular blocky structure; friable; few fine roots; many fine pores; about 40 percent, by volume, is sandstone fragments less than 4 inches in diameter; strongly acid; gradual, wavy boundary.

B22t—10 to 15 inches, yellowish-red (5YR 5/8) gravelly sandy clay loam; weak, medium, subangular blocky structure; friable; few fine roots; many fine pores; common, patchy, clay films on faces of peds; sand grains coated; about 40 percent, by volume, is sandstone fragments less than 4 inches in diameter; very strongly acid; abrupt, smooth boundary.

R—15 inches, sandstone.

The A1 horizon is dark brown or dark grayish brown. The A2 horizon is brown, yellowish brown, or yellowish red. The B21t horizon is yellowish-red or red fine sandy loam or loam that is gravelly or stony. The B22t horizon is yellowish-red or red silty clay loam or sandy clay loam that is gravelly or stony. Depth to bedrock ranges from 12 to 20 inches. Content of coarse fragments ranges from 35 to 50 percent throughout the profile. The A horizon is medium acid to very strongly acid, and the B horizon is strongly acid or very strongly acid.

Mountainburg soils are near Carnasaw and Linker soils. They are shallower to bedrock and have more coarse fragments in the B horizon than those soils.

Mountainburg stony fine sandy loam, 3 to 12 percent slopes (MoD).—This soil is on the top and sides of mountains, on benches, and on low ridges in valleys. Areas range from about 40 to 200 acres in size.

Included with this soil in mapping are rock outcrop and a few spots of Linker soils.

Runoff is medium to rapid, and the hazard of erosion is severe.

This soil is not suited to cultivation. It is poorly suited to pasture. It is better suited to woodland and to wildlife habitat than to most other uses. Suitable pasture plants are bermudagrass, annual lespedeza, and sericea lespedeza. Most of this soil is in woodland of poor quality. Capability unit VIs-1; woodland group 5x3.

Mountainburg-Urban land complex, 3 to 12 percent slopes (MuD).—This complex consists of Mountainburg soils and of areas of material, mainly from Mountainburg soils, that has been modified by urban development. Areas generally range from about 40 to 200 acres in size. Mountainburg soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Linker soils and rock outcrop.

Runoff is medium to rapid on the Mountainburg soils, and the hazard of erosion is severe if the areas are not protected by vegetation. These soils contain a large amount of coarse fragments and are 12 to 20 inches deep over bedrock. Consequently, they are droughty The shallow depth to bedrock limits the rooting depth for many kinds of plants. Frequent irrigation is needed for satisfactory growth of most kinds of ornamental plants.

These soils are poorly suited to most landscaping plants. They are limited for most urban uses by their shallow depth to bedrock. Not assigned to a capability unit or to a woodland group.

Mountainburg-Urban land complex, 12 to 40 percent slopes (MuE).—This complex consists of Mountainburg soils and of areas of material, mainly from Mountainburg soils, that has been modified by urban development. Areas generally range from about 40 to 200 acres in size. Mountainburg soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest. A Mountainburg soil in this complex has the profile described as representative for the Mountainburg series.

Included with this complex in mapping are spots of Linker soils and rock outcrop.

Runoff is rapid on the Mountainburg soils, and the hazard of erosion is very severe if the areas are not protected by vegetation. These soils contain a large amount of coarse fragments and are 12 to 20 inches deep over bedrock. Consequently, they are droughty. The shallow depth to bedrock limits the rooting depth for many kinds of plants. Frequent irrigation is needed for satisfactory growth of most kinds of ornamental plants.

These soils are poorly suited to most landscaping plants. They are limited for most urban uses because of the shallow depth to bedrock and slope. Not assigned to a capability unit or to a woodland group.

Norwood Series

The Norwood series consists of well-drained, level soils on young natural levees along the Arkansas River. These soils formed in loamy sediment carried from the west by the Arkansas River. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is dark-brown silty clay loam about 8 inches thick. The underlying material is brown to dark reddish-brown, thinly stratified silty clay loam, silt loam, and very fine sandy loam.

Norwood soils are high in natural fertility. Permeability is moderate, and available water capacity is high. Response to fertilizer is good, but these soils are somewhat difficult to till because of a high content of clay in the surface layer.

These soils are well suited to cultivated crops, and most of the acreage is cultivated.

Representative profile of Norwood silty clay loam, in a moist, cultivated area in the NE¼NW¼NE¼ sec. 24, T. 3 N., R. 14 W.:

Ap—0 to 6 inches, dark-brown (7.5YR 3/2) silty clay loam; weak, medium, granular structure; friable; common fine roots; mildly alkaline; calcareous; abrupt, smooth boundary.

A1—6 to 8 inches, dark-brown (10YR 3/3) silty clay loam; weak, medium, granular structure; friable; common fine roots; mildly alkaline; calcareous; abrupt, smooth boundary.

C1—8 to 10 inches, brown (7.5YR 5/4) silt loam; massive; friable; many bedding planes; few fine roots; mildly alkaline; calcareous; abrupt, smooth boundary.

C2—10 to 14 inches, dark reddish-brown (5YR 3/3) silty clay loam; massive; firm; mildly alkaline; calcareous; abrupt, smooth boundary.

C3—14 to 20 inches, dark-brown (7.5YR 3/2) silty clay loam; massive; firm; few small mussel shells; mildly alkaline; calcareous; abrupt, smooth boundary.

C4—20 to 22 inches, brown (7.5YR 4/2) silt loam; massive; friable; mildly alkaline; calcareous; abrupt, smooth boundary.

C5—22 to 27 inches, brown (7.5YR 4/2) and reddish-brown (5YR 4/3) silty clay loam; massive; firm; few bedding planes; mildly alkaline; calcareous; abrupt, smooth boundary.

C6—27 to 30 inches, reddish-brown (5YR 4/4) silt loam; massive; friable; many bedding planes; moderately alkaline; calcareous; abrupt, smooth boundary.

C7—30 to 35 inches, dark reddish-brown (5YR 3/2) silty clay loam; massive; firm; few worm casts; many bedding planes in upper part; mildly alkaline; calcareous; abrupt, smooth boundary.

C8—35 to 41 inches, reddish-brown (5YR 4/4) silt loam; massive; friable; many bedding planes; moderately alkaline; calcareous; clear, smooth boundary.

C9—41 to 52 inches, dark-brown (7.5YR 3/2) silt loam; massive; firm; common partly decayed wood fragments; moderately alkaline; calcareous; abrupt, smooth boundary.

C10—52 to 57 inches, brown (7.5YR 5/4) very fine sandy loam; massive; friable; common bedding planes; moderately alkaline; calcareous.

The A horizon is very dark gray, very dark grayish brown, or dark brown. The C horizon is thin layers of dark reddish-brown to brown fine sandy loam to silty clay loam. The A horizon is neutral or mildly alkaline in reaction, and the C horizon is mildly alkaline to moderately alkaline. The A and C horizons are calcareous. Bedrock is many feet beneath the surface.

Norwood soils are near Bruno, Crevasse, Keo, Latanier, and Moreland soils. They contain more silt and clay and less sand than Bruno and Crevasse soils and more clay than Keo soils. Norwood soils formed in loamy sediment rather than in beds of clayey sediment, as did Latanier and Moreland soils.

Norwood silty clay loam (No).—This soil is along the Arkansas River. Slopes are less than 1 percent. Areas range from about 20 to 200 acres in size.

Included with this soil in mapping are a few spots of Norwood soils that are gently undulating. Also included are spots of Bruno, Crevasse, Keo, Latanier, and Moreland soils.

This soil is somewhat difficult to till, because of a high content of clay in the surface layer. Clean-tilled crops that leave a large amount of residue can be safely grown year after year on this soil if it is well managed. In areas that are subject to occasional flooding, cool-season crops are likely to be damaged by floods in some years.

This soil is well suited to crops. Most of the acreage is in soybeans and alfalfa, but a few areas are in cotton, corn, truck crops, grain sorghum, and pasture. This soil is suited to winter small grain. Suitable pasture plants are bermudagrass, bahiagrass, dallisgrass, johnsongrass, tall fescue, and white clover. Capability units I-1 (protected areas) and IIw-1 (occasionally flooded areas); woodland group 2o4.

Perry Series

The Perry series consists of poorly drained, level soils on bottom lands. These soils formed in thick beds of clayey slack-water deposits laid down by the Arkansas River. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is dark yellowish-brown clay about 3 inches thick. The subsoil extends to a depth of 72 inches or more. Its upper 27 inches is mottled, dark-gray and gray clay, and the lower part is dark reddish-brown clay that is mottled below a depth of 61 inches.

Perry soils are moderate to high in natural fertility. Permeability is very slow, and available water capacity is high. When these soils dry, they shrink and crack, and when wet, they expand and the cracks seal.

Where these soils are adequately drained, they are suited to farming. Most areas are cleared, but some are wooded, and others have developed for urban uses.

Representative profile of Perry clay, in a moist pasture in the NW¼SW¼SE¼ sec. 23, T. 2 N., R. 11 W.:

Ap—0 to 3 inches, dark yellowish-brown (10YR 3/4) clay; massive, parting to weak, medium, granular structure; firm; plastic; few fine roots; medium acid; abrupt, smooth boundary.

B21g—3 to 8 inches, dark-gray (10YR 4/1) clay; few, fine, distinct, yellowish-brown (10YR 3/4) mottles; moderate, medium, subangular blocky structure; firm; plastic; few fine roots; few, small, black concretions; few fine pores; medium acid; clear, smooth boundary.

B22g—8 to 13 inches, dark-gray (10YR 4/1) clay; many, medium, distinct, light-gray (10YR 7/2) and pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; very firm; plastic; common fine pores; medium acid; clear smooth boundary.

B23g—13 to 16 inches, dark-gray (10YR 4/1) clay; many, medium and coarse, prominent mottles of dark reddish brown (2.5YR 3/4) and many, medium, distinct mottles of light gray (10YR 7/2) and pale brown (10YR 6/3); moderate, medium, angular blocky structure; firm; plastic; few fine pores; medium acid; clear, smooth boundary.

B24g—16 to 30 inches, gray (10YR 5/1) clay; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, angular blocky structure; firm; plastic; medium acid; gradual, irregular boundary.

IIB25—30 to 61 inches, dark reddish-brown (5YR 3/4) clay; moderate, medium, angular blocky structure; firm; plastic; common slickensides; common black accretions; neutral; gradual, irregular boundary.

IIB26—61 to 72 inches, dark reddish-brown (5YR 3/4) clay; common, medium, prominent, dark-gray (10YR 4/1) mottles; moderate, medium, angular blocky structure; firm; plastic; few slickensides; thin bands of light reddish-brown (5YR 6/4) soft carbonate; moderately alkaline; calcareous.

The A horizon is dark gray, gray, very dark grayish brown, or dark yellowish brown. The B2g horizon is gray or dark gray. Depth to the IIB2 horizon ranges from 20 to 36 inches. The A and B2g horizons are slightly acid or medium acid, and the IIB2 horizon is neutral to moderately alkaline in reaction.

Perry soils are near Latanier and Moreland soils and clayey Umbraqualfs. They formed in thicker beds of clayey sediment than the Latanier soils. They are grayer in the upper part of the profile and more poorly drained than Latanier and Moreland soils. Where the surface layer of Perry soils has a color value of less than 3.5, it is thinner than the surface layer of the clayey Umbraqualfs. Perry soils have a thicker B horizon and are not so acid as the clayey Umbraqualfs.

Perry clay (Pe).—This soil is in low depressions on bottom lands. Slopes are less than 1 percent. This soil has the profile described as representative for the series. Areas range from about 30 to 500 acres in size.

Included with this soil in mapping are a few spots of Latanier and Moreland soils and clayey Umbraqualfs.

Runoff is very slow, and wetness is a severe limitation. Some tracts are subject to frequent flooding in winter and in spring. Because of its high clay content, this soil can be cultivated only within a narrow range of moisture content. Preparing a seedbed and maintaining good tilth are difficult. Farming operations are delayed several days after rains unless surface drains are provided. If this soil is adequately drained and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown year after year.

This soil is suited to crops, and most areas are cultivated. A few small areas are in pasture and woodland. Suitable crops are soybeans, rice, winter small grain, cotton, and grain sorghum. Suitable pasture plants are bermudagrass, dallisgrass, tall fescue, white clover, and vetch. Capability unit IIIw-3 and woodland group 2w6 (protected areas); capability unit IVw-2 and woodland group 3w6 (frequently flooded areas).

Perry-Urban land complex (Pu).—This poorly drained complex consists of Perry soils, and of areas of material, mainly from Perry soils, that has been modified by urban development. Slopes are less than 1 percent. Areas generally range from about 30 to 200 acres in size. Perry soil makes up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Latanier and Moreland soils, areas of clayey Umbraqualfs, and spots subject to frequent flooding.

Runoff is very slow on the Perry soil. Permeability is very slow, and available water capacity is high.

Because of wetness and poor aeration, the soils in this complex are suited to only a limited number of water-tolerant landscaping plants. Because of wetness, low bearing capacity, and high shrink-swell potential, these soils are severly limited for most urban uses. Not assigned to a capability unit or to a woodland group.

Rexor Series

The Rexor series consists of well-drained, level to gently undulating soils on flood plains of local drainageways. These soils formed in alluvium washed from uplands of weathered sandstone and shale. The native vegetation is mixed hardwoods and pines.

In a representative profile the surface layer is dark grayish-brown and dark yellowish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 66 inches or more. The upper 29 inches is strong-brown silt loam, the middle 13 inches is mottled, dark-brown silt loam, and the lower part is mottled, yellowish-red and very pale brown silt loam.

Rexor soils are moderate in natural fertility. Permeability is moderate, and available water capacity is high. Response to fertilizer is good. These soils are easy to till. They generally are not suited to cultivated crops, however, because they are subject to flooding several times each year, and at least once during the growing season.

Most areas of these soils are cleared and are used for pasture and meadow. A few small tracts have been developed for urban uses.

Representative profile of Rexor silt loam, frequently flooded, in a moist pasture in the NW¼NW¼NW¼ sec. 4, T. 1 S., R. 13 W.:

Ap1—0 to 2 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; many fine roots; medium acid; clear, smooth boundary.

Ap2—0 to 8 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine and medium, subangular blocky structure; friable; common fine roots; medium acid; abrupt, smooth boundary.

B1—8 to 19 inches, strong-brown (7.5YR 5/8) silt loam; weak, fine and medium, subangular blocky structure; friable; common fine roots; many fine and medium pores; medium acid; gradual, smooth boundary.

B21t—19 to 25 inches, strong-brown (7.5YR 5/8) silt loam; moderate, medium, subangular blocky structure; friable; few fine roots; many fine pores; thin, patchy clay films on faces of peds, in pores, and in cavities; medium acid; gradual, smooth boundary.

B22t—25 to 37 inches, strong-brown (7.5YR 5/6) silt loam; few, fine, faint, light yellowish-brown (10YR 3/4) mottles; moderate, medium, subangular blocky structure; friable; few fine roots; many fine pores; common, thin, patchy clay films on faces of peds, in pores, and in cavities; medium acid; clear, smooth boundary.

B23t—37 to 50 inches, dark-brown (7.5YR 4/4) silt loam; many, medium, distinct, very pale brown (10YR 7/4) mottles; moderate, medium, subangular blocky structure; friable; few fine roots; many fine and medium pores; few worm-holes; few thick clay films and common, thin, patchy clay films on faces of peds, in pores, and in cavities; medium acid; clear, smooth boundary.

B24t—50 to 66 inches, mottled, yellowish-red (5YR 4/8) and very pale brown (10YR 7/3) silt loam; moderate, medium, subangular blocky structure; friable; few fine roots; many fine pores; few, thin, patchy clay films on faces of peds; common, large, black accretions; medium acid.

The Ap horizon is dark grayish brown, brown, dark brown, or dark yellowish brown. The B1 horizon is strong brown or dark yellowish brown. In some places the B1 horizon has dark-brown mottles. The upper layers of the Bt horizon are brown, dark-brown, strong-brown, yellowish-brown, or dark yellowish-brown silt loam or silty clay loam. In many places the B23t horizon and lower layers are mottled with yellowish red, very pale brown, light brownish gray, grayish brown, or gray. Reaction is medium acid to very strongly acid throughout.

Rexor soils are near Amy and Leadvale soils. They are better drained than these soils. They are browner below the A horizon than Amy soils, and they lack the mottled fragipan of Leadvale soils.

Rexor silt loam, frequently flooded (Re).—This well-

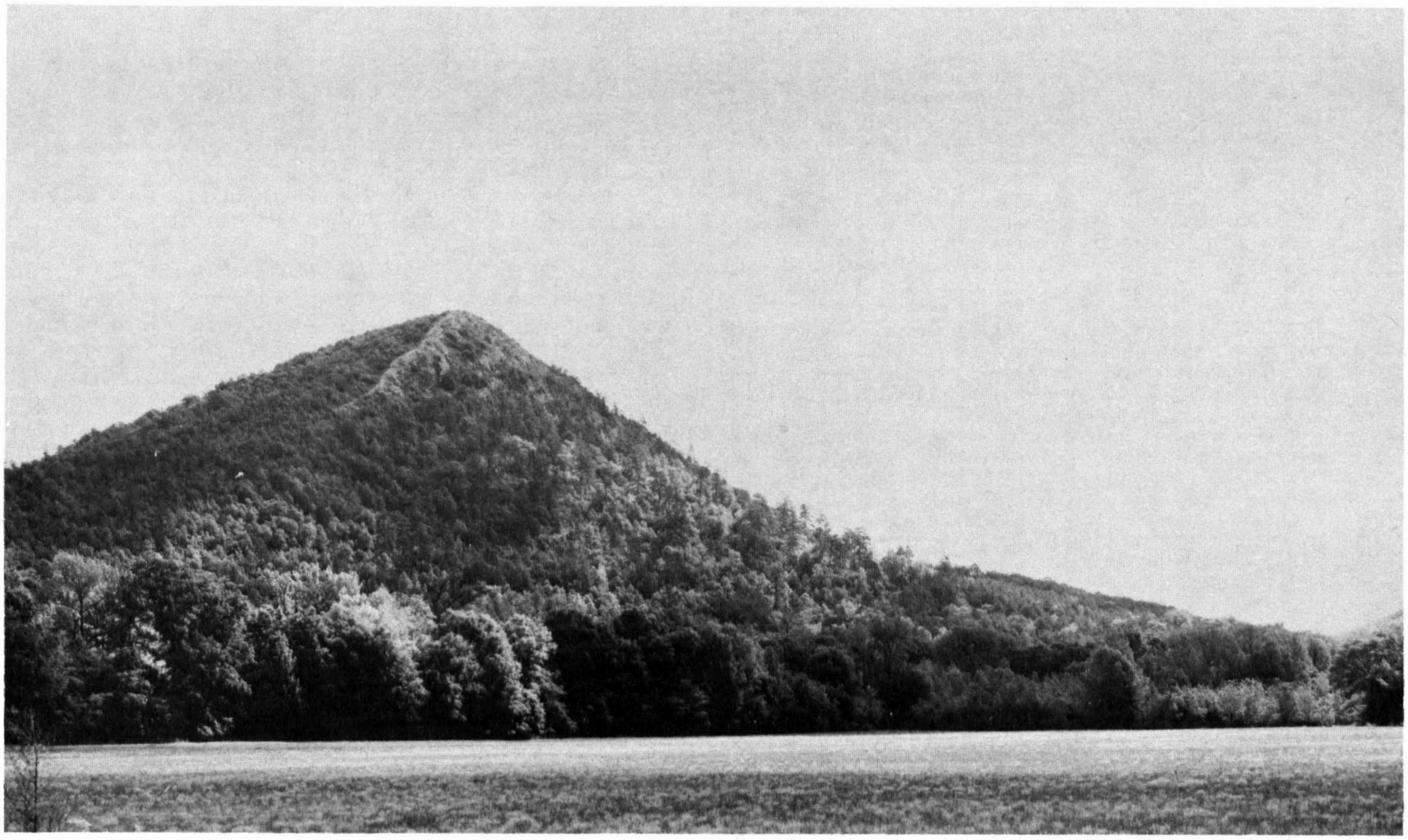

Figure 8.—**Pasture in need of renovation on Rexor silt loam, frequently flooded. On Pinnacle Mountain in background is the Carnasaw-Mountainburg association, steep.**

drained soil is on flood plains of local drainageways. Slopes are 0 to 2 percent. Areas range from about 20 to 300 acres in size. This soil has the profile described as representative for the series.

Included with this soil in mapping are a few spots of Amy soils.

The hazard of flooding is severe on this soil, and floods are likely to occur several times each year, generally at least once during the growing season.

This soil is not suited to cultivation. It is used mainly for pasture and meadow (fig. 8). Bermudagrass is better suited than other pasture plants. Capability unit Vw-2; woodland group 2w8.

Rexor-Urban land complex, frequently flooded (Rf).—This well-drained complex is along drainageways. It consists of Rexor soils and of areas of material, mainly from the Rexor soils and from fill from other sources, that has been modified by urban development. Areas generally range from about 20 to 50 acres in size. Rexor soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Amy soils.

Runoff is slow on the Rexor soils. Permeability is moderate, and available water capacity is high.

These soils are suited to a wide selection of landscaping plants where they are protected from flooding. They are severely limited for urban uses, because of the flooding hazard. Not assigned to a capability unit or to a woodland group.

Rilla Series

The Rilla series consists of well-drained, level and gently sloping soils that formed in mixed alluvium on old natural levees laid down by the Arkansas River. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is brown silt loam about 7 inches thick. The subsoil is 47 inches thick. The upper 11 inches is reddish-brown silt loam, the middle 15 inches is yellowish-red silty clay loam, and the lower 21 inches is yellowish-red silt loam. The underlying material is pink very fine sandy loam and yellowish-red silt loam.

Rilla soils are moderate to high in natural fertility. Permeability is moderate, and available water capacity is high. Response to fertilizer is good. Tilth is easy to maintain.

These soils are well suited to most crops and pasture plants commonly grown in the county, and nearly all areas are cleared. Some areas have been developed for urban uses.

Representative profile of Rilla silt loam, 0 to 1 percent slopes, in a moist, cultivated area in the NE¼NE¼NE¼ sec. 26, T. 2 S., R. 10 W.:

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; weak, very coarse, platy structure parting to weak, fine, granular; very friable; few fine roots; slightly acid; clear, smooth boundary.

B21t—7 to 18 inches, reddish-brown (5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; thin, patchy clay films on faces of peds in lower part; silt coatings on vertical faces of most peds; few fine roots; many fine pores; strongly acid; gradual, smooth boundary.

B22t—18 to 33 inches, yellowish-red (5YR 4/6) silty clay loam; moderate, medium, subangular blocky structure; friable; common, thin, patchy clay films on faces of peds; silt coatings on vertical faces of most peds; few fine roots; many fine pores; strongly acid; clear, smooth boundary.

B3—33 to 54 inches, yellowish-red (5YR 4/6) silt loam; weak, medium, subangular blocky structure; pinkish-gray (7.5YR 7/2) coatings on faces of peds and streaks of silt in seams between peds; common fine pores; strongly acid; clear, smooth boundary.

C1—54 to 64 inches, pink (7.5YR 7/4) very fine sandy loam; common lenses of strong brown (7.5YR 5/6); massive, parting to weak, coarse, platy fragments; strongly acid; clear, smooth boundary.

C2—64 to 72 inches, yellowish-red (5YR 4/6) silt loam; massive; common fine pores; medium acid.

The Ap horizon is brown or dark grayish brown. The B2t horizon is strong-brown, brown, yellowish-red, or reddish-brown silty clay loam or silt loam. The B3 horizon is reddish-brown or yellowish-red silty clay loam or silt loam. The C horizon is pink, yellowish-red, reddish-brown, brown, or strong-brown very fine sandy loam to silty clay loam. Reaction is strongly acid to neutral in the A horizon, strongly acid or very strongly acid in the B horizon, and strongly acid to neutral in the C horizon.

Rilla soils are near Keo soils. They are not so alkaline as the Keo soils, and they have a B horizon of clay accumulation that Keo soils lack.

Rilla silt loam, 0 to 1 percent slopes (RmA).—This soil is on natural levees along the Arkansas River. Areas range from about 40 to 800 acres in size. The profile of this soil is the one described as representative for the series.

Included with this soil in mapping are spots of Keo soils and spots of soils that have a clayey layer in the subsoil.

This soil warms early in spring, and early planting is possible. It can be cultivated over a wide range of moisture content. If this soil is well managed, clean-tilled crops that leave a large amount of residue can be grown year after year.

This soil is well suited to farming. The main crops are cotton and soybeans (fig. 9). Other suitable crops are corn, winter small grain, grain sorghum, and truck crops such as tomatoes and green beans. Suitable pasture plants are bahiagrass, bermudagrass, dallisgrass, johnsongrass, tall fescue, annual lespedeza, crimson clover, and white clover. Capability unit I-1; woodland group 2o4.

Figure 9.—**Soybeans growing between the rows of trees in a young pecan grove on Rilla silt loam, 0 to 1 percent slopes.**

Rilla silt loam, 3 to 5 percent slopes (RmC).—This soil is on natural levees of abandoned channels of the Arkansas River. Areas range from about 20 to 300 acres in size.

Included with this soil in mapping are spots of Keo soils and spots of soils that have a clayey layer in the subsoil.

The hazard of erosion is moderate. If this soil is cultivated across the slope, clean-tilled crops that leave a large amount of residue can be safely grown year after year. Crops can be sown without attention to row direction.

This soil is suited to farming. The main crops are cotton and soybeans. Other suitable crops are corn, winter small grain, grain sorghum, and truck crops such as tomatoes and green beans. Suitable pasture plants are bahiagrass, bermudagrass, dallisgrass, johnsongrass, tall fescue, annual lespedeza, crimson clover, and white clover. Capability unit IIe-2; woodland group 2o4.

Rilla-Perry complex, undulating (RpB).—This complex is in areas of alternating long, narrow ridges and swales on bottom lands of the Arkansas River. Slopes range from 0 to 5 percent. Rilla soils on the top and sides of the ridges make up about 50 percent of the acreage, and Perry soils in the swales make up about 25 percent. Areas range from about 20 to 300 acres in size.

Included with this complex in mapping are spots of Latanier and Moreland soils and narrow strips of soils that are transitional between the Rilla and Perry soils in that they have loamy upper layers and clayey lower layers. These included soils make up about 25 percent of the acreage.

Wetness is a severe limitation where these soils occur in swales, and the hazard of erosion is moderate where they occur on ridges. Farming operations are delayed several days after rains unless surface drains are installed. If the soils in this complex are cultivated parallel with the trend of the ridges and the swales, adequately drained, and otherwise well managed, clean-tilled crops that leave a large amount of residue can be grown year after year.

The soils in this complex are suited to crops. They are used mainly for pasture and meadow. Suitable crops include soybeans, winter small grain, cotton, and grain sorghum. Suitable pasture plants are bermudagrass, dallisgrass, tall fescue, white clover, and vetch. Capability unit IIIw-4; woodland group 2w5.

Rilla-Urban land complex, 0 to 1 percent slopes (RuA).—This well-drained complex consists of Rilla soils and of areas of material, mainly from Rilla soils, that has been modified by urban development. Areas generally range from about 40 to 200 acres in size. Rilla soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Keo soils, spots of gently sloping Rilla soils, and spots of soils that have a clayey layer in the subsoil.

Runoff on the Rilla soils is slow, but internal drainage is good. These soils are suited to a wide selection of landscaping plants. They are slightly to moderately limited for most urban uses. Not assigned to a capability unit or to a woodland group.

Saffell Series

The Saffell series consists of well-drained, gently sloping soils on uplands. These soils formed in gravelly, loamy coastal plain sediment. The native vegetation is mixed pines and hardwoods.

In a representative profile the surface layer is dark-brown gravelly fine sandy loam about 7 inches thick. The subsoil is yellowish-red gravelly loam that extends to a depth of about 44 inches. The underlying material is mottled, gravelly fine sandy loam.

Saffell soils are low in natural fertility. Permeability is moderate, and available water capacity is low. Response to fertilizer is fair. These soils are somewhat droughty and are difficult to till because of a high gravel content.

All of these soils are in areas that are being developed for urban uses.

Representative profile of Saffell gravelly fine sandy loam, in a moist area of Saffell-Urban land complex, 3 to 8 percent slopes, in the NE¼SE¼SE¼ sec. 24, T. 1 N., R. 13 W.:

Ap—0 to 7 inches, dark-brown (7.5YR 4/4) gravelly fine sandy loam; weak, fine, granular structure; very friable; many fine roots; about 25 percent, by volume, is sandstone and quartzite pebbles as much as 1½ inches in diameter; strongly acid; abrupt, smooth boundary.

B1—7 to 15 inches, yellowish-red (5YR 4/8) gravelly loam; weak, fine and very fine, subangular blocky structure; very friable; common fine roots; common fine pores; about 40 percent, by volume, is quartzite and sandstone pebbles as much as 1½ inches in diameter; very strongly acid; gradual, wavy boundary.

B2t—15 to 33 inches, yellowish-red (5YR 4/6) gravelly loam; weak, fine and very fine, subangular blocky structure; very friable; few fine pores; thin, patchy clay films on faces of peds; sand grains coated; about 60 percent, by volume, is sandstone and quartzite pebbles as much as 2 inches in diameter; very strongly acid; gradual, smooth boundary

B3—33 to 44 inches, yellowish-red (5YR 5/6) gravelly loam; weak, fine, subangular blocky structure; very friable; about 70 percent, by volume, is sandstone and quartzite pebbles as much as 2 inches in diameter; very strongly acid; gradual, smooth boundary.

C—44 to 72 inches, mottled, brownish-yellow (10YR 6/8), white (10YR 8/1), and red (2.5YR 4/8) gravelly fine sandy loam; massive; friable; about 80 percent, by volume, is sandstone and quartzite pebbles as much as 2½ inches in diameter; very strongly acid.

The A horizon is brown or dark brown. The B1 horizon is yellowish red or reddish brown. The B2t horizon is gravelly loam, gravelly clay loam, or gravelly sandy clay loam. In some places it is mottled with brownish yellow and red. Content of gravel, by volume, ranges from 15 to 25 percent in the A horizon, from about 35 to 70 percent in the B horizon, and from 50 to 80 percent in the C horizon. Reaction is very strongly acid or strongly acid throughout.

Saffell soils are near Smithdale soils. They are gravelly throughout, whereas Smithdale soils have few or no pebbles in the A and B horizons.

Saffell-Urban land complex, 3 to 8 percent slopes (SfC).—This complex consists of Saffell soils and of areas of material, mainly from Saffell soils, that has been modified by urban development. Areas range from about 20 to 150 acres in size. Saffell soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Smithdale soils.

Runoff is medium on the Saffell soils, and the hazard of erosion is severe if the areas are not protected by vegetation. These soils are droughty, and frequent irrigation is needed for satisfactory growth of most ornamental plants.

These soils are suited to a wide selection of landscaping plants. They are slightly to moderately limited for most urban uses. Not assigned to a capability unit or to a woodland group.

Sallisaw Series

The Sallisaw series consists of well-drained, nearly level and gently sloping soils on stream terraces. The soils formed in alluvium washed from uplands of weathered sandstone and shale. The native vegetation is mixed pines and hardwoods.

In a representative profile the surface layer is dark-brown gravelly silt loam about 7 inches thick. The subsoil extends to a depth of 64 inches. Its upper 20 inches is brown and yellowish-red silt loam, the middle 24 inches is yellowish-red gravelly silt loam, and the lower 13 inches of the subsoil and the underlying material are mottled, gravelly silt loam.

Sallisaw soils are moderate to low in natural fertility. Permeability is moderate, and available water capacity is medium to high. Response to fertilizer is good. Pebbles and cobbles in the surface layer of most tracts make tillage somewhat difficult.

Where erosion is controlled, these soils are suited to cultivation. Most areas were formerly cultivated, but they are now used mainly for pasture, meadow, or woodland, or they are in areas being developed for urban uses.

Representative profile of Sallisaw gravelly silt loam 1 to 3 percent slopes, in a moist pasture in the NW¼NE¼SW¼ sec. 19, T. 2 N., R. 13 W.:

Ap—0 to 7 inches, dark-brown (10YR 4/3) gravelly silt loam; moderate, fine and medium, granular structure; friable; many fine and medium roots; about 15 percent, by volume, is pebbles and a few cobblestones as much as 8 inches in diameter; strongly acid; clear, smooth boundary.

B1—7 to 13 inches, brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure parting to weak, fine, granular; friable; about 10 percent, by volume, is pebbles as much as 3 inches in diameter; medium acid; gradual, wavy boundary.

B21t—13 to 27 inches, yellowish-red (5YR 5/8) silt loam; moderate, medium, subangular blocky structure; friable; thin, patchy clay films on faces of peds; common fine and medium roots; about 5 percent, by volume, is pebbles as much as 3 inches in diameter; strongly acid; clear, smooth boundary.

IIB22t—27 to 51 inches, yellowish-red (5YR 5/8) gravelly silt loam; moderate, medium, subangular blocky structure; friable; few fine and medium roots; about 50 percent, by volume, is pebbles as much as 3 inches in diameter; continuous clay films coat pebbles; strongly acid; clear, smooth boundary.

IIB3—51 to 64 inches, mottled, light-gray (10YR 7/2), yellowish-brown (10YR 5/8), and yellowish-red (5YR 5/8) gravelly silt loam; moderate, medium, subangular blocky structure; friable; many fine pores; about 50 percent, by volume, is pebbles as much as 1 inch in diameter; medium acid; clear, smooth boundary.

IIC—64 to 72 inches, mottled, light-gray (10YR 7/2), brownish-yellow (10YR 6/6), and yellowish-brown (10YR 5/8) gravelly silt loam; weak, medium, subangular blocky structure; friable; about 50 percent, by volume, is pebbles as much as 1 inch in diameter; medium acid.

The Ap horizon and the A1 horizon, where present, are brown or dark-brown silt loam or gravelly silt loam. The B1 horizon is brown, dark brown, or yellowish red. The B21t horizon is strong-brown or yellowish-red silt loam or silty clay loam that is gravelly in some profiles. The IIB22t horizon is strong-brown or yellowish-red gravelly silt loam or gravelly silty clay loam. In some places the IIB23t horizon is mottled in shades of red, gray, and brown. Content of coarse fragments ranges from 10 to 25 percent in the Ap horizon and the A1 horizon; where present from 5 to 20 percent in the B1 and B21t horizons; and from 35 to 70 percent in the IIB and IIC horizons. Reaction is strongly acid or medium acid throughout.

Sallisaw soils are near Carnasaw and Leadvale soils. They are not so clayey in the B horizon as Carnasaw soils. Sallisaw soils are better drained than Leadvale soils, and they lack the fragipan of Leadvale soils.

Sallisaw gravelly silt loam, 1 to 3 percent slopes (SgB).—This soil is on stream terraces. Areas range from about 20 to 150 acres in size. This soil has the profile described as representative for the series.

Included with this soil in mapping are a few spots of Leadvale soils.

The hazard of erosion is moderate. If this soil is contour cultivated, terraced on long slopes, and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown year after year. Crops can be sown without attention to row direction.

This soil is used mainly for pasture or meadow. It is suited to such crops as soybeans, grain sorghum, winter small grain, and truck crops. Suitable pasture plants include bahiagrass, bermudagrass, tall fescue, white clover, sericea lespedeza, and annual lespedeza. Capability unit IIe-1; woodland group 3o7.

Sallisaw gravelly silt loam, 3 to 8 percent slopes (SgC).—This soil is on stream terraces. Areas range from about 20 to 150 acres in size.

Included with this soil in mapping are a few spots of Carnasaw and Leadvale soils.

Runoff is medium, and the hazard of erosion is severe. If this soil is contour cultivated, terraced, and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown in the less sloping areas year after year. Intensified conservation measures are needed as slope length and gradient increase.

This soil is used mainly for pasture and meadow. It is suited to such crops as soybeans, grain sorghum, winter small grain, and truck crops. Suitable pasture plants are bahiagrass, bermudagrass, tall fescue, white clover, sericea lespedeza, and annual lespedeza. Capability unit IIIe-1; woodland group 3o7.

Sallisaw-Urban land complex, 3 to 8 percent slopes (ShC).—This complex consists of Sallisaw soils and of areas of material, mainly from Sallisaw soils, that have been modified by urban development. Areas generally range from about 20 to 150 acres in size. Sallisaw soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Carnasaw and Leadvale soils and spots of soils that have slopes of less than 3 percent.

Runoff is medium on the Sallisaw soils, and the hazard of erosion is severe if the areas are not protected by vegetation.

These soils are suited to a wide selection of landscaping plants. They are slightly to moderately limited for most urban uses. Not assigned to a capability unit or to a woodland group.

Sallisaw-Leadvale association, undulating (SKC).—The soils in this association are in narrow valleys along upland drainageways. Slopes range from 2 to 8 percent. The soils are in areas large enough to be mapped separately, but they were not separated in mapping because of their poor accessibility and their low intensity of use. The soils are generally in a regular pattern and occur in about the same relative proportions in each area. About 40 to 50 percent of this association is Sallisaw silt loam and gravelly silt loam, and 35 to 45 percent is Leadvale silt loam. The remaining 5 to 25 percent is shale outcrop, gravel bars along creeks, and spots of Carnasaw soils. Areas of this association range from 50 to 300 acres in size.

Runoff is medium, and the hazard of erosion is severe.

The soils in this association are suited to such crops as soybeans, grain sorghum, winter small grain, and truck crops. Suitable pasture plants are bahiagrass, bermudagrass, tall fescue, white clover, sericea lespedeza, and annual lespedeza. Capability unit IIIe-1; woodland group 3o7.

Smithdale Series

The Smithdale series consists of well-drained, gently sloping to moderately sloping soils on uplands. The soils formed in loamy coastal plain sediment. The native vegetation is mixed pines and hardwoods.

In a representative profile the surface layer is brown fine sandy loam about 5 inches thick. The upper part of the subsoil is red clay loam about 11 inches thick. The lower part is red sandy loam that has splotches of strong brown. It extends to a depth of 72 inches or more.

Smithdale soils are moderate to low in natural fertility. Permeability is moderate, and available water capacity is medium. Response to fertilizer is good. The surface layer is easy to till and can be cultivated over a wide range of moisture content.

Where erosion control measures are used, the gently sloping areas of these soils are suitable for cultivation. Most areas were formerly cultivated, but they are now used mainly for pasture. Some areas are wooded. Many tracts have been developed for urban uses, and others are idle and held for future urban development.

Representative profile of Smithdale fine sandy loam, in a moist area of Smithdale-Urban land complex, 3 to 8 percent slopes, in the SW¼SE¼NW¼ sec. 21, T. 1 S., R. 12 W.:

Ap—0 to 5 inches, brown (7.5YR 4/4) fine sandy loam; weak, medium, subangular blocky structure parting to weak, fine, granular; friable; medium acid; abrupt, smooth boundary.

B21t—5 to 16 inches, red (2.5YR 4/8) clay loam; strong, coarse, prismatic structure parting to moderate, medium, subangular blocky; firm; common fine roots; common fine pores; patchy clay films on faces of peds; strongly acid; gradual, smooth boundary.

B22t—16 to 45 inches, red (2.5YR 4/8) sandy loam; common, coarse, strong-brown (7.5YR 5/6) splotches; strong, coarse, prismatic structure parting to moderate, medium, subangular blocky; friable; few fine roots; common fine pores; patchy clay films on faces of peds; uncoated sand grains on some vertical ped faces; thick, continuous clay films on some vertical surfaces; very strongly acid; gradual, wavy boundary.

B23t—45 to 72 inches, red (2.5YR 4/8) sandy loam; common, coarse, strong-brown (7.5YR 5/6) splotches; strong, coarse, prismatic structure; friable; few roots on prism faces; common thick clay films on vertical faces of prisms; uncoated sand grains on some vertical ped faces and in pockets or seams; very strongly acid.

The Ap horizon is dark brown, dark grayish brown, brown, or yellowish brown. In undisturbed areas the A1 horizon is dark-gray or dark grayish-brown fine sandy loam 1 to 3 inches thick, and the A2 horizon is brown, pale-brown, or yellowish-brown fine sandy loam 3 to 5 inches thick. In some places there is a B1 horizon of strong-brown or reddish-brown fine sandy loam 3 to 6 inches thick. The B2t horizon is yellowish-red or red clay loam, sandy clay loam, loam, or sandy loam. The A horizon is very strongly acid to neutral in reaction, and the B horizon is very strongly acid or strongly acid.

Smithdale soils are near Leadvale, Saffell, and Tiak soils. They are redder and better drained than Leadvale soils, and they lack the fragipan of those soils. Smithdale soils are not so clayey in the B horizon as Tiak soils. They lack the high gravel content of Saffell soils.

Smithdale fine sandy loam, 3 to 8 percent slopes (StC).—This soil is on coastal plain uplands. Areas range from about 40 to 300 acres in size.

Included with this soil in mapping are a few spots of Leadvale, Tiak, and Saffell soils.

Runoff is medium, and the hazard of erosion is severe. If this soil is contour cultivated, terraced, and otherwise well managed, clean-tilled crops that leave a large amount of residue can be grown in the less sloping areas year after year. Intensified conservation measures are needed as slope length and gradient increase.

This soil is used mainly for pasture. Many tracts are held for future urban development. This soil is suited to such crops as soybeans, grain sorghum, winter small grain, and truck crops. Suitable pasture plants are bahiagrass, bermudagrass, dallisgrass, white clover, annual lespedeza, and sericea lespedeza. Capability unit IIIe-1; woodland group 3o1.

Smithdale fine sandy loam, 8 to 12 percent slopes (StD).—This soil is on coastal plain uplands. Areas range from about 5 to 150 acres in size.

Included with this soil in mapping are a few spots of Saffell soils and spots of soils that have slopes of less than 8 percent.

Runoff is rapid, and the hazard of erosion is very severe. A few crops can be safely grown in a cropping system that includes close-growing cover crops most of the time.

This soil is poorly suited to crops. It is better suited to pasture and to woodland than to most other uses. Suitable pasture plants are bermudagrass, bahiagrass, annual lespedeza, and sericea lespedeza. Most areas of this soil are in woodland. Capability unit IVe-2; woodland group 3o1.

Smithdale-Urban land complex, 3 to 8 percent slopes (SuC).—This complex consists of Smithdale soils and areas of material, mainly from Smithdale soils, that have been modified by urban development. Areas generally range from about 20 to 150 acres in size. A Smithdale soil in this unit has the profile described as representative for the Smithdale series. Smithdale soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Leadvale, Saffell, and Tiak soils and spots of soils that have slopes of more than 8 percent.

Runoff is medium on the Smithdale soils, and the hazard of erosion is severe if the areas are not protected by vegetation.

These soils are suited to a wide selection of landscaping plants. They are slightly to moderately limited for most urban uses. Not assigned to a capability unit or to a woodland group.

Tiak Series

The Tiak series consists of moderately well drained, nearly level to gently sloping soils that formed in loamy and clayey coastal plain sediment. The native vegetation is mixed pines and hardwoods.

In a representative profile the surface layer is brown fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown loam about 7 inches thick. The subsoil extends to a depth of 72 inches or more. The upper 16 inches is red and yellowish-red silty clay, the middle 10 inches is mottled, yellowish-red silty clay, and the lower part is mottled, gray silty clay.

Tiak soils are low in natural fertility. Permeability is slow, and available water capacity is high. Response to fertilizer is fair. Where erosion is controlled, these soils are suited to cultivation. Most areas were formerly cultivated, but are now used as woodland and for pasture. Many tracts have been developed for urban uses or are idle and held for future urban development.

Representative profile of Tiak fine sandy loam, in a moist wooded spot in an area of Tiak-Urban land complex, 3 to 8 percent slopes, in the NW¼NE¼SE¼ sec. 16, T. 1 S., R. 12 W.:

A1—0 to 3 inches, brown (10YR 4/3) fine sandy loam; weak, fine, granular structure; friable; many fine roots; medium acid; clear, smooth boundary.

A2—3 to 10 inches, yellowish-brown (10YR 5/4) loam; weak, fine, granular structure; friable; common fine roots; common fine pores; strongly acid; gradual, smooth boundary.

B21t—10 to 20 inches, red (2.5YR 4/8) silty clay; strong, medium, subangular blocky structure; firm; common fine roots; thick, continuous clay films on faces of peds; very strongly acid; gradual, smooth boundary.

B22t—20 to 26 inches, yellowish-red (5YR 5/8) silty clay; common, medium, prominent mottles of yellowish brown (10YR 5/6) and common, medium, distinct mottles of red (2.5YR 4/8); strong, medium, subangular blocky structure; firm; few fine roots; continuous clay films on faces of peds; very strongly acid; clear, smooth boundary.

B23t—26 to 36 inches, yellowish-red (5YR 5/6) silty clay; common, medium, prominent mottles of light gray (10YR 7/2) and common, medium, distinct mottles of reddish yellow (7.5YR 6/8); moderate, medium, subangular blocky structure; firm; few fine roots; few fine pores; continuous clay films on faces of peds; very strongly acid; gradual, smooth boundary.

B24t—36 to 52 inches, mottled, gray (10YR 6/1), strong-brown (7.5YR 5/8), and red (2.5YR 4/6) silty clay; moderate, medium, subangular blocky structure; firm; few roots; continuous clay films on faces of peds; very strongly acid; gradual, smooth boundary.

B25t—52 to 64 inches, gray (10YR 6/1) silty clay; common, medium, prominent, yellowish-red (5YR 5/8) mottles; moderate, medium, subangular blocky structure; firm; continuous clay films on faces of peds; very strongly acid; gradual, wavy boundary.

B26t—64 to 72 inches, gray (10YR 6/1) silty clay; common, medium, distinct, reddish-yellow (7.5YR 6/8) mottles; moderate, medium, angular blocky structure; firm; continuous clay films on faces of peds; very strongly acid.

The A1 horizon is dark grayish brown, dark brown, or brown. The A2 horizon is loam or fine sandy loam. The B21t horizon is yellowish-red or red clay loam, silty clay, or clay. The B22t horizon and lower layers are silty clay or clay. The B22t and B23t horizons are yellowish red or red. The A horizon is medium acid to very strongly acid, and the Bt horizon is strongly acid or very strongly acid.

Tiak soils are near Leadvale and Smithdale soils. They are more clayey in the B horizon than these soils.

Tiak fine sandy loam, 1 to 3 percent slopes (TaB).—This soil is on coastal plain uplands. Areas range from 20 to 200 acres in size.

Included with this soil in mapping are a few spots of Leadvale soils.

The hazard of erosion is severe. If this soil is contour cultivated, terraced on long slopes, and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown year after year in a cropping system that includes a winter cover crop every year. Crops can be sown without attention to row direction.

This soil is used mainly as woodland or for pasture. It is suited to such crops as soybeans, grain sorghum, winter small grain, and truck crops. Suitable pasture plants are bahiagrass, bermudagrass, tall fescue, white clover, sericea lespedeza, and annual lespedeza. Capability unit IIIe-2; woodland group 3c2.

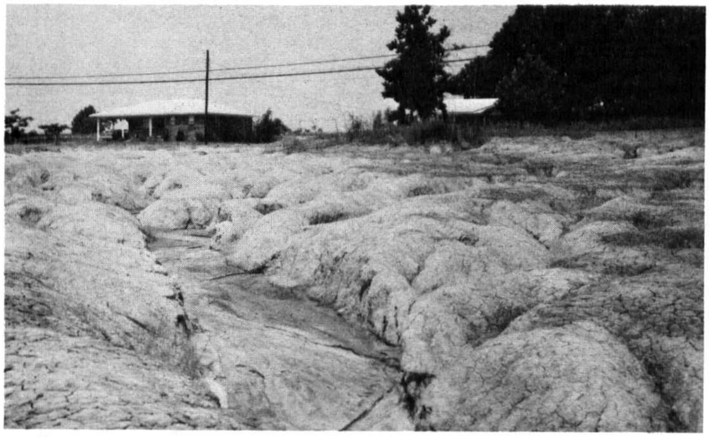

Figure 10.—**Very severe gully erosion in an area of Tiak soils in the Tiak-Urban land complex, 3 to 8 percent slopes.**

Tiak-Urban land complex, 3 to 8 percent slopes (TuC).—This complex consists of Tiak soils and of areas of material, mainly from Tiak soils, that have been modified by urban development. Areas generally range from about 20 to 200 acres in size. A Tiak soil in this unit has the profile described as representative for the Tiak series. Tiak soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Leadvale and Smithdale soils and spots of soils that have slopes of less than 3 percent.

Runoff is rapid on the Tiak soils, and the hazard of erosion is very severe if the areas are not protected by vegetation (fig. 10).

These soils are suited to a wide selection of landscaping plants. They are severely limited for most urban uses because of their high shrink-swell potential and slow percolation rate. Not assigned to a capability unit or to a woodland group.

Umbraqualfs

Umbraqualfs are poorly drained, level soils on bottom lands. These soils formed in thick beds of clayey slack-water deposits laid down by the Arkansas River. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is very dark brown silty clay about 6 inches thick. The subsurface layer is dark-gray silty clay about 5 inches thick. The subsoil is 19 inches thick. The upper 4 inches is very dark grayish-brown silty clay, the middle 6 inches is dark-gray clay, and the lower 9 inches is black clay. The underlying material is mottled, gray and dark-gray clay.

The Umbraqualfs are moderate to high in natural fertility. Permeability is very slow, and available water capacity is high.

Where these soils are adequately drained, they are suited to farming. Most areas are cultivated. Urban development is extending to areas of these soils.

Representative profile of Umbraqualfs, clayey, in a moist, cultivated area in the SE¼NW¼SW¼ sec. 25, T. 2 N., R. 12 W.:

Ap—0 to 6 inches, very dark brown (10YR 2/2) silty clay; massive parting to weak, fine, granular structure; firm; plastic; common fine roots; strongly acid; clear, smooth boundary.

A2g—6 to 11 inches, dark-gray (10YR 4/1) silty clay; root channels stained yellowish red (5YR 5/8) and yellowish brown (10YR 5/8); weak, medium and coarse, subangular blocky structure; firm; plastic; shiny pressure faces on peds; few fine roots; few fine pores; many, fine, black accretions; very strongly acid; clear, smooth boundary.

B21tg—11 to 15 inches, very dark grayish-brown (10YR 3/2) silty clay; root channels stained yellowish red (5YR 5/8); moderate, medium, subangular blocky structure; firm; plastic; shiny pressure faces on peds; few fine roots; common fine pores; common, fine, black accretions; extremely acid; gradual, wavy boundary.

B22tg—15 to 21 inches, dark-gray (N7/0) clay; root channels stained yellowish red (5YR 4/8); moderate, fine and medium, subangular blocky structure; firm; plastic; shiny pressure faces on peds; few fine roots; few fine pores; extremely acid; gradual, wavy boundary.

B23tg—21 to 30 inches, black (10YR 2/1) clay; interiors of some peds mottled dark gray (10YR 4/1); root channels stained dark yellowish brown (10YR 4/4); moderate, medium, subangular blocky structure; firm; plastic; few fine roots; few fine pores; common fragments of yellowish-brown (10YR 3/4) decayed plant material; clay films or pressure faces on peds; strongly acid; clear, smooth boundary.

C1g—30 to 42 inches, gray (10YR 5/1) clay; many, medium, prominent, yellowish-red (5YR 5/8) mottles; massive; firm; plastic; very strongly acid; clear, smooth boundary.

C2g—42 to 60 inches, dark-gray (N 4/0) clay; common, fine, distinct, strong-brown mottles; massive; firm; plastic; very strongly acid.

The Ap horizon is very dark brown, very dark gray, or very dark grayish brown. The B21tg horizon is black, very dark gray, or very dark grayish-brown silty clay or clay. The B22tg horizon is dark gray or gray. The B23tg horizon ranges from black to gray. The C horizon is gray or dark gray. The A horizon is very strongly acid or strongly acid, and the B and C horizons are extremely acid to strongly acid.

Umbraqualfs are near Perry soils. They have a thicker dark surface layer than Perry soils, and they are more acid.

Umbraqualfs, clayey (Um).—This soil is in low depressions on bottom lands. Slopes are less than 1 percent. Areas range from about 50 to 300 acres in size.

Included with this soil in mapping are a few spots of Perry soils.

Runoff is very slow, and wetness is a severe limitation. Most tracts are subject to occasional flooding in winter and in spring. Because of its high clay content, this soil can be cultivated only within a narrow range of moisture content. Preparing a seedbed and maintaining good tilth are difficult. Farming operations are delayed several days after rains unless surface drains are provided. If this soil is adequately drained and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown year after year.

This soil is suited to crops, and most areas are cultivated. A few small areas are in pasture. Suitable crops include soybeans, rice, winter small grain, cotton, and grain sorghum. Suitable pasture plants are bermudagrass, dallisgrass, tall fescue, and white clover. Capability unit IIIw-3; woodland group 2w6.

Urban Land

Urban land (Ut) is a miscellaneous land type that occurs throughout the part of the county that is developed for urban use. It is mainly on Little Rock Air Force Base, within the cities of Little Rock and North Little Rock, and in their satellite communities and suburbs. The more intensely developed parts of Little Rock and North Little

Rock have 75 to 100 percent of their areas covered with office buildings, service buildings, hotels and motels, industrial buildings and yards, streets and sidewalks, parking lots, railroads, shopping centers, closely spaced residences, and other works and structures. On the air base, most of the area is covered by paved runways, taxiways and parking areas, operational buildings, dormitories, and streets.

In this mapping unit, most areas of soils that are not covered by works and structures have been so altered during construction that it was not practical to map them separately. Cuts and fills and grading and compaction by machinery during construction have severely altered the characteristics of the original soils.

Included with this land type in mapping are areas that have only 50 to 75 percent of the surface covered by works and structures. Also included are areas that have only a thin layer of introduced fill material and where the buried original soil can be identified. Not assigned to a capability unit or to a woodland group.

Wrightsville Series

The Wrightsville series consists of poorly drained, level to depressional soils on old stream terraces. The soils formed in loamy and clayey alluvium. The native vegetation is chiefly mixed pines and hardwoods.

In a representative profile the surface layer is yellowish-brown silt loam about 3 inches thick. The subsurface layer is mottled, light-gray silt loam about 21 inches thick. The subsoil, about 45 inches thick, is mottled, gray and light brownish-gray silty clay and clay that has tongues of white silt extending throughout. The underlying material is dark-red clay.

Wrightsville soils are low in natural fertility. Permeability is very slow, and available water capacity is high. Response to fertilizer is fair. These soils are easy to till, but they are wet for long periods after rains.

Where drained and well managed, these soils are suited to most crops and pasture plants commonly grown in the county. Most of the areas are used for woodland and pasture. Some tracts have been developed for urban uses, and others are being held for urban development.

Representative profile of Wrightsville silt loam, in a moist, wooded area in the NW¼NW¼SW¼ sec. 17, T. 1 S., R. 11 W.:

O1—½ inch to 0, mixed pine needles, hardwood leaves, and twigs.

A1—0 to 3 inches, yellowish-brown (10YR 5/4) silt loam; common, fine, faint, light-gray and pale-brown mottles; weak, thin, platy structure, parting to weak, fine, granular; very friable; common fine and medium roots; common fine pores; strongly acid; abrupt, wavy boundary.

A21g—3 to 15 inches, light-gray (10YR 7/1) silt loam; many, medium, distinct mottles of dark yellowish brown (10YR 4/4) and common, fine, prominent mottles of strong brown; weak, medium, angular blocky structure; friable; few fine and medium roots; many fine pores; very strongly acid; gradual, wavy boundary.

A22g—15 to 24 inches, light-gray (10YR 7/1) silt loam; many, medium, distinct, brownish-yellow (10YR 6/6) mottles; weak, medium, subangular blocky structure; friable; few fine and medium roots; many fine pores; root channels stained strong brown (7.5YR 5/8); many, fine, brown accretions and common, medium, brown accretions; very strongly acid; clear, irregular boundary.

B21tg and A2g—24 to 42 inches, gray (10YR 6/1) silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/8) and common, fine, prominent mottles of strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; firm; continuous clay films on faces of peds; common white (10YR 8/1) silt tongues ½ inch to 3 inches in diameter; few fine and medium roots; many fine pores; few, fine, dark accretions; very strongly acid; gradual, irregular boundary.

B22tg and A2g—42 to 62 inches, light brownish-gray (10YR 6/6) and few, fine, prominent mottles of strong brown (7.5YR 5/6); weak, medium, angular blocky structure; very firm; thin, continuous clay films on faces of peds; few medium and fine roots; few fine pores; few, fine and medium, black accretions; common white (10YR 8/1) silt tongues ½ inch to 2 inches in diameter; very strongly acid; gradual, irregular boundary.

B3g and A2g—62 to 69 inches, gray (10YR 6/1) clay; many, medium, prominent, yellowish-red (5YR 4/8) mottles; weak, medium, angular blocky structure; very firm; few fine and medium roots; common fine pores; few white (10YR 8/1) silt tongues ½ inch to 2 inches in diameter; common, fine and medium, black accretions; strongly acid; abrupt, irregular boundary.

IIC—69 to 72 inches, dark-red (2.5YR 3/6) clay; black stains on faces of peds; white (10YR 8/1) silt streaks in cracks; slightly acid.

The A1 horizon is dark gray to yellowish brown. The A2g horizon is light gray or light brownish gray. The B2tg and A2g horizons are gray or light brownish-gray silty clay loam, silty clay, or clay. The B3g and A2g horizons are mottled, gray or light brownish-gray silty clay or clay. In many places the IIC horizon is lacking within 72 inches of the surface. The A and B horizons are strongly acid or very strongly acid, and the IIC horizon is very strongly acid to neutral in reaction.

Wrightsville soils are near Amy and Leadvale soils. They are more clayey in the B horizon than those soils and they are more poorly drained than Leadvale soils.

Wrightsville silt loam (Wt).—This soil is on the coastal plain. Slope gradient is less than 1 percent. Areas range from about 40 to 800 acres in size. The profile of this soil is the one described as representative for the series.

Included with this soil in mapping are a few spots of Amy and Leadvale soils.

Runoff is slow, and wetness is a severe limitation. Farming operations are delayed several days after rains unless surface drains are installed. If this soil is adequately drained and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown year after year.

This soil is suited to crops where it is drained and well managed. The main use of this soil is for woodland. Suitable crops include soybeans, cotton, and grain sorghum. Winter small grain can be grown where surface drainage is adequate. Suitable pasture plants include bermudagrass, bahiagrass, tall fescue, white clover, annual lespedeza, and sericea lespedeza. Capability unit IIIw-1; woodland group 3w9.

Wrightsville-Urban land complex (Wu).—This poorly drained complex consists of Wrightsville soils and of areas of material, mainly from Wrightsville soils, that has been modified by urban development. Areas generally range from about 20 to 200 acres in size. Wrightsville soils make up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Amy and Leadvale soils.

Runoff is slow on the Wrightsville soils and a seasonal perched water table saturates the soil to the surface during wet seasons.

These soils are suited only to water-tolerant landscaping plants. They are severely limited for most urban uses because of wetness, a seasonal perched water table, a slow percolation rate, and low bearing capacity. Not assigned to a capability unit or to a woodland group.

Use and Management of the Soils

In this section the use and management of the soils in Pulaski County for crops and pasture, wildlife, woodland, engineering, town and country planning, and recreation are discussed.

Use of the Soils for Crops and Pasture[3]

This section discusses the management of soils in Pulaski County for crops and pasture and explains the system of capability grouping used by the Soil Conservation Service. A table that shows predicted yields under improved management is also provided.

In the rural part of the county, most of the cleared areas on the bottom lands of the Arkansas River are used for such crops as soybeans, cotton, and small grains. On uplands and in valleys, pasture and meadow are the main uses of cleared areas, but some tracts are idle.

In general, the soils in the county, except those on the bottom lands of the Arkansas River, are low in nitrogen, potassium, phosphorus, calcium, and organic-matter content. Many of those soils that are suitable for cultivation are erodible. Poor surface or internal drainage, susceptibility to flooding, or both, are limitations to use of some soils.

Contour cultivation, terraces, and grassed waterways are needed on sloping soils that are used for clean-tilled crops, and row arrangement and surface drainage are needed for dependable growth in areas of wet soil.

Annual cover crops or grasses and legumes should be grown regularly in the cropping system if the hazard of erosion is severe or if the crops that are grown leave only a small amount of residue. Crop residue should be shredded and spread evenly to provide protective cover and active organic matter to the soils.

The amount of fertilizer to be applied generally is determined by soil tests, the kinds of crops to be grown, and past experiences with fertilization and crops on the various fields. On most of the soils, periodic applications of agricultural limestone according to soil tests are beneficial to most crops. Generally lime is necessary to attain satisfactory growth of such crops as alfalfa and white clover.

If left bare, many of the soils tend to crust and pack during periods of heavy rainfall. Growing cover crops and managing crop residue help to preserve tilth.

Perennial grasses or legumes, or a mixture of these, are grown for pasture and hay. The mixture generally consists of either a summer or a winter perennial grass and a suitable legume.

Coastal bermudagrass, common bermudagrass, dallisgrass, and Pensacola bahiagrass are the summer perennials commonly grown. Pensacola bahiagrass is fairly new to this county, but its use results in a highly satisfactory production of good-quality forage. Johnsongrass is also suited to many of the soils in the county. Tall fescue is the chief winter perennial grass grown in the county. All of these grasses respond well to fertilizers, and particularly to nitrogen. White clover, crimson clover, annual lespedeza, and sericea lespedeza are the commonly grown legumes.

Proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Other management practices, such as brush and weed control, fertilization, and renovation of the pasture, are also important.

Capability grouping

Some readers, particularly those who farm on a large scale, may find it practical to use and manage alike some of the different kinds of soil on their farm. These readers can make good use of the capability classification system, a grouping that shows, in a general way, the suitability of soils for most kinds of farming.

The grouping is based on permanent limitations of soils when used for field crops, the risk of damage when they are farmed, and the way the soils respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, horticultural crops, or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations, for forest trees, for engineering, or for town and country planning.

In the capability system, all kinds of soil are grouped at three levels: the class, the subclass, and the unit. The broadest grouping, the capability class, is designated by Roman numerals I to VIII. In class I are the soils that have the fewest limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and land-forms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products. The subclass indicates major kinds of limitations within the classes. Within most of the classes there can be up to four subclasses. The subclasses are indicated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils are subject to little or no erosion but have other limitations that confine their use largely to pasture, range, or wildlife.

Subclasses are further divided into groups called capability units. These are groups of soils so much alike that they are suited to the same crops and pasture plants, require about the same management, and have generally similar productivity and other response to management. Capability units are generally identified by numbers assigned locally, for example, IIe-1 or IIIw-3.

The eight classes in the capability system and the subclasses and units in Pulaski County are described in the list

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[3] W. WILSON FERGUSON, conservation agronomist, Soil Conservation Service, assisted in the preparation of this section.

that follows. The unit designation is given in the Guide to Mapping Units.

Class I soils have few limitations that restrict their use.

Unit I-1. Level, well-drained, deep, loamy soils; on bottom lands.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Subclass IIe. Soils that are subject to moderate erosion unless protected.

Unit IIe-1. Nearly level, moderately well drained and well drained, deep, loamy soils; on uplands.

Unit IIe-2. Gently sloping, well-drained, deep, loamy soils; on bottom lands.

Subclass IIw. Soils that are moderately limited because of excess water.

Unit IIw-1. Level, well-drained, deep, loamy, occasionally flooded soils; on bottom lands.

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

Subclass IIIe. Soils that are subject to severe erosion if they are cultivated and not protected.

Unit IIIe-1. Gently sloping and undulating, moderately well drained and well drained, moderately deep and deep, loamy soils; on uplands.

IIIe-2. Nearly level, moderately well drained, deep, loamy soils that have a clayey subsoil; on uplands.

Subclass IIIw. Soils that are severely limited for cultivation because of excess water.

Unit IIIw-1. Level, poorly drained, deep, loamy soils; on uplands.

Unit IIIw-2. Level, somewhat poorly drained, deep, clayey soils; on bottom lands.

Unit IIIw-3. Level, poorly drained, deep, clayey soils; on bottom lands.

Unit IIIw-4. Undulating, well-drained and poorly drained, deep, loamy and clayey soils that are complexly intermingled; on bottom lands.

Subclass IIIs. Soils that are severely limited because of low available water capacity.

Unit IIIs-1. Level and nearly level, excessively drained, deep, stratified, loamy and sandy soils; on bottom lands.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Subclass IVe. Soils that are subject to very severe erosion if they are cultivated and not protected.

Unit IVe-1. Gently sloping and undulating, well-drained, moderately deep, loamy soils that have a clayey subsoil; on uplands.

Unit IVe-2. Moderately sloping, well-drained, deep, loamy soils; on uplands.

Subclass IVw. Soils that are very severely limited for cultivation because of excess water.

Unit IVw-1. Undulating, predominantly poorly drained, deep, loamy soils; on uplands.

Unit IVw-2. Level, poorly drained, deep, clayey soils that are subject to frequent flooding in winter and spring; on bottom uplands.

Subclass IVs. Soils that are very severely limited because of low available water capacity.

Unit IVs-1. Level and nearly level, excessively drained, deep, sandy soils; on bottom lands.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.

Subclass Vw. Soils that are too wet for cultivation; drainage or protection from flooding are not feasible.

Unit Vw-1. Level and undulating, predominantly poorly drained, deep, loamy soils that are subject to frequent flooding; on bottom lands.

Unit Vw-2. Level and gently undulating, well-drained, deep, loamy soils that are subject to frequent flooding; on bottom lands.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife.

Subclass VIe. Soils that are severely limited, chiefly by risk of erosion, unless protective cover is maintained.

Unit VIe-1. Moderately sloping, well-drained, moderately deep, loamy soils that have a clayey subsoil; on uplands.

Unit VIe-2. Moderately steep, well-drained, moderately deep, loamy soils; on uplands.

Subclass VIs. Soils that are severely limited, chiefly by low available water capacity and stones.

Unit VIs-1. Undulating to moderately sloping, well-drained, shallow, stony soils; on uplands.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, range, woodland, or wildlife.

Subclass VIIe-1. Soils that are very severely limited, chiefly by risk of erosion, unless protective cover is maintained.

Unit VIIe-1. Steep, well-drained, moderately deep, loamy soils that have a clayey subsoil; on uplands.

Subclass VIIs. Soils that are very severely limited, chiefly by low available water capacity and stones.

Unit VIIs-1. Moderately steep and steep, well-drained, shallow, stony soils; on uplands.

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife habitat, water supply, or esthetic purposes (none in Pulaski County).

Predicted yields

Table 3 lists predicted yields of the principal crops grown in the county. The predictions are based on estimates made by farmers, soil scientists, agronomists, and others who have knowledge of yields in the county and on research data. The yields are the average yields per acre that can be expected by a good commercial farmer at the level of management which results in the highest economic returns.

Crops other than those shown in table 3 are grown in the county, but yields for them are not included in the table, because their acreage is small or because reliable data on yields are not available. Soils that have a significant part of their area in urban developments are not included in table 3.

The predicted yields given in table 3 can be expected if the following management practices are applied:

1. Rainfall is effectively used and conserved.
2. Surface drainage systems are installed.
3. Crop residue is managed to maintain soil tilth.
4. Minimum but timely tillage is used.
5. Insect, disease, and weed-control measures are consistently used.

TABLE 3.—*Predicted average yields per acre of principal crops and pasture*

[Absence of a figure indicates that the crop is not suited to the specific soil or is not commonly grown on it. Predicted yields are not included for mapping units that consist of a high percentage of Urban land]

Soil	Cotton	Soybeans	Rice	Wheat	Bermudagrass	Bahiagrass	Tall fescue
	Lbs of lint	*Bu*	*Bu*	*Bu*	*AUM*[1]	*AUM*[1]	*AUM*[1]
Amy silt loam	450	25			6.0	7.5	6.0
Amy silt loam, frequently flooded					6.0	7.5	
Amy complex, undulating					6.5	7.5	6.5
Bruno fine sandy loam	400	20		35	5.5	6.0	
Carnasaw gravelly silt loam, 3 to 8 percent slopes					5.0	5.5	4.0
Carnasaw gravelly silt loam, 8 to 12 percent slopes					4.5	5.0	4.0
Carnasaw-Mountainburg association, undulating							
Carnasaw-Mountainburg association, steep							
Crevasse fine sand	350	15		25	4.0		
Guthrie-Leadvale complex, undulating					6.5	7.5	6.5
Keo silt loam	850	40		40	8.5	9.0	8.0
Latanier silty clay	650	35	120		7.5	8.0	7.5
Leadvale silt loam, 1 to 3 percent slopes		30		35	6.5	7.5	7.0
Leadvale silt loam, 3 to 8 percent slopes		25		30	6.5	7.0	6.5
Linker gravelly fine sandy loam, 3 to 8 percent slopes		20		25	6.0	6.5	5.0
Linker-Mountainburg association, moderately steep							
Moreland silty clay	650	35	130		7.0	7.5	6.5
Mountainburg stony fine sandy loam, 3 to 12 percent slopes					4.0	4.5	
Norwood silty clay loam	850	40		40	8.5	9.0	8.0
Perry clay	500	35	130		6.5		7.5
Rexor silt loam, frequently flooded					7.0	7.0	
Rilla silt loam, 0 to 1 percent slopes	850	40		40	8.5	9.0	8.5
Rilla silt loam, 3 to 5 percent slopes	800	35		40	8.5	9.0	8.5
Rilla-Perry complex, undulating	750	35			8.0	8.5	8.0
Sallisaw gravelly silt loam, 1 to 3 percent slopes		30		35	7.5	7.5	7.0
Sallisaw gravelly silt loam, 3 to 8 percent slopes		25		30	6.5	7.0	7.0
Sallisaw-Leadvale association, undulating							
Smithdale fine sandy loam, 3 to 8 percent slopes		25		30	6.5	7.0	6.5
Smithdale fine sandy loam, 8 to 12 percent slopes					5.5	6.0	
Tiak fine sandy loam, 1 to 3 percent slopes					5.0	5.5	4.0
Umbraqualfs, clayey		30			6.5		7.0
Wrightsville silt loam	450	25	120		7.0	7.5	7.0

[1] Animal-unit-months represent the number of months that 1 acre will provide grazing for one animal-unit (1,000 pounds live weight), or the number of months the pasture can be grazed multiplied by the number of animal units an acre will support. For example, 1 acre of Keo silt loam in an improved pasture of tall fescue will provide grazing for two animals for 4 months, so it has a rating of 8 animal-unit-months.

6. Fertilizers are applied according to soil tests and crop needs.
7. Adapted crop varieties are used at recommended seeding rates.

For rice, the following additional practices are applied:

8. Suitable quality of irrigation water is used.
9. Irrigation is timed to suit the needs of the soil and crop.
10. Irrigation systems are properly designed and efficiently used.

Wildlife[4]

Soils directly influence the kind and amount of vegetation and the amount of water available. In this way soils indirectly influence the kind of wildlife that can live in an area. Soil properties that affect the growth of wildlife habitat are (1) thickness of soil useful to crops, (2) surface texture, (3) available water capacity, (4) wetness, (5) flood hazard, (6) slope, and (7) permeability of the soil to air and water.

In table 4 the soils of Pulaski County are rated for their relative suitability for seven elements of wildlife habitat and three groups, or kinds, of wildlife. Ratings were not made for Urban land and for mapping units in which Urban land is a major component.

Each soil in table 4 is rated according to its suitability for producing various kinds of plants and other elements that make up wildlife habitat. The ratings mainly take into account the characteristics of the soils and closely related natural factors of the environment. They do not take into account climate, present use of soils, or present distribution of wildlife and people. For this reason, selection of an area

[4] ROY A. GRIZZELL, biologist, Soil Conservation Service, assisted in the preparation of this section.

TABLE 4.—*Suitability of the soils for elements of wildlife habitat and kinds of wildlife*

Soils	Elements of wildlife habitat							Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood plants	Coniferous plants	Wetland plants	Shallow-water developments	Openland	Woodland	Wetland
Amy silt loam	Poor	Fair	Fair	Good	Fair	Good	Good	Fair	Good	Good.
Amy silt loam, frequently flooded	Poor	Fair	Fair	Good	Fair	Good	Poor	Fair	Good	Fair.
Amy complex, undulating	Poor	Fair	Fair	Good	Fair	Good	Fair	Fair	Good	Fair.
Bruno fine sandy loam	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Carnasaw gravelly silt loam, 3 to 8 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Carnasaw gravelly silt loam, 8 to 12 percent slopes	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Carnasaw-Mountainburg association, undulating:										
Carnasaw part	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Mountainburg part	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Carnasaw-Mountainburg association, steep:										
Carnasaw part	Poor to very poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Mountainburg part	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Crevasse fine sand	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Guthrie-Leadvale complex, undulating	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
Keo silt loam	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Latanier silty clay	Fair	Fair	Fair	Good	Poor	Good	Good	Fair	Good	Good.
Leadvale silt loam, 1 to 3 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Leadvale silt loam, 3 to 8 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Linker gravelly fine sandy loam, 3 to 8 percent slopes	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
Linker-Mountainburg association, moderately steep:										
Linker part	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Mountainburg part	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Moreland silty clay	Fair	Fair	Fair	Good	Poor	Good	Good	Fair	Good	Good.
Mountainburg stony fine loam, 3 to 12 percent slopes	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Norwood silty clay loam	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Perry clay	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Rexor silt loam, frequently flooded	Poor	Fair	Fair	Good	Good	Poor	Very poor	Fair	Good	Very poor.
Rilla silt loam, 0 to 1 percent slopes	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Rilla silt loam, 3 to 5 percent slopes	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Rilla-Perry complex, undulating	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
Sallisaw gravelly silt loam, 1 to 3 percent slopes	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Sallisaw gravelly silt loam, 3 to 8 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Salllsaw-Leadvale association, undulating:										
Sallisaw part	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Leadvale part	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Smithdale fine sandy loam, 3 to 8 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Smithdale fine sandy loam, 8 to 12 percent slopes	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Tiak fine sandy loam, 1 to 3 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Umbraqualfs, clayey	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Wrightsville silt loam	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

for development as a habitat for wildlife requires inspection at the site.

A rating of *good* means the element of wildlife habitat and kinds of wildlife generally are easily created, improved, and maintained. Few or no limitations affect management in this category, and satisfactory results are expected when the soil is used for the prescribed purpose.

A rating of *fair* means the element of wildlife habitat and kinds of wildlife can be established, improved, or maintained in most places. Moderate intensity of management and fairly frequent attention may be required for satisfactory results.

A rating of *poor* means the element of wildlife habitat and limitations for the designated kinds of wildlife are severe. Habitats can be created, improved, or maintained in most places, but management is difficult and requires intensive effort.

A rating of *very poor* means use of the soil for the elements of wildlife habitat are very severe and that unsatisfactory results are to be expected. It is either impossible or impractical to create, improve, or maintain habitats on soils in this category.

In the following paragraphs the elements of wildlife habitat rated in table 4 are briefly described.

Grain and seed crops are annual grain-producing plants, such as corn, sorghum, millet, and soybeans.

Grasses and legumes are domestic grasses and legumes that are established by planting. They provide food and cover for wildlife. Grasses include bahiagrass, ryegrass, and panicgrass; legumes include annual lespedeza, shrub lespedeza, and other clovers.

Wild herbaceous plants are native or introduced perennial grasses, forbs, and weeds that provide food and cover for upland wildlife. Beggarweed, perennial lespedeza, wildbean, pokeweed, and cheatgrass are typical examples.

Hardwood plants are nonconiferous trees, shrubs, and woody vines that produce wildlife in the form of fruits, nuts, buds, catkins, or browse. Such plants commonly grow in their natural environment, but they can be planted and developed through wildlife management programs. Typical species in this category are oak, beech, cherry, dogwood, maple, viburnum, grape, honeysuckle, greenbrier, and silverberry.

Coniferous plants are cone-bearing trees and shrubs that provide cover and frequently furnish food in the form of browse, seeds, or fruitlike cones. They commonly grow in their natural environment, but they can be planted and managed. Typical plants in this category are pines, cedars, and ornamental trees and shrubs.

Wetland plants are annual and perennial herbaceous plants that grow wild on wet or moist sites. They furnish food and cover mostly for wetland wildlife. Typical examples of plants are smartweed, wild millet, spikerush and other rushes, sedges, burreed, tearthumb, and aneilema. Submerged and floating aquatics are not included in this category.

Shallow-water developments are impoundments or excavations for controlling water, generally not more than 5 feet deep, to create habitats that are suitable for waterfowl. Some are designed to be drained, planted, and then flooded; others are permanent impoundments that grow submerged aquatics.

Table 4 also rates soils according to their suitability as habitat for the three kinds of wildlife in the county—openland, woodland, and wetland. These ratings are related to ratings made for the elements of habitat. For example, soils rated very poor for shallow-water developments are rated very poor for wetland wildlife. The kinds of wildlife rated in table 4 are briefly described in the following paragraphs.

Openland wildlife are birds and mammals that normally live in meadows, pastures, and open areas where grasses, herbs, and shrubbery plants grow. Quail, doves, meadowlarks, field sparrows, cottontail rabbit, and fox are typical examples of openland wildlife.

Woodland wildlife are birds and mammals that normally live in wooded areas of hardwood trees, coniferous trees, and shrubs. Woodcock, thrushes, wild turkey, vireos, deer, squirrels, and raccoon are typical examples of woodland wildlife.

Wetland wildlife are birds and mammals that normally live in wet areas, marshes, and swamps. Duck, geese, rail, shore birds, heron, mink, and muskrat are typical examples of wetland wildlife.

Woodland[5]

Originally, the land area of Pulaski County, except for river sandbars, was wooded. Within the woodlands on the uplands were scattered tracts of savanna, where the open stand of forest trees had an understory of tall native grasses. In 1969 only about 49 percent of the county, including about 28,000 acres in public ownership, was woodland. Since that time urban expansion has engulfed another several thousand acres of woodland.

Good stands of commercial trees are produced in the woodlands of the southern and western parts of the county. Woodlands of fair quality are in the northern part. Needleleaf forest types occur most frequently on the uplands, and broadleaf types generally predominate on the bottom lands along the creeks and rivers.

The value of the wood products is substantial, though it is below its potential. Other values of these areas include grazing, wildlife, recreation, natural beauty, and conservation of soil and water. This section has been provided to explain how soils affect tree growth and management in the county. In table 5 potential productivity and management concerns of the soils of Pulaski County are listed.

Some of the column headings in table 5 are explained in the following paragraphs.

Soils are placed in woodland groups according to their suitability for trees, their response to management, and their potential productivity.

Each woodland group is identified by a three-part symbol. The first part of the symbol indicates the relative productivity of the soils: 1 = very high; 2 = high; 3 = moderately high; 4 = moderate; and 5 = low. The second part of the symbol, a letter, indicates the important soil property that imposes a moderate or severe hazard or limitation in managing the soils for wood production. The letter *x* shows that the main limitation is stoniness or rockiness; *w* shows that excessive water in or on the soil is the chief limitation; *t* shows that toxic substances in the soil are the chief limitation; *d* shows that the rooting depth is restricted; *c* shows that clay in the upper part of the soil is a limitation; *s* shows that the soils

[5] MAX D. BOLAR, woodland conservationist, and IVAN R. PORTER, range conservationist, Soil Conservation Service, assisted in the preparation of this section.

TABLE 5.—*Use and management of the soils for wood crops and woodland forage*[1]

[Absence of data indicates information is not available]

Soil series and map symbols	Woodland group	Potential productivity		Understory vegetation used as forage		Hazards and limitations			Species preferred for planting
		Important wood crops	Site index[2]	Important plants	Estimated yields for medium canopy	Erosion hazard	Equipment limitations	Seedling mortality	
					Lbs per acre				
Amy: Am, ApB	2w9	Loblolly pine Shortleaf pine Sweetgum	90 80 90	Switchgrass, velvetgrass, beaked panicum, bluestems, low panicums, uniolas, sedges, flatsedges, forbs.	Unfavorable years, 1,000; favorable years, 2,000.	Slight	Severe	Severe	Loblolly pine, sweetgum, Nuttall oak, Shumard oak, cherrybark oak, green oak, willow oak, swamp chestnut oak, green ash, water oak.
Ao	2w9	Loblolly pine Sweetgum Water oak	90 90 90	Switchgrass, velvetgrass, beaked panicum, bluestems, low panicums, uniolas, sedges, flatsedges, forbs.	Unfavorable years, 1,000; favorable years, 2,000.	Slight	Severe	Severe	Loblolly pine, sweetgum, eastern cottonwood, green ash, sycamore, Nuttall oak, willow oak, swamp chestnut oak.
Bruno: Bs	2s5	Cherrybark oak Water oaks Sweetgum Eastern cottonwood. Sycamore	95 95 95 105 90	Switchcane, Virginia wildrye, beaked panicum, uniolas, low panicums, honeysuckle, forbs.	Unfavorable years, 3,000; favorable years, 4,000.	Slight	Moderate	Moderate	Cherrybark oak, Shumard oak, water oak, sweetgum, eastern cottonwood, sycamore.
Carnasaw: CaC, CaD, CMC	3o1	Shortleaf pine Loblolly pine	70 80	Little bluestem, big bluestem, plumegrass, beaked panicum, low panicums, uniolas, sedges, forbs.	Unfavorable years, 1,500; favorable years, 2,500.	Slight	Slight	Slight	Loblolly pine, shortleaf pine, eastern redcedar.
CMF For Mountainburg part, see Mountainburg series.	3r3	Shortleaf pine Loblolly pine	70 80	Little bluestem, big bluestem, plumegrass, beaked panicum, low panicums, uniolas, sedges, forbs.	Unfavorable years, 1,500; favorable years, 2,500.	Moderate	Severe	Moderate	Loblolly pine, shortleaf pine, eastern redcedar.
Crevasse: Cr	3s6	Sycamore Eastern cottonwood.	90 100	Eastern gamagrass, Florida paspalum, switchgrass, indiangrass, beaked panicum, forbs.	Unfavorable years, 2,000; favorable years, 3,000.	Slight	Moderate	Severe	Cottonwood, sycamore.

Guthrie: GeB	2w9	Sweetgum Loblolly pine Water oaks	90 80 ----------	Switchgrass, velvetgrass, beaked panicum, uniolas, low panicums, sedges, forbs.	Unfavorable years, 1,000; favorable years, 2,000.	Slight	Severe	Severe	Loblolly pine, sweetgum, Nuttall oak, willow oak, water oak, Shumard oak, swamp chestnut oak.
Keo: Ko	2o4	Eastern cottonwood. Sweetgum Sycamore Southern red oak Water oak Green ash	100 90 ---------- ---------- ---------- ----------	Switchcane, switchgrass, bluestems, Virginia wildrye, uniolas, sedges, low panicums, vines, forbs.	Unfavorable years, 3,000; favorable years, 4,000.	Slight	Slight	Slight	Eastern cottonwood, sycamore, sweetgum, Shumard oak, cherrybark oak, black walnut.
Latanier: La	2w5	Cherrybark oak Water oak Sweetgum Green ash Pecan Eastern cottonwood. Sycamore	90 90 90 90 90 110 ----------	Switchgrass, eastern gamagrass, Virginia wildrye, broadleaf uniola, beaked panicum, redtop panicum, velvetgrass, sedges, rushes.	Unfavorable years, 1,800; favorable years, 2,000.	Slight	Moderate	Moderate	Cottonwood, sweetgum, sycamore, green ash, cherrybark oak, willow oak, water oak, Shumard oak.
Leadvale: LeB, LeC	3o7	Loblolly pine Shoftleaf pine Red oak White oak Eastern redcedar Black walnut Black cherry	80 70 70 60 50 ---------- ----------	Bluestems, plumegrass, switchgrass, Virginia wildrye, low panicums, forbs.	Unfavorable years, 1,500; favorable years, 3,500.	Slight	Slight	Slight	Loblolly pine, shortleaf pine, eastern redcedar, southern red oak, black locust, black walnut, black cherry.
Linker: LkC, LRE For Mountainburg part of LRE, see Mountainburg series.	4o1	Shortleaf pine Southern red oak White oak Eastern redcedar	60 50 50 40	Bluestems, indiangrass, switchgrass, Canada wildrye, low panicums, forbs.	Unfavorable years, 1,000; favorable years, 2,500.	Slight	Slight	Slight	Loblolly pine, shortleaf pine, eastern redcedar.
Moreland: Me	2w6	Eastern cottonwood. Sweetgum Cherrybark oak Water oak Green ash	100 90 90 90 75	Switchgrass, eastern gamagrass, Virginia wildrye, broadleaf uniola, beaked panicum, redtop panicum, velvetgrass, sedges, rushes.	Unfavorable years, 1,000; favorable years, 2,000.	Slight	Severe	Moderate	Cherrybark oak, willow oak, sweetgum, sycamore, eastern cottonwood, green ash, water oak, swamp chestnut oak, Shumard oak.
Mountainburg: MoD	5x3	Shortleaf pine Eastern redcedar Loblolly pine	50 30 ----------	Bluestems, indiangrass, Canada wildrye, switchgrass, low panicums, forbs.	Unfavorable years, 800; favorable years, 2,000.	Slight to moderate.	Severe	Slight to moderate.	Loblolly pine, shortleaf pine, eastern redcedar.

TABLE 5.—*Use and management of the soils for wood crops and woodland forage*[1]—Continued

Soil series and map symbols	Woodland group	Potential productivity: Important wood crops	Potential productivity: Site index[2]	Understory vegetation used as forage: Important plants	Understory vegetation used as forage: Estimated yields for medium canopy	Hazards and limitations: Erosion hazard	Hazards and limitations: Equipment limitations	Hazards and limitations: Seedling mortality	Species preferred for planting
					Lbs per acre				
Norwood: No	2o4	Eastern cottonwood. Sweetgum Sycamore Southern red oak Water oak Green ash	100 90 --- --- --- ---	Switchcane, switchgrass, bluestems, Virginia wildrye, uniolas, sedges, low panicums, vines, forbs.	Unfavorable years, 3,000; favorable years, 4,000.	Slight	Slight	Slight	Eastern cottonwood, sycamore, sweetgum, Shumard oak, cherrybark oak, black walnut.
Perry: Pe:									
Protected part	2w6	Sweetgum Green ash Eastern cottonwood. Water oak	90 70 90 ---	Switchgrass, eastern gamagrass, Virginia wildrye, broadleaf uniola, beaked panicum, redtop panicum, velvetgrass, sedges, rushes.	Unfavorable years, 1,000; favorable years, 2,000.	Slight	Severe	Moderate	Eastern cottonwood, sweetgum, willow oak, Nuttall oak, water oak, swamp chestnut oak, green ash.
Frequently flooded part	3w6	Sweetgum Green ash Eastern cottonwood. Water oak	80 70 85 ---	Switchgrass, eastern gamagrass, Virginia wildrye, broadleaf uniola, beaked panicum, redtop panicum, velvetgrass, sedges, rushes.	Unfavorable years, 1,000; favorable years, 2,000.	Slight	Severe	Severe	Eastern cottonwood, sweetgum, willow oak, Nuttall oak, water oak, swamp chestnut oak, green ash.
Rexor: Re	2w8	Loblolly pine Sweetgum Cherrybark oak	90 90 90	Switchgrass, indiangrass, Virginia wildrye, uniolas, sedges, forbs.	Unfavorable years, 2,500; favorable years, 3,000.	Moderate	Slight	Slight	Loblolly pine, sweetgum, cherrybark oak.
Rilla:									
RmA, RmC	2o4	Eastern cottonwood. Cherrybark oak Nuttall oak Water oak Sweetgum	100 100 85 85 100	Switchcane, Virginia wildrye, switchgrass, uniolas, sedges, low panicums, vines, forbs.	Unfavorable years, 3,000; favorable years, 4,000.	Slight	Slight	Slight	Eastern cottonwood, sweetgum, sycamore, cherrybark oak, Nuttall oak, willow oak, black walnut.
RpB	2w5	Eastern cottonwood. Cherrybark oak Nuttall oak Water oak Sweetgum	100 100 85 85 100	Switchcane, Virginia wildrye, switchgrass, uniolas, sedges, low panicums, vines, forbs.	Unfavorable years, 3,000; favorable years, 4,000.	Slight	Moderate	Slight	Eastern cottonwood, sweetgum, sycamore, cherrybark oak, Nuttall oak, willow oak, black walnut.

Sallisaw: SgB, SgC, SKC. For Leadvale part of SKC, see Leadvale series.	2o7	Loblolly pine Shortleaf pine Red oak White oak Eastern redcedar Black walnut Black cherry	80 70 70 60 50 --------- ---------	Bluestems, switchgrass, plumegrass, Virginia wildrye, low panicums, forbs.	Unfavorable years, 1,500; favorable years, 3,000.	Slight	Slight	Slight	Loblolly pine, shortleaf pine, black walnut, sweetgum, cherrybark oak, Shumard oak, eastern redcedar, black locust.
Smithdale: StC, StD	3o1	Loblolly pine Shortleaf pine	80 70	Bluestems, Virginia wildrye, uniolas, beaked panicum, low panicums, forbs.	Unfavorable years, 1,800; favorable years, 3,000.	Slight	Slight	Slight	Loblolly pine, shortleaf pine, eastern redcedar.
Tiak: TaB	3c2	Loblolly pine Shortleaf pine	80 70	Bluestems, indiangrass, uniolas, beaked panicum, low panicums, paspalums, forbs.	Unfavorable years, 1,000; favorable years, 2,500.	Slight	Moderate	Moderate	Loblolly pine, shortleaf pine, eastern redcedar.
Umbraqualfs: Um	2w6	Sweetgum Green ash Eastern cottonwood. Water oak	90 70 90 ---------	Switchgrass, eastern gamagrass, Virginia wildrye, broadleaf uniola, beaked panicum, redtop panicum, velvetgrass, sedges, rushes.	Unfavorable years, 1,000; favorable years, 2,000.	Slight	Severe	Moderate	Eastern cottonwood, sweetgum, willow oak, Nuttall oak, water oak, Shumard oak, swamp chestnut oak.
Wrightsville: Wt	3w9	Loblolly pine Sweetgum Water oak	80 80 80	Bluestems, switchgrass, plumegrass, beaked panicum, low panicums, paspalums, forbs.	Unfavorable years, 1,000; favorable years, 3,000.	Slight	Severe	Moderate	Loblolly pine, sweetgum, water oak, willow oak.

[1] Where preferred hardwood species are understocked, grazing should be restricted until those species are established and have grown above browsing height.
[2] Site index rating adapted from data gathered in soil-site studies by the Soil Conservation Service and the Forest Service.

are sandy; *f* shows that the soils have a large amount of coarse fragments; *r* shows that the soils have steep slopes; and *o* shows that the soils have no significant restrictions or limitations for woodland use or management. The third element in the symbol indicates the degree of management problems and the general suitability of the soils for certain kinds of trees.

The commercially important trees that are adapted to the soils are those that woodland managers generally favor in intermediate or improvement cuttings.

The site index is the average height of dominant trees, in feet, at age 30 for cottonwood; at age 35 for sycamore; at age 25 for planted pines; and at age 50 for all other species.

Understory vegetation is listed for all the soils, although the managed hardwood sites are not commonly grazed, because of the hazard of damage to the young, preferred species of trees.

The estimated yield for a medium canopy class (36 to 55 percent canopy), both in unfavorable and favorable years, is given in pounds of air-dry forage per acre.

Erosion hazard measures the risk of soil losses in well-managed woodland. Erosion hazard is *slight* if expected soil loss is small, *moderate* if some measures to control erosion are needed in logging and road construction, and *severe* if intensive treatment or special equipment and methods are needed to prevent excessive soil losses.

Equipment limitation ratings reflect the soil conditions that restrict the use of equipment normally used in woodland management or harvesting. A *slight* rating indicates the kind of equipment used is not limited, nor is the time of the year. A rating of *moderate* indicates a seasonal limitation or need for modification in methods or equipment. A *severe* limitation indicates the need for specialized equipment or operations.

Seedling mortality ratings indicate the degree of expected mortality of planted seedlings where plant competition is not a limiting factor. Normal rainfall, good planting stock, and proper planting are assumed. A *slight* rating indicates expected mortality is less than 25 percent, a *moderate* rating a loss of 25 to 50 percent, and a *severe* rating a loss of more than 50 percent of the seedlings.

Engineering Uses of the Soils[6]

This section is useful to those who need information about soils used as structural material or as foundation material upon which structures are built. Among those who can benefit from this section are planning commissioners, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 6, 7, and 8, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 6 and 7, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists that is not known to all engineers. The Glossary defines many of these terms commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified Soil Classification system (*13*), used by the SCS engineers, the Department of Defense, and others, and the AASHO system (*1*), adopted by the American Association of State Highway Officials.

In the Unified system, soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML-CL.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils of high bearing strength, or the

[6] ROBERT P. CANTRELL, agricultural engineer, Soil Conservation Service assisted in the preparation of this section.

best soils for subgrade (foundation). At the other extreme, in group A-7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 8; the estimated classification, without group index numbers, is given in table 6 for all soils mapped in the survey area.

Engineering properties

Several estimated soil properties significant in engineering are given in table 6. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 6.

Depth to bedrock is the distance from the surface of the soil to the upper surface of the rock layer.

Depth to seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in the soil in most years. The depths given in table 6 are the depths to a seasonal perched water table that is separated from the permanent water table by an impervious layer or a dry zone.

Soil texture is described in table 6 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly silt loam." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state; and the liquid limit, from a 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 plastic. Liquid limit and plasticity index are estimated in table, 6, but in table 8 the data on liquid limit and plasticity index are based on tests of soil samples.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 6 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts. These estimates should not be confused with the coefficient *K* used by engineers.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Corrosivity, as used in table 6, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosivity for concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations

The estimated interpretations in table 7 are based on the engineering properties of soils shown in table 6, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Pulaski County. In table 7, ratings are used to summarize suitability of the soils for topsoil and road fill. For drainage of crops and pasture, irrigation, pond reservoir areas, embankments, and terraces and diversions, table 7 lists those soil features not to be overlooked in planning, installation, and maintenance. Specific values should not be assigned to the ratings of bearing capacity given in table 7.

Soil suitability is rated by the terms good, fair, and poor. A rating of *good* indicates that soil properties are generally favorable, *fair* indicates soil properties are unfavorable but can be overcome or modified by special planning, and *poor* indicates soil properties are so unfavorable as to require major soil reclamation or special design.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or its response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that will result in the area from which topsoil is taken.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has

TABLE 6.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up two or more kinds of soil. The soils in such map series that appear in the first column of this table. Absence of data indicates that the soil is too variable to

Soil series and map symbols	Depth to—		Depth from surface	Classification			Coarse fraction greater than 3 inches
	Bedrock	Seasonal high water table		USDA texture	Unified	AASHO	
	Inches	*Feet*	*Inches*				
*Amy: Am, Ao[2], ApB[2], Au	>72	0–1	0–12	Silt loam	ML	A-4	
			12–72	Silt loam and silty clay loam.	CL	A-4	
*Bruno[2]: Bs, Bu. Urban land part of Bu is too variable so estimate.	>72	>6	0–16	Fine sandy loam and sandy loam.	SM or ML	A-4	
			16–23	Fine sand	SM	A-2	
			23–25	Silt loam	ML	A-4	
			25–60	Loamy fine sand	SM	A-2	
*Carnasaw: CaC, CaD, CbC, CbD, CMC, CMF. Urban land part of CbC and CbD is too variable to estimate. For Mountainburg part of CMC and CMF, see Mountainburg series.	30–60	>5	0–6	Gravelly silt loam and silt loam.	SM or ML	A-4	
			6–38	Silty clay and clay	ML, CL, MH, or CH	A-7	
			38–49	Silty clay loam	ML, MH	A-7	0–10
Crevasse: Cr[2]	>72	>6	0–72	Fine sand and sand	SM-SP or SM	A-2 or A-3	
*Guthrie: GeB. For Leadvale part, see Leadvale series.	>72	0–1	0–6	Silt loam	ML	A-4	
			6–16	Silt loam	CL-ML or CL	A-4	
			16–46	Silty clay loam (fragipan).	CL	A-6	
			46–72	Silt loam	CL	A-6	0–10
*Keo[2]: Ko, Ku. Urban land part of Ku is too variable to estimate.	>72	>6	0–38	Silt loam and loam	ML or CL-ML	A-4	
			38–62	Silt loam and very fine sandy loam.	ML, CL-ML, ML or CL	A-4 or A-6	
Latanier: La	>72	1–2	0–34	Silty clay	CH	A-7	
			34–56	Fine sandy loam	ML or SM	A-4	
*Leadvale: LeB, LeC, LdB, LdC. Urban land part of LdB and LdC is too variable to estimate.	>72	1½–2½	0–7	Silt loam	ML, CL-ML, or CL	A-4	
			7–16	Silt loam	CL-ML or CL	A-4 or A-6	
			16–72	Silt loam and silty clay loam (fragipan).	ML, CL-ML, or CL	A-6 or A-4	
*Linker: LkC, LnC, LrE. Urban land part of LnC is too variable to estimate. For Mountainburg part of LrE, see Mountainburg series.	20–40	>4	0–4	Gravelly fine sandy loam.	SM or ML	A-2 or A-4	0–25
			4–9	Fine sandy loam	ML, CL-ML, CL, SM, SM-SC, or SC	A-4 or A-6	0–5
			9–30	Clay loam	SC or CL	A-4 or A-6	0–10
Moreland: Me	>72	1–2	0–41	Silty clay	CH	A-7	
			41–43	Silty clay loam	CL or CH	A-6 or A-7	
			43–58	Silty clay	CH	A-7	
			58–72	Loamy sand	SM	A-2	
*Mountainburg: MoD, MuD, MuE. Urban land part of MuD and MuE is too variable to estimate.	12–20	>2	0–10	Stony fine sandy loam and gravelly fine sandy loam.	SM	A-2	20–45
			10–15	Gravelly sandy clay loam.	SM, SM-SC, or SC	A-2 or A-4	5–30

significant to engineering

ping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other be rated or that no estimate was made. The symbol > means more than; the symbol < means less than]

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability[1]	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
					Percent	*Inches per hour*	*Inches per inch of soil*	*pH*			
100	95–100	90–100	70–95	<30	[3] NP–5	0.6–2.0	0.16–0.24	4.5–5.5	Low	High	Moderate.
100	95–100	95–100	85–95	25–40	8–20	0.06–0.2	0.16–0.24	4.5–5.5	Low	High	Moderate.
-------	100	70–100	45–80	-------	NP	>6.0	0.10–0.15	5.6–8.4	Low	Low	Moderate to low.
-------	100	70–100	20–35	-------	NP	>6.0	0.05–0.08	5.6–8.4	Low	Low	Moderate to low.
-------	100	90–100	75–95	-------	NP	>6.0	0.16–0.24	5.6–8.4	Low	Low	Moderate to low.
-------	100	70–100	20–35	-------	NP	>6.0	0.07–0.11	5.6–8.4	Low	Low	Moderate to low.
75–100	55–100	50–95	45–75	<35	NP–10	0.6–2.0	0.12–0.24	5.1–6.0	Low	Low	Moderate.
90–100	80–100	80–100	75–95	41–65	15–35	0.06–0.2	0.10–0.18	4.5–5.5	High	High	Moderate to high.
75–100	55–90	55–85	51–85	41–55	12–25	0.06–0.6	0.11–0.22	<5.5	Moderate	Moderate	Moderate to high.
-------	100	70–100	5–25	-------	NP	>6.0	0.02–0.08	6.1–7.8	Low	Low	Moderate to low.
-------	100	95–100	90–100	<30	NP–6	0.2–2.0	0.16–0.24	4.5–6.5	Low	High	Low to high.
-------	100	95–100	90–100	20–30	5–10	0.2–0.6	0.16–0.24	4.5–5.5	Low	High	Moderate to high.
-------	100	95–100	90–100	25–35	11–20	0.06–0.2	0.08–0.12	4.5–5.5	Low	High	Moderate to high.
85–100	85–100	80–100	75–100	20–35	11–20	0.2–0.6	0.16–0.24	4.5–5.5	Low	High	Moderate to high.
-------	-------	95–100	80–95	<30	NP–7	0.6–2.0	0.15–0.24	6.1–7.8	Low	Low	Low.
-------	-------	90–100	80–95	<40	NP–15	0.6–2.0	0.13–0.24	7.8–8.4	Low	Low	Low.
-------	100	95–100	95–100	51–75	25–45	<0.06	0.14–0.18	6.1–8.4	High	High	Low.
-------	100	60–90	45–75	<30	NP–4	0.6–2.0	0.11–0.15	6.6–8.4	Low	High	Low.
100	95–100	95–100	75–95	<30	NP–10	0.6–2.0	0.16–0.24	4.5–7.3	Low	Moderate	High to low.
100	95–100	90–100	80–100	25–35	6–15	0.6–2.0	0.16–0.24	4.5–5.5	Low	Moderate	Moderate to high.
95–100	95–100	90–100	80–100	20–40	3–20	0.2–0.6	0.08–0.11	4.5–5.5	Low	High	Moderate to high.
75–85	60–80	50–75	25–55	<30	NP–7	0.6–2.0	0.08–0.12	4.5–6.0	Low	Low	Moderate to high.
80–100	75–100	65–95	40–70	<35	NP–12	0.6–2.0	0.11–0.15	4.5–5.5	Low	Low	Moderate to high.
75–100	75–100	55–95	40–75	20–40	8–20	0.6–2.0	0.12–0.20	4.5–5.5	Low	Low	Moderate to high.
-------	100	95–100	95–100	51–75	25–45	<0.06	0.14–0.18	6.1–8.4	High	High	Low.
-------	100	95–100	95–100	35–55	15–30	0.06–6.2	0.18–0.22	6.1–8.4	Moderate	High	Low.
-------	100	95–100	95–100	51–70	25–40	<0.06	0.14–0.18	6.1–8.4	High	High	Low.
-------	100	70–100	20–35	-------	NP	<6.0	0.06–0.10	6.1–8.4	Low	Low	Low.
75–85	70–80	50–60	15–35	-------	NP	2.0–6.0	0.05–0.08	4.5–6.0	Low	Low	Moderate to high.
75–85	55–65	45–55	30–45	<30	NP–10	2.0–6.0	0.05–0.08	4.5–5.5	Low	Low	Moderate to high.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	Classification: USDA texture	Classification: Unified	Classification: AASHO	Coarse fraction greater than 3 inches
	Inches	*Feet*	*Inches*				
Norwood: No[2]	>72	>6	0–8	Silty clay loam	CL	A-6 or A-7	
			8–35	Silt loam and silty clay loam.	CL	A-4, A-6, or A-7	
			35–57	Silt loam and very fine sandy loam.	ML, CL-ML, or CL	A-4 or A-6	
*Perry: Pe[2], Pu. Urban land part of Pu is too variable to estimate.	>72	0–1	0–30	Clay	CH	A-7	
			30–72	Clay	CH	A-7	
*Rexor[2]: Re, Rf. Urban land part of Rf is too variable to estimate.	>72	3–4	0–66	Silt loam	ML, CL-ML, or CL	A-4 or A-6	
*Rilla: RmA, RmC, RpB, RuA. For Perry part of RpB, see Perry series. Urban land part of RuA is too variable to estimate.	>72	>6	0–7	Silt loam	ML, CL-ML, or CL	A-4	
			7–54	Silt loam and silty clay loam.	CL	A-4 or A-6	
			54–72	Very fine sandy loam and silt loam.	ML, CL-ML, or CL	A-4 or A-6	
*Saffell: SfC. Urban land part is too variable to estimate.	>72	>6	0–7	Gravelly fine sandy loam.	SM or ML	A-2 or A-4	
			7–44	Gravelly loam	GC or SC	A-2	
			44–72	Gravelly fine sandy loam.	GM-GP or GM	A-1 or A-2	
*Sallisaw: SgB, SgC, ShC, SKC. Urban land part of ShC is too variable to estimate. For Leadvale part of SKC, see Leadvale series.	>72	>6	0–7	Gravelly silt loam	SM, ML, or GM	A-4	0–10
			7–27	Silt loam	CL	A-4 or A-6	
			27–72	Gravelly silt loam	GC or SC	A-2, A-4, A-6	
*Smithdale: StC, StD, SuC. Urban land part of SuC is too variable to estimate.	>72	>6	0–5	Fine sandy loam	SM or ML	A-4	
			5–16	Clay loam	CL	A-4 or A-6	
			16–72	Sandy loam	SM or ML	A-4	
*Tiak: TaB, TuC. Urban land part of TuC is too variable to estimate.	>72	2–3	0–10	Fine sandy loam and loam.	SM or ML	A-4	
			10–72	Silty clay	CL or CH	A-7	
Umbraqualfs: Um[2]	>72	0–1	0–11	Silty clay	CH	A-7	
			11–60	Silty clay and clay	CH	A-7	
Urban land: Ut. Properties too variable to estimate; onsite investigation required.							
*Wrightsville: Wt, Wu. Urban land part of Wu is too variable to estimate.	>72	0–1	0–24	Silt loam	ML or CL-ML	A-4	
			24–69	Silty clay and clay	CH	A-7	
			69–72	Clay	CH	A-7	

[1] These values should not be confused with the coefficient "K" used by engineers.
[2] All or part of these soils is subject to flooding.
[3] NP means nonplastic.

significant to engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability[1]	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
					Percent	*Inches per hour*	*Inches per inch of soil*	*pH*			
-------	100	95–100	90–100	30–45	15–25	0.6–2.0	0.18–0.22	6.6–7.8	Moderate	Low to moderate.	Low.
-------	100	95–100	85–100	20–45	8–25	0.6–2.0	0.16–0.24	7.4–8.4	Low to moderate.	Low to moderate.	Low.
-------	100	95–100	70–95	20–40	4–20	0.6–2.0	0.13–0.24	7.4–8.4	Low	Low	Low.
-------	-------	100	95–100	51–80	30–50	<0.06	0.12–0.18	5.6–6.5	High	High	Low.
-------	-------	100	95–100	55–80	30–50	<0.06	0.12–0.18	6.6–8.4	High	High	Low.
-------	100	95–100	80–95	25–35	4–15	0.6–2.0	0.16–0.24	4.5–6.0	Low	Low	Moderate to high.
-------	100	95–100	90–100	<30	NP–10	0.6–2.0	0.16–0.24	5.1–7.3	Low	Low	Moderate to low.
-------	100	95–100	90–100	25–40	8–25	0.6–2.0	0.16–0.24	4.5–5.5	Moderate	Low	Moderate to high.
-------	100	95–100	70–95	20–40	4–20	0.6–2.0	0.13–0.24	5.1–7.3	Low	Low	Moderate to low.
70–85	60–75	50–70	30–60	-------	NP	2.0–6.0	0.07–0.10	4.5–5.5	Low	Low	Moderate to high.
40–70	30–50	25–45	20–35	20–30	8–15	0.6–2.0	0.07–0.10	4.5–5.5	Low	Low	Moderate to high.
35–50	10–35	10–25	5–20	<35	NP–10	2.0–6.0	0.03–0.07	4.5–5.5	Low	Low	Moderate to high.
70–90	60–80	55–75	45–70	<35	NP–10	0.6–2.0	0.12–0.22	5.1–6.0	Low	Low	Moderate.
80–95	70–90	65–85	55–80	25–40	8–20	0.6–2.0	0.14–0.22	5.1–6.0	Low	Low	Moderate.
30–70	20–50	20–45	15–40	25–40	8–20	0.6–6.0	0.05–0.12	5.1–6.0	Low	Low	Moderate.
95–100	90–100	75–90	40–60	-------	NP	2.0–6.0	0.11–0.15	4.5–7.3	Low	Low	Low to high.
95–100	90–100	80–95	70–80	20–40	8–15	0.6–2.0	0.15–0.20	4.5–5.5	Low	Low	Moderate to high.
95–100	90–100	70–85	40–55	-------	NP	2.0–6.0	0.10–0.14	4.5–5.5	Low	Low	Moderate to high.
95–100	95–100	75–95	45–80	<35	NP–10	0.6–2.0	0.11–0.20	4.5–6.0	Low	Moderate	Moderate to high.
-------	-------	100	90–100	45–65	20–35	0.06–0.2	0.14–0.18	4.5–5.5	High	High	Moderate to high.
-------	-------	100	95–100	51–70	25–45	<0.06	0.14–0.18	4.5–5.5	High	High	High.
-------	-------	100	95–100	55–80	30–50	<0.06	0.12–0.18	<4.5–5.5	High	High	High.
-------	100	95–100	90–100	<30	NP–7	0.2–0.6	0.16–0.24	4.5–5.5	Low	High	Moderate.
-------	100	95–100	90–100	51–65	30–40	<0.06	0.12–0.18	4.5–5.5	High	High	Moderate to high.
-------	100	95–100	90–100	55–70	30–45	<0.06	0.12–0.18	4.5–7.3	High	High	Low to high.

TABLE 7.—*Interpretations of engineering properties of the soils*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series that appear in the first column of this table]

Soil series and map symbols	Suitability as a source of—		Soil features affecting—				
	Topsoil	Road fill[1]	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
*Amy: Am, Ao, ApB, Au. Urban land part of Au is too variable to interpret.	Poor: poorly drained.	Poor: poorly drained; low bearing capacity.	Soil features generally favorable.	Medium to low strength; medium compressibility; fair compaction characteristics; subject to piping.	Slow permeability; poorly drained; Ao and part of ApB subject to frequent flooding.	Slow intake rate; slow permeability; poorly drained; high available water capacity; Ao and ApB subject to frequent flooding.	Practice not applicable; level and undulating.
*Bruno: Bs, Bu. Urban land part of Bu is too variable to interpret.	Fair: thin layer over stratified sandy and loamy material; site somewhat difficult to reclaim.	Good to fair: stratified loamy and sandy material; moderate to high bearing capacity.	High seepage rate.	Medium to low strength and compressibility; medium to low permeability; fair compaction characteristics; subject to piping.	Excessively drained.	Rapid intake rate; rapid permeability; low available water capacity.	Practice not applicable; level to nearly level on bottom lands.
*Carnasaw: CaC, CaD, CbC, CbD, CMC, CMF. Urban land part of CbC and CbD is too variable to interpret. For Mountainburg part of CMC and CMF, see Mountainburg series.	Poor: thin layer over plastic, clayey material; coarse fragments; slope is greater than 15 percent in many places.	Poor: low bearing capacity; high shrink-swell potential; slope is greater than 25 percent in some places.	Moderately deep to bedrock.	Medium to low strength; high compressibility; fair to poor compaction characteristics.	Well drained; slope.	Moderate intake rate; slow permeability; medium to high available water capacity; medium to rapid runoff.	Too steep where slopes are more than 8 percent; erodible; slow permeability; difficult to vegetate terrace channel; subsoil material in terrace embankment likely to crack when dry; terraces likely to fail in places.
Crevasse: Cr	Poor: sandy material	Good	High seepage rate.	Medium strength; medium permeability; subject to piping.	Excessively drained.	Rapid intake rate; rapid permeability; low available water capacity.	Practice not applicable; level to nearly level on bottom lands.
*Guthrie: GeB	Poor: poorly drained.	Poor: poorly drained; low bearing capacity.	Soil features generally favorable.	Medium to low strength; medium compressiblity; fair compaction characteristics; subject to piping.	Slow permeability; poorly drained; irregular, mounded surface.	Slow intake rate; slow permeability; poorly drained; medium available water capacity; irregular, mounded surface.	Practice not applicable; irregular, mounded surface.

*Keo: Ko, Ku	Good	Fair: moderate bearing capacity.	Moderate seepage rate.	Medium to low strength; medium compressibility; fair compaction characteristics; subject to piping.	Well drained	Moderate intake rate; moderate permeability.	Practice not applicable; level on bottom lands.
Latanier: La	Poor in upper 34 inches; plastic, clayey material. Good below a depth of 34 inches.	Poor in upper 34 inches; plastic, clayey material; low bearing capacity; high shrink-swell potential. Fair below a depth 34 inches: moderate bearing capacity.	Soil features generally favorable for surface impoundments; moderate seepage rate below a depth of 34 inches in excavated ponds.	Low strength, high compressibility, and poor compaction characteristics in upper 34 inches; medium strength and compressibility, fair compaction characteristics, and subject to piping below a depth of 34 inches.	Very slow permeability; somewhat poorly drained.	Slow intake rate; very slow permeability; high available water capacity; somewhat poorly drained.	Practice not applicable; level on bottom lands.
*Leadvale: LeB, LeC, LdB, LdC. Urban land part of LdB and LdC is too variable to interpret.	Fair: moderately thick layer; underlying material somewhat difficult to reclaim.	Fair: moderate bearing capacity.	Features generally favorable.	Medium to low strength; medium compressibility; fair compaction characteristics; subject to piping.	Moderately well drained; slope.	Moderate intake rate; moderately slow permeability; medium available water capacity.	Features generally favorable.
*Linker: LkC, LnC. Urban land part of LnC is too variable to interpret.	Fair to poor: coarse fragments; thin layer over moderately plastic material; excavated area difficult to reclaim in places.	Fair to poor: moderate bearing capacity; material is 20 to 40 inches thick; excavated area difficult or unfeasible to reclaim.	Moderate seepage rate; bedrock at a depth of 20 to 40 inches.	Medium strength; medium compressibility; fair compaction characteristics; thin layer of borrow material.	Well drained; slope.	Moderate intake rate; moderate permeability; medium available water capacity; medium runoff.	Features generally favorable; erodible; subject to piping; bedrock at a depth of 20 to 40 inches.
LRE. For Mountainburg part, see Mountainburg series.	Poor: coarse fragments; thin layer over moderately plastic material; excavated area difficult to reclaim in places; slope is greater than 15 percent in most places.	Fair to poor: moderate bearing capacity; material is 20 to 40 inches thick; excavated area difficult or impossible to reclaim.	Moderate seepage rate; bedrock at a depth of 20 to 40 inches.	Medium strength; medium compressibility; fair compaction characteristics; thin layer of borrow material.	Well drained; slope.	Moderate intake rate; moderate permeability; medium available water capacity; rapid runoff.	Slopes excessive.
Moreland: Me	Poor: plastic, clayey material.	Poor: plastic, clayey material; low bearing capacity; high shrink-swell potential.	Features generally favorable.	Medium to low strength; high compressibility; poor compaction characteristics.	Very slow permeability; somewhat poorly drained.	Slow intake rate; very slow permeability; high available water capacity; somewhat poorly drained.	Practice not applicable; level on bottom lands.

TABLE 7.—*Interpretations of engineering properties of the soils*—Continued

Soil series and map symbols	Suitability as a source of—		Soil features affecting—				
	Topsoil	Road fill[1]	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
*Mountainburg: MoD, MuD, MuE. Urban land part of MuD and MuE is too variable to interpret.	Poor: coarse fragments; thin layer; bedrock at a depth of 12 to 20 inches; excavated area difficult or unfeasible to reclaim.	Poor: thin layer; coarse fragments; excavated area unfeasible to reclaim.	High seepage rate; bedrock at a depth of 12 to 20 inches.	Thin layer of borrow material; coarse fragments; medium permeability; subject to piping.	Well drained; slope.	Rapid intake rate; moderately rapid permeability; low available water capacity; rapid runoff; generally nonarable.	Generally nonarable; coarse fragments; bedrock at a depth of 12 to 20 inches; most slopes excessive.
Norwood: No.	Fair: somewhat plastic material; difficult to work.	Fair to poor: moderate to low bearing capacity; moderate shrink-swell potential.	Moderate seepage rate.	Medium to low strength; medium compressibility; fair compaction characteristics; subject to piping.	Well drained.	Moderate intake rate; moderate permeability; high available water capacity.	Practice not applicable; level on bottom lands.
*Perry: Pe, Pu. Urban land part of Pu is too variable to interpret.	Poor: poorly drained; plastic, clayey material.	Poor: poorly drained; plastic, clayey material.	Features generally favorable.	Medium to low strength; high compressibility; poor compaction characteristics.	Very slow permeability; poorly drained.	Slow intake rate; very slow permeability; high available water capacity; poorly drained.	Practice not applicable; level on bottom lands.
*Rexor: Re, Rf. Urban land part of Rf is too variable to interpret.	Good.	Fair: moderate bearing capacity.	Moderate permeability.	Medium to low strength; medium compressibility; fair compaction characteristics; subject to piping.	Well drained; frequently flooded.	Frequently flooded; moderate intake rate; moderate permeability; high available water capacity.	Practice not applicable; level and frequently flooded on bottom lands.
*Rilla: RmA, RmC, RpB, RuA. For Perry part of RpB, see Perry series. Urban land part of RuA is too variable to interpret.	Good: Fair in some areas, somewhat plastic material within a depth of 16 inches.	Fair: moderate bearing capacity; moderate to low shrink-swell potential.	Moderate permeability.	Medium to low strength; medium compressibility; fair compaction characteristics; subject to piping.	Well drained.	Moderate intake rate; moderate permeability; high available water capacity; medium runoff on RmC and RpB.	Practice generally not applicable; level to irregular, undulating or gently sloping on bottom lands.
*Saffell: SfC. Urban land part is too variable to interpret.	Poor: coarse fragments.	Good.	Moderate permeability.	Medium strength; medium to low permeability; fair compaction characteristics; subject to piping.	Well drained; slope.	Moderately rapid intake rate; moderate permeability; low available water capacity; slow to medium runoff.	Erodible; subject to piping.

*Sallisaw: SgB, SgC, ShC, SKC. Urban land part of ShC is too variable to interpret. For Leadvale part of SKC, see Leadvale series.	Fair to poor: coarse fragments.	Fair: moderate bearing capacity.	Moderate permeability.	Medium to low strength; medium compressibility; fair compaction characteristics; subject to piping.	Well drained; slope.	Moderate intake rate; moderate permeability; medium to high available water capacity; slow to medium runoff.	Features generally favorable; erodible; subject to piping.
*Smithdale: StC, StD, SuC------ Urban land part of SuC is too variable to interpret.	Fair: thin layer; somewhat plastic material within a depth of 5 inches.	Fair: moderate bearing capacity.	Moderate permeability.	Medium to low strength; medium compressibility; fair compaction characteristics; subject to piping.	Well drained; slope.	Moderately rapid intake rate; moderate permeability; medium available water capacity; medium runoff.	Features generally favorable; erodible; subject to piping.
*Tiak: TaB, TuC---- Urban land part of TuC is too variable to interpret.	Poor: thin layer; plastic, clayey material within a depth of 10 inches.	Poor: plastic, clayey material; low bearing capacity; high shrink-swell potential.	Features generally favorable.	Medium to low strength; medium to high compressibility; fair to poor compaction characteristics.	Moderately-well drained; slope.	Moderate intake rate; slow permeability; high available water capacity; medium runoff.	Erodible: slow permeability; subsoil material in terrace embankment likely to crack when dry; terraces likely to fail in places.
Umbraqualfs: Um----	Poor: poorly drained; plastic, clayey material.	Poor: poorly drained; plastic, clayey material.	Features generally favorable.	Medium to low strength; high compressibility; poor compaction characteristics.	Very slow permeability; poorly drained.	Slow intake rate; very slow permeability; high available water capacity; poorly drained.	Practice not applicable; level on bottom lands.
Urban land: Ut. Properties too variable to interpret; onsite investigation needed.							
*Wrightsville: Wt, Wu------------ Urban land part of Wu is too variable to interpret.	Poor: poorly drained.	Poor: poorly drained; plastic, clayey material that has high shrink-swell potential below a depth of 24 inches.	Features generally favorable.	Medium to low strength; medium to high compressibility; fair to poor compaction characteristics; material in upper 24 inches subject to piping.	Poorly drained; very slow permeability.	Slow intake rate; very slow permeability; high available water capacity; poorly drained.	Practice not applicable; level on broad flats.

[1] Engineers and others should not apply specific values to estimates given for bearing capacity of soils.

TABLE 8.—*Engineering test data*

[Tests performed by the Arkansas State Highway Department, Division of Materials and Tests]

Soil name and location	Parent material	Arkansas SCS report number: S71-Ark-60	Depth	Moisture-density[1]: Maximum dry density	Moisture-density[1]: Optimum moisture	Mechanical analysis[2] — Percentage less than 3 inches passing sieve—: No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Liquid limit[3]	Plasticity index[4]	Classification: AASHO[5]	Classification: Unified[6]
			In	*Lb per cu ft*	*Pct*					*Pct*			
Carnasaw gravelly silt loam:													
SW¼NE¼SE¼ sec. 3, T. 2 N., R. 15 W. (Modal profile)	Loamy colluvium over clayey material weathered from shale.	6-2	4-10	105	17	100	96	92	73	27	3	A-4(1)	ML
		6-3	10-21	102	22	100	93	84	78	52	22	A-7-5(19)	MH
		6-5	40-51	110	17	100	86	65	53	49	19	A-7-5(8)	ML
Leadvale silt loam:													
NE¼NE¼SE¼ sec. 31, T. 4 N., R. 11 W. (Modal profile)	Loamy valley fill.	2-2	7-16	111	16	--------	100	98	94	30	7	A-4(7)	ML
		2-4	24-48	108	17	100	99	93	87	28	5	A-4(4)	ML
		2-5	48-72	104	20	--------	100	96	89	39	19	A-6(18)	CL

[1] Based on AASHO Designation T 99-57, Method A (*1*).

[2] Mechanical analyses according to the AASHO Designation T 88-57 (*1*). Results of this procedure may differ from the results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by hydrometer method and the various grain-size fractions are calculated on the basis of all 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 coarser than 2 millimeters in diameter is excluded from the calculation of grain-size fractions. The mechanical analyses data used in this table are not suitable for use in naming textural classes for soils.

[3] Based on AASHO Designation T 89-60 (*1*).

[4] Based on AASHO Designation T 90-56 and AASHO Designation T 91-54 (*1*).

[5] Based on AASHO Designation M 145-66 I (*2*).

[6] Based on ASTM Designation D 2488-66 T (*3*).

been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among the factors that are unfavorable.

Drainage of crops and pasture is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope and stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion, or soil blowing; soil texture; content of stones; accumulations of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held available to plants; and need for drainage, or depth to water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate

Additional interpretations of engineering uses of soils are given in section "Town and Country Planning."

Engineering test data

Table 8 contains engineering test data for some of the major soil series in Pulaski County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limit and plastic limit. The mechanical analyses were made by combined sieve and hydrometer methods.

Compaction, or moisture-density, data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the *optimum moisture content* is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed *maximum dry density*. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, as has been explained for table 6.

Town and Country Planning

Table 9 gives the degree and kind of limitation of the soils of Pulaski County for selected nonfarm uses. The degrees of limitation reflect all the features of the given soil, to a depth of about 6 feet or to bedrock, that affect a particular use.

Soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means that soil properties are generally favorable for the rated use, or in other words, that limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means that soil properties are so unfavorable and so difficult to correct or overcome as to require major soil reclamation, special designs, or intensive maintenance.

Following are explanations of some of the columns in table 9.

Dwellings without basements, as rated in table 9, are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, as for example, excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or big stones, and freedom from flooding or a high water table.

Local roads and streets, as rated in table 9, have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep. Soil properties that most affect design and construction of roads and streets are load-supporting capacity and stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Ratings for light industry are for undisturbed soils that are used to support building foundations. Emphasis is on foundations, ease of excavation for underground utilities, and corrosion potential of uncoated steel pipe. The undisturbed soil is rated for spread footing foundations for buildings less than three stories high or foundation loads not in excess of that weight. Properties affecting load-supporting capacity and settlement under load are wetness, flooding, texture, plasticity, density, and shrink-swell behavior. Properties affecting excavation are wetness, flooding, slope, and depth to bedrock. Properties affecting corrosion of buried uncoated steel pipe are wetness, texture, total acidity, and electrical resistivity.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic

TABLE 9.—*Degree and kinds of limitations of soils for town and country planning*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series that appear in the first column of this table. Absence of data indicates that the soil is too variable to be rated or that no estimate was made]

Soil series and map symbols	Dwellings without basements[1]	Shallow excavations	Local roads and streets[1]	Light industry[1]	Septic tank absorption fields	Sewage lagoons[2]	Sanitary landfill (trench type)[3]
*Amy:							
Am, Ao, ApB, Au. Urban land part of Au is too variable to estimate.	Severe: poorly drained; perched seasonal water table; Ao and part of ApB are subject to frequent flooding; low bearing capacity.	Severe: poorly drained; perched seasonal water table; Ao and part of ApB are subject so frequent flooding.	Severe: poorly drained; low bearing capacity; Ao and part of ApB are subject to frequent flooding.	Severe: poorly drained; perched seasonal water table; Ao and part of ApB are subject to frequent flooding; low bearing capacity.	Severe: slow permeability; perched seasonal water table; Ao and part of ApB are subject to frequent flooding.	Generally slight. Moderate for ApB; irregular surface. Severe for Ao and part of ApB; subject to frequent flooding.	Severe: poorly drained; perched seasonal water table; Ao and part of ApB are subject to frequent flooding.
*Bruno: Bs, Bu. Urban land part of Bu is too variable to estimate.	Generally slight. Severe where subject to occasional flooding.	Severe: predominantly sandy material, sidewalls unstable; some areas subject to occasional flooding.	Generally slight. Moderate where subject to occasional flooding.	Generally slight. Severe where subject to occasional flooding.	Slight. Severe where subject to occasional flooding or where a hazard of pollution of ground water exists.	Severe: rapid permeability; some areas subject to occasional flooding.	Severe: rapid permeability; some areas subject to occasional flooding.
*Carnasaw:							
CaC, CaD, CbC, CbD, CMC. Urban land part of CbC and CbD is too variable to estimate. For Mountainburg part of CMC, see Mountainburg series.	Severe: low bearing capacity; high shrink-swell potential.	Severe: predominantly clayey material; bedrock at a depth of 40 inches or less in places.	Severe: low bearing capacity; high shrink-swell potential.	Severe: low bearing capacity; high shrink-swell potential; slope is greater than 8 percent in some places.	Severe: slow permeability; moderately deep over bedrock.	Generally moderate: moderately deep over bedrock; slope. Severe where bedrock is at a depth of 40 inches or less or where slope is greater than 7 percent.	Severe: predominantly clayey material; rippable bedrock at a depth of 60 inches or less.
CMF. For Mountainburg part, see Mountainburg series.	Severe: low bearing capacity; high shrink-swell potential; slope.	Severe: predominantly clayey material; bedrock at a depth of 40 inches or less in places; slope.	Severe: low bearing capacity; high shrink-swell potential; slope.	Severe: low bearing capacity; high shrink-swell potential; slope.	Severe: slow permeability; moderately deep to bedrock; slope.	Severe: slope.	Severe: predominantly clayey material; rippable bedrock at a depth of 60 inches or less; slope is greater than 25 percent in some places.
Crevasse: Cr	Generally slight. Severe where subject to flooding.	Severe: sandy material, sidewalls unstable; most areas subject to flooding.	Generally slight. Severe where subject to flooding.	Generally slight. Severe where subject to flooding.	Generally slight. Severe where subject to flooding or where a hazard of pollution of ground water exists.	Severe: rapid permeability; most areas subject to flooding.	Severe: rapid permeability; most areas subject to flooding.

*Guthrie: GeB. For Leadvale part, see Leadvale series.	Severe: poorly drained; perched seasonal water table; low bearing capacity.	Severe: poorly drained; perched seasonal water table.	Severe: poorly drained; low bearing capacity.	Severe: poorly drained; perched seasonal water table; low bearing capacity.	Severe: slow permeability; perched seasonal water table.	Moderate: irregular surface.	Severe: poorly drained; perched seasonal water table.
*Keo: Ko, Ku. Urban land part of Ku is too variable to estimate.	Generally moderate: moderate bearing capacity. Severe where subject to occasional flooding.	Generally slight. Severe where subject to occasional flooding.	Moderate: moderate bearing capacity; some areas subject to occasional flooding.	Generally moderate: moderate bearing capacity. Severe where subject to occasional flooding.	Generally slight. Severe where subject to occasional flooding.	Generally moderate: moderate permeability. Severe where subject to occasional flooding.	Generally slight. Severe where subject to occasional flooding.
Latanier: La	Severe: low bearing capaccity; high shrink-swell potential; perched seasonal water table.	Severe: somewhat poorly drained; perched seasonal water table; clayey material at a depth of 34 inches or less; loamy material below a depth of 34 inches; sidewalls somewhat unstable.	Severe: low bearing capacity; high shrink-swell potential.	Severe: low bearing capacity; high shrink-swell potential; perched seasonal water table.	Severe: very slow permeability at a depth of 34 inches or less; perched seasonal water table.	Generally slight. Moderate if excavated into loamy material at a depth below 34 inches.	Severe: somewhat poorly drained; perched seasonal water table; plastic, clayey material at a depth of 34 inches or less; loamy material with moderate permeability below a depth of 34 inches.
*Leadvale: LeB, LeC, LdB, LdC. Urban land part of LdB and LdC is too variable to estimate.	Moderate: moderately well drained; moderate bearing capacity.	Moderate: moderately well drained; perched seasonal water table.	Moderate: moderate bearing capacity.	Moderate: moderately well drained; moderate bearing capacity; slope is greater than 4 percent in many places.	Severe: moderately slow permeability; perched seasonal water table.	Generally slight. Moderate where slope is 2 to 7 percent. Severe where slope is greater than 7 percent.	Moderate: moderately well drained; somewhat plastic material.
*Linker: LkC, LnC, LRE. Urban land part of LnC is too variable to estimate. For Mountainburg part of LRE, see Mountainburg series.	Generally moderate: moderate bearing capacity; hard bedrock at a depth of 20 to 40 inches. Severe where slope is greater than 15 percent.	Severe: hard bedrock at a depth of 20 to 40 inches; slope is greater than 15 percent in many places.	Generally moderate: moderate bearing capacity; hard bedrock at a depth of 20 to 40 inches. Severe where slope is greater than 15 percent.	Generally moderate: moderate bearing capacity; hard bedrock at a depth of 20 to 40 inches. Severe where slope is greater than 15 percent.	Severe: hard bedrock at a depth of 20 to 40 inches; slope is greater than 15 percent in many places in LRE.	Severe: hard bedrock at a depth of 20 to 40 inches; slope is greater than 7 percent in many places.	Severe: hard bedrock at a depth of 20 to 40 inches.
Moreland: Me	Severe: low bearing capacity; high shrink-swell potential; perched seasonal water table.	Severe: somewhat poorly drained; perched seasonal water table; predominantly plastic, clayey material.	Severe: low bearing capacity; high shrink-swell potential.	Severe: low bearing capacity; high shrink-swell potential; perched seasonal water table.	Severe: very slow permeability; perched seasonal water table.	Slight	Severe: perched seasonal water table; predominantly plastic, clayey material; sandy material with rapid permeability below a depth of 58 inches.

TABLE 9.—*Degree and kinds of limitations of soils for town and country planning*—Continued

Soil series and map symbols	Dwellings without basements[1]	Shallow excavations	Local roads and streets[1]	Light industry[1]	Septic tank absorption fields	Sewage lagoons[2]	Sanitary landfill (trench type)[3]
*Mountainburg: MoD, MuD, MuE. Urban land part of MuD and MuE is too variable to estimate.	Severe: hard bedrock at a depth of 12 to 20 inches; slope is greater than 15 percent in many places.	Severe: hard bedrock at a depth of 12 to 20 inches; coarse fragments; slope is greater than 15 percent in many places.	Severe: hard bedrock at a depth of 12 to 20 inches; slope is greater than 15 percent in many places.	Severe: hard bedrock at a depth of 12 to 20 inches; slope is greater than 15 percent in many places.	Severe: hard bedrock at a depth of 12 to 20 inches; slope is greater than 15 percent in many places.	Severe: hard bedrock at a depth of 12 to 20 inches; coarse fragments; slope is greater than 15 percent in many places.	Severe: hard bedrock at a depth of 12 to 20 inches; coarse fragments; slope is greater than 15 percent in some places.
Norwood: No.	Generally moderate: moderate bearing capacity; moderate shrink-swell potential. Severe where subject to occasional flooding.	Generally slight. Severe where subject to occasional flooding.	Generally moderate: moderate bearing capacity; moderate shrink-swell potential. Severe where subject to occasional flooding.	Generally moderate: moderate bearing capacity; moderate shrink-swell potential. Severe where subject to occasional flooding.	Generally slight. Severe where subject to occasional flooding.	Generally moderate: moderate permeability. Severe where subject to occasional flooding.	Generally slight. Severe where subject to occasional flooding.
*Perry: Pe, Pu. Urban land part of Pu is too variable to estimate.	Severe: poorly drained; perched seasonal water table; low bearing capacity; high shrink-swell potential; some areas subject to frequent flooding.	Severe: poorly drained; perched seasonal water table; plastic, clayey material; some areas subject to frequent flooding.	Severe: poorly drained; low bearing capacity; high shrink-swell potential; some areas subject to frequent flooding.	Severe: poorly drained; perched seasonal water table; low bearing capacity; high shrink-swell potential; some areas subject to frequent flooding.	Severe: very slow permeability; perched seasonal water table; some areas subject to frequent flooding.	Generally slight. Severe where subject to frequent flooding.	Severe: poorly drained; perched seasonal water table; plastic, clayey material; some areas subject to frequent flooding.
*Rexor: Re, Rf. Urban land part of Rf is too variable to estimate.	Severe: subject to frequent flooding.	Severe: subject to frequent flooding.	Severe: subject to frequent flooding.	Severe: subject to frequent flooding.	Severe: subject to frequent flooding.	Severe: subject to frequent flooding.	Severe: subject to frequent flooding.
Rilla: RmA, RmC, RpB, RuA. For Perry part of RpB, see Perry series. Urban part of RuA is too variable to estimate.	Moderate: moderate bearing capacity; moderate shrink-swell potential.	Slight.	Moderate: moderate bearing capacity; moderate shrink-swell potential.	Moderate: moderate bearing capacity; moderate shrink-swell potential.	Slight.	Moderate: moderate permeability; slope is greater than 2 percent in some places.	Moderate: somewhat plastic material.
*Saffell: SfC. Urban land part is too variable to estimate.	Slight.	Severe: coarse fragments.	Slight.	Generally slight. Moderate where slope is 4 to 8 percent.	Slight.	Generally moderate: moderate permeability. Severe where slope is greater than 7 percent.	Slight.

*Sallisaw: SgB, SgC, ShC, SKC. Urban land part of ShC is too variable to estimate. For Leadvale part of SKC, see Leadvale series.	Moderate: moderate bearing capacity.	Moderate: coarse fragments.	Moderate: moderate bearing capacity.	Moderate: moderate bearing capacity.	Slight	Moderate to severe: moderate permeability ranging to moderately rapid below a depth of 27 inches in places. Severe where slope is greater than 7 percent.	Moderate to severe: coarse fragments; moderately rapid permeability below a depth of 27 inches in places.
*Smithdale: StC, StD, SuC. Urban land part of SuC is too variable to estimate.	Slight to moderate: high to moderate bearing capacity. Moderate where slope is greater than 8 percent.	Generally slight. Moderate where slope is greater than 8 percent.	Slight to moderate: high to moderate bearing capacity; slope is greater than 8 percent in some places.	Generally slight to moderate: high to moderate bearing capacity. Severe where slope is greater than 8 percent.	Slight	Severe: moderately rapid permeability below a depth of 16 inches; slope is greater than 7 percent in some places.	Severe: moderately rapid permeability below a depth of 16 inches.
*Tiak: TaB, TuC. Urban land part of TuC is too variable to estimate.	Severe: low bearing capacity; high shrink-swell potential.	Severe: predominantly plastic, clayey material.	Severe: low bearing capacity; high shrink-swell potential.	Severe: low bearing capacity; high shrink-swell potential.	Severe: slow permeability; perched seasonal water table.	Generally slight. Moderate where slope is 2 to 7 percent. Severe where slope is greater than 7 percent.	Severe: predominantly plastic, clayey material; perched seasonal water table.
Umbraqualfs: Um	Severe: poorly drained; perched seasonal water table; low bearing capacity; high shrink-swell potential; most areas subject to occasional flooding.	Severe: poorly drained; perched seasonal water table; plastic clayey material; most areas subject to occasional flooding.	Severe: poorly drained; low bearing capacity; high shrink-swell potential; most areas subject to occasional flooding.	Severe: poorly drained; perched seasonal water table; low bearing capacity; high shrink-swell potential; most areas subject to occasional flooding.	Severe: very slow permeability; perched seasonal water table; most areas subject to occasional flooding.	Slight	Severe: poorly drained; perched seasonal water table; plastic, clayey material; most areas subject to occasional flooding.
Urban land: Ut. Limitations too variable to estimate; onsite investigation needed.							
*Wrightsville: Wt, Wu. Urban land part of Wu is too variable to estimate.	Severe: poorly drained; perched seasonal water table; low bearing capacity; high shrink-swell potential.	Severe: poorly drained; perched seasonal water table; plastic, clayey material below a depth of 24 inches.	Severe: poorly drained; low bearing capacity; high shrink-swell potential.	Severe: poorly drained; perched seasonal water table; low bearing capacity; high shrink-swell potential.	Severe: very slow permeability; perched seasonal water table.	Slight	Severe: poorly drained; perched seasonal water table; plastic, clayey material below a depth of 24 inches.

[1] Engineers and others should not apply specific values to estimates given for bearing capacity of soils.
[2] For information about lagoon embankments, see table 7, page 44, column "Embankments, dikes, and levees."
[3] Onsite studies of the underlying strata, water table, and hazards of aquifer pollution and drainage into ground water need to be made for landfill deeper than 6 feet.

tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor, and sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic-matter content, and slope, and, if the floor needs to be leveled, depth to bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified soil classification system and the amount of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated the ratings in table 9 apply only to a depth of about 6 feet, and therefore limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper than that. For some soils, reliable predictions can be made to a depth of 10 or 15 feet, but regardless of that, every site should be investigated before it is selected. For information about the use of soils for area-type sanitary landfills, contact the local Soil Conservation Service office.

The detailed soil map and information in table 9 are guides for evaluating areas for the specific uses. They do not eliminate the need for detailed onsite investigations before a final determination is made.

Additional information that may be useful in town and country planning is given in the sections "Engineering Uses of the Soils" and "Recreational Use."

Recreational Use

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 10 the soils of Pulaski County are rated according to limitations that affect their suitability for camp areas, playgrounds, picnic areas, and paths and trails.

In table 10 the soils are rated as having slight, moderate, or severe limitations for the specified uses. For all of these ratings, it is assumed that a good cover of vegetation can be established and maintained. A limitation of *slight* means that soil properties are generally favorable and limitations are so minor that they easily can be overcome. A *moderate* limitation can be overcome or modified by planning, by design, or by special maintenance. A *severe* limitation means that costly soil reclamation, special design, intense maintenance, or a combination of these, is required.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Playgrounds are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops, good drainage, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Picnic areas are attractive natural or landscaped tracts used primarily for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic, however, is confined to access roads. The best soils are firm when wet but not dusty when dry, are free of flooding during the season of use, and do not have slopes or stoniness that greatly increase cost of leveling sites or of building access roads.

Paths and trails are used for local and cross-country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Formation and Classification of Soils

In this section the factors that affect soil formation in Pulaski County and the processes of horizon differentiation are discussed. The system of soil classification is explained; the soil series are placed in some of the higher categories of that system; and physical and chemical analyses are given for representative profiles of selected soil series. For a description of all the soil series in the county, including a profile representative of each series, see the section "Description of the Soils."

Factors of Soil Formation

Soil is formed by weathering and other processes that act upon the regolith. The characteristics of the soil at any given point depend upon climate, living organisms, parent material, relief, and time. Each factor acts on the soil and modifies the effect of the other four. When climate, living organisms, or any other of the five factors is varied to a significant extent, a different soil may be formed (*10*).

Climate and living organisms are the forces of soil formation that act on the parent material. Relief modifies the effects of climate and living organisms, mainly by its influence on temperature and runoff. Climate, vegetation, parent material, and relief interact over time. Thus, the effect of time is also reflected in soil characteristics.

TABLE 10.—*Degree and kind of limitations of the soils for recreational use*

Soil series and map symbols	Camp areas	Playgrounds	Picnic areas	Paths and trails
Amy: Am, Ao, ApB, Au. Urban land part of Au is too variable to estimate.	Severe: poorly drained; Ao and part of ApB are subject to frequent flooding.	Severe: poorly drained; Ao and part of ApB are subject to frequent flooding.	Severe: poorly drained; Ao and part of ApB are subject to frequent flooding.	Severe: poorly drained; Ao and part of ApB are subject to frequent flooding.
Bruno: Bs, Bu. Urban land part of Bu is too variable to estimate	Slight	Generally slight: Moderate where subject to occasional flooding.	Slight	Slight
Carnasaw:				
CaC, CbC, CMC. Urban land part of CbC is too variable to estimate. For Mountainburg part of CMC, see Mountainburg series.	Moderate: slow permeability; coarse fragments on surface; part of CMC has slopes of 8 to 12 percent.	Generally moderate: slow permeability; coarse fragments on surface; moderately deep to bedrock. Severe where slopes are greater than 6 percent, or where coarse fragments on surface are greater than 20 percent of area.	Generally slight. Moderate on part of CMC that has slopes of 8 to 12 percent.	Slight.
CaD, CbD. Urban land part of CbD is too variable to estimate.	Moderate: slow permeability; coarse fragments on surface; slope.	Severe: slope	Moderate: slope	Slight.
CMF. For Mountainburg part, see Mountainburg series.	Generally moderate: slow permeabllity; coarse fragments on surface; slopes of 12 to 15 percent. Severe where slope is greater than 15 percent.	Severe: slope	Moderate where slope is 12 to 15 percent. Severe where slope is greater than 15 percent.	Generally slight. Moderate where slope is 15 to 25 percent. Severe where slope is greater than 25 percent.
Crevasse: Cr	Generally moderate: sandy surface layer; poor trafficability; difficult to establish and maintain vegetation. Severe where subject to frequent flooding.	Severe: sandy surface layer; poor trafficability; difficult to establish and maintain vegetation; some areas subject to frequent flooding.	Moderate: sandy surface layer; poor trafficability; difficult to establish and maintain vegetation.	Severe: sandy surface layer; poor trafficability.
Guthrie: GeB. For Leadvale part, see Leadvale series.	Severe: poorly drained	Severe: poorly drained	Severe: poorly drained	Severe: poorly drained.
Keo: Ko, Ku. Urban land part of Ku is too variable to estimate.	Slight	Generally slight. Moderate where subject to occasional flooding.	Slight	Slight.
Latanier: La	Severe: somewhat poorly drained; very slow permeability; clayey surface layer; poor trafficability.	Severe: somewhat poorly drained; very slow permeability; clayey surface layer; poor trafficability.	Severe: clayey surface layer; poor trafficability.	Severe: clayey surface layer; poor trafficability.
Leadvale:				
LeB, LeC, LdB, LdC. Urban land part of LdB and LdC is too variable to estimate.	Moderate: moderately slow permeability.	Generally moderate: moderately slow permeability. Severe where slope is greater than 6 percent.	Slight	Slight.
Linker:				
LkC, LnC. Urban land part of LnC is too variable to estimate.	Slight	Generally moderate: coarse fragments on surface; moderately deep to bedrock. Severe where slope is greater than 6 percent.	Slight	Slight.

TABLE 10.—*Degree and kind of limitations of the soils for recreational use*—Continued

Soil series and map symbols	Camp areas	Playgrounds	Picnic areas	Paths and trails
LRE. For Mountainburg part, see Mountainburg series.	Moderate where slope is 12 to 15 percent: coarse fragments and stones on surface. Severe where slope is greater than 15 percent.	Severe: slope.	Moderate where slope is 12 to 15 percent: coarse fragments and stones on surface. Severe where slope is greater than 15 percent.	Moderate: coarse fragments and stones on surface; slope is greater than 15 percent in most places.
Moreland: Me.	Severe: somewhat poorly drained; very slow permeability; clayey surface layer; poor trafficability.	Severe: somewhat poorly drained; very slow permeability; clayey surface layer; poor trafficability.	Severe: clayey surface layer; poor trafficability.	Severe: clayey surface layer; poor trafficability.
Mountainburg: MoD, MuD. Urban land part of MuD is too variable to estimate.	Moderate: coarse fragments and stones on surface; difficult to establish and maintain vegetation.	Severe: shallow to bedrock; coarse fragments and stones on surface; slope is greater than 6 percent in many places; difficult to establish and maintain vegetation.	Moderate: coarse fragments and stones on surface; difficult to establish and maintain vegetation.	Moderate: coarse fragments and stones on surface.
Norwood: No.	Moderate: sticky surface layer; poor trafficability.	Moderate: sticky surface layer; poor trafficability; some areas subject to occasional flooding.	Moderate: sticky surface layer; poor trafficability.	Moderate: sticky surface layer; poor trafficability.
Perry: Pe, Pu. Urban land part of Pu is too variable to estimate.	Severe: poorly drained; very slow permeability; clayey surface layer; poor trafficability; some areas subject to frequent flooding.	Severe: poorly drained; very slow permeability; clayey surface layer; poor trafficability; some areas subject to frequent flooding.	Severe: poorly drained; clayey surface layer; poor trafficability.	Severe: poorly drained, clayey surface layer; poor trafficability.
Rexor: Re, Rf. Urban land part of Rf is too variable to estimate.	Severe: subject to frequent flooding.	Severe: subject to frequent flooding.	Moderate: subject to frequent flooding.	Moderate: subject to frequent flooding.
Rilla: RmA, RmC, RpB, RuA. For Perry part of PpB, see Perry series. Urban land part of RuA is too variable to estimate.	Slight.	Slight.	Slight.	Slight.
Saffell: SfC. Urban land part is too variable to estimate.	Slight.	Generally moderate: coarse fragments on surface. Severe where slope is greater than 6 percent.	Slight.	Slight.
Sallisaw: SgB, SgC, ShC, SKC. Urban land part of ShC is too variable to estimate. For Leadvale part of SKC, see Leadvale series.	Slight.	Generally moderate: coarse fragments on surface; slope. Severe where slope is greater than 6 percent.	Slight.	Slight.
Smithdale: StC, SuC. Urban land part of SuC is too variable so estimate.	Slight.	Generally moderate: slope. Severe where slope ls greater than 6 percent.	Slight.	Slight.
StD.	Moderate: slope.	Severe: slope.	Moderate: slope.	Slight.

TABLE 10.—*Degree and kind of limitations of the soils for recreational use*—Continued

Soil series and map symbols	Camp areas	Playgrounds	Picnic areas	Paths and trails
Tiak: TaB, TuC. Urban land part of TuC is too variable to estimate.	Moderate: slow permeability	Generally moderate: slow permeability; slope. Severe where slope is greater than 6 percent.	Slight	Slight.
Umbraqualfs: Um	Severe: poorly drained; very slow permeability; clayey surface layer; poor trafficability.	Severe: poorly drained; very slow permeability; clayey surface layer; poor trafficability.	Severe: poorly drained; clayey surface layer; poor trafficability.	Severe: poorly drained; clayey surface layer; poor trafficability.
Urban land: Ut. Limitations too variable to estimate; onsite investigation needed.				
Wrightsville: Wt, Wu. Urban land part of Wu is too variable to estimate.	Severe: poorly drained; very slow permeability.	Severe: poorly drained; very slow permeability.	Severe: poorly drained	Severe: poorly drained.

The interaction of the five factors of soil formation is more complex for some soils than for others. The five factors, and how they interact to form some of the soils in the county, are discussed in the following paragraphs.

Parent material

In Pulaski County, the soils formed in two general kinds of parent material. In the southeastern third of the county, the parent materials are unconsolidated sediment ranging in age from the Tertiary Period through the Recent Epoch. In most of the rest of the county, the soils formed in material that weathered from consolidated bedrock of the Ordovician Period through the Pennsylvanian Period.

Alluvium deposited by the Arkansas River is the chief parent material on the flood plain from the northwest to the vicinity of Little Rock, and on the bottom lands in the eastern part of the county. This alluvium is a mixture of minerals derived from many kinds of soil, rock, and unconsolidated material. It washed downstream from the Arkansas River basin, which extends from the Rocky Mountains and includes parts of Colorado, New Mexico, Texas, Kansas, Oklahoma, and Arkansas. This sediment had a high content of bases and weatherable minerals, and some was calcareous.

The sandier sediment was deposited on parts of natural levees adjacent to the stream channel. Crevasse and Bruno soils formed in this sediment. Young loamy sediment deposited near the stream channel makes up the natural levees on which the Keo and Norwood soils formed. Similar, but older, loamy deposits are the parent materials of the Rilla soils. The clayey sediment deposited some distance away from the channel in the slack-water bays is the material in which the clayey Umbraqualfs and the Moreland and Perry soils formed. Latanier soils formed in areas where the meander pattern of the river had changed and thin clayey deposits were laid down in younger backswamps over loamy sediment of former natural levees. All of these soils have high base saturation and medium to high content of weatherable minerals, and some, like the Norwood soils, are calcareous.

The parent materials of soils on the coastal plain were deposited in the Gulf of Mexico when it covered southern and eastern Arkansas. These materials extend diagonally across the county from Jacksonville through Little Rock. They consist mainly of clayey and loamy sediment. Some strata have a high content of quartz and chert pebbles. This sediment is low in bases and weatherable minerals. In places where clayey sediment was the dominant parent material, Tiak and Wrightsville soils formed. Where the loamy sediment was dominant, Smithdale and Amy soils formed. Saffell soils formed in areas that had loamy sediment with a high content of pebbles. All of these soils but the Wrightsville soils are low in bases and weatherable minerals.

The Ouachita Mountains area covers the western part of the county. In this area, the soils formed mainly in residuum from moderately hard to hard bedrock of nine geological formations (*6*). These rock layers have been folded and faulted and in many places are tilted toward the vertical. The soils formed in material weathered mainly from the upturned, broken edges of the rocks. The rock layers include shale, slate, sandstone, chert, and novaculite. Carnasaw soils formed in areas where the shale and slate were the dominant parent materials. These are moderately deep soils that have a clayey B horizon. The shallow, loamy Mountainburg soils formed in areas where the sandstone, chert, and novaculite were the dominant parent materials. Carnasaw soils have an irregular boundary at the soil-rock contact, probably because the shale and slate are tilted and the degree of weathering has varied along the upturned edges.

Parent materials of soils along the drainageways in the Ouachita Mountains area are mainly loamy sediment that washed from the surrounding hills and mountains. Soils that formed in this sediment are mainly of the Leadvale, Rexor, and Sallisaw series.

Igneous rock is the parent material for soils in a small area at the eastern end of the Ouachita Mountains. This area is along the southeastern edge of Little Rock. The rock is nephelite syenite. Linker and Mountainburg soils formed in the regolith weathered from this rock.

The parent materials in the northern part of the county range from slightly tilted and faulted to level-bedded acid sandstone and shale of the Atoka Formation (*4*, *6*). These sedimentary rocks include coarse-grained sandstone, shaly sandstone, sandy shale, and clayey shale, all of which are interbedded. Leadvale and Guthrie soils formed in the valleys where the shale or sediment that washed from adjacent uplands are the dominant materials. On the ridges and low mountains, sandstone is the dominant rock. Linker and Mountainburg soils formed in residuum in these areas.

Climate

The climate of Pulaski County is characterized by mild winters, warm or hot summers, and generally abundant rainfall. The generally warm temperatures and high precipitation probably are similar to the climate under which the soils in the county formed.

The warm, moist climate promotes rapid soil formation and rapid chemical reaction. The large amount of water that moves through the soil is instrumental in removing dissolved or suspended materials. Plant remains decompose rapidly, and the organic acid thus formed hastens the removal of carbonates and the formation of clay minerals. Because the soil is frozen only to a shallow depth, and for short periods, soil formation continues almost the year round. The climate throughout the county is relatively uniform, though its effect is modified locally by runoff. Climate alone does not account for differences in the soils of the county.

Living organisms

Higher plants and animals, as well as insects, bacteria, and fungi, are important in the formation of soils. Living organisms help to increase the content of organic matter and nitrogen in the soil, to increase or decrease the supply of plant nutrients, and to change structure and porosity.

Before Pulaski County was settled, the native vegetation had more influence on soil formation than did animal activity. The northern part of the county was covered by forests and small areas of savanna.

The native vegetation in the swamp areas was mainly baldcypress and water tupelo. Some Perry soils and the clayey Umbraqualfs formed in these areas. On the poorly drained to well-drained flood plains and natural levees, the trees were chiefly cottonwood, black willow, hackberry, elm, sycamore, ash, oak, hickory, and pecan. Bruno, Crevasse, Keo, Latanier, Norwood, Moreland, and Rilla soils and some Perry soils formed in these areas. The differences in these soils are mainly caused by parent material, age, and relief.

In the coastal plain area, the native vegetation was mixed stands of shortleaf and loblolly pines, oak, and hickory. Amy and Cahaba soils and some Leadvale, Saffell, Smithdale, Tiak, and Wrightsville soils formed in these areas. They differ chiefly in parent material and relief. Rexor soils and some Amy soils formed along drainageways where the native vegetation was mainly mixed hardwoods.

In the Ouachita Mountains in the western part of the county, the native vegetation was upland oaks, hickory, and shortleaf pine. Carnasaw and Mountainburg soils formed in material that remained in place, and Leadvale and Sallisaw soils formed on stream terraces in this area.

In the Arkansas Valley and Ridges area, which stretches across most of the northern part of the county, the native vegetation was mainly shortleaf pine, upland oaks, and hickory. Guthrie, Leadvale, Linker, and Mountainburg soils formed in this area. Within this area were scattered tracts of savanna. In these savannas the vegetation was scattered trees, mainly oak, and an understory of tall native grasses. Some Linker and Mountainburg soils formed in these areas.

Man is influencing the formation of the soils by clearing forests and tilling the soil; introducing new plants; fertilizing; applying chemicals for insect, disease, and weed control; improving drainage; and controlling floods. Man has had his strongest and most destructive effect on formation of soils in urban areas by cutting and filling, compacting, and covering with roof and pavement. Even in many of the areas that have remained in woodland, man is influencing soil formation through woodland management practices such as selective harvesting, timber stand improvement, and planting pure stands of preferred species. Only a few results of man's activities can be seen now in rural areas, such as changes in structure, color, organic-matter content, nutrient content, and thickness of the surface horizon, or plow layer. Many of the results of man's activities will probably not be evident for several centuries.

Relief

Relief is inequalities in elevation, brought about in Pulaski County chiefly by faulting and folding, and the subsequent entrenchment of drainage channels into the land surface. The highest elevation in the county, about 1,068 feet above sea level, is in the western part of the county. The lowest elevation, about 213 feet above sea level, is in the southeastern part of the county at the Arkansas River.

Some of the greatest differences in the soils of Pulaski County are caused by differences in relief through its effect on drainage, runoff, erosion, and percolation of water through the soil. Relief ranges from near-vertical bluffs to broad flats.

Generally, the steeper slopes and narrow ridges have lost so much soil material through geologic erosion that the soils on them—Mountainburg soils, for example—are shallow. In contrast, the broad, level or gently sloping areas have lost little soil material, and the soils in these areas—Linker, Leadvale, and Guthrie, for example—are moderately deep or deep.

The flood plain of the Arkansas River is level to nearly level and was subject to frequent overflow before flood-control dams were built on the river and its tributaries. The floodwaters, loaded with soil particles, move at different speeds, depending partly on the topography. The rapidly moving waters deposit sandy sediment similar to that in which the Crevasse soils formed. The waters moving less rapidly deposit mixed sediment high in silt, and the Keo, Norwood, and Rilla soils formed in this material. The slack or still waters caught in flood bays and broad flats deposit clayey sediment, and Perry soils formed in this material.

The coastal plain in the eastern and south-central parts of the county is level to rolling. Most of the sloping areas and the ridgetops are well drained or moderately well drained. The Saffell, Smithdale, and Tiak soils formed in these areas. On the level and nearly level flats and depressions, the poorly drained Amy and Wrightsville soils formed.

Time

The length of time required for soil formation depends largely on other factors of soil formation. Generally, less time is required if the climate is warm and humid and the vegetation luxuriant. If other factors are equal, less time is also required where the parent material is loamy than where it is clayey.

In terms of geological time, most of the soils of Pulaski County are old, regardless of whether they are on mountaintops, mountainsides, or stream terraces. The young soils formed either in alluvium along streams or in residual material where geologic erosion has nearly kept pace with weathering of the bedrock.

Some of the soils on the uplands are examples of old soils. They formed in material weathered from sandstone, quartzite, and shale ranging in age from Pennsylvanian to Ordovician. Most are old enough that nearly all of the cations have been leached out, the reaction is strongly acid or very strongly acid, there has been considerable weathering and translocation of clay, and the horizons are clearly expressed. Iron, as well as clay, has been translocated from the A horizon to the B horizon and then oxidized, causing the B horizon to have stronger red, brown, and yellow colors than the A horizon. Carnasaw and Linker soils clearly show the impact of time, acting with other soil-forming factors, on the parent material.

The Norwood and Bruno soils are examples of very young soils. They formed in recent alluvium on the flood plain of the Arkansas River. No definite horizons have formed below the A horizon. Instead, these soils still have the depositional rock structure, or bedding planes, and little or no soil structure. Base saturation is high, and the reaction is neutral to moderately alkaline, which indicates that leaching has been slight. The organic-matter content decreases irregularly with increasing depth. Except for the slight mechanical changes caused by worms and roots, there is little evidence of soil-forming activity.

Processes of Horizon Differentiation

In this section a brief definition of the horizon nomenclature and processes responsible for soil formation are given. The marks that the soil-forming factors leave on the soil are recorded in the soil profile, which is a succession of layers, or horizons, from the surface to the parent rock. The horizons differ in one or more properties, such as color, texture, structure, consistence, and porosity. Most soil profiles contain three major horizons, called A, B, and C. Very young soils do not have a B horizon.

The A horizon can be the horizon of maximum accumulation of organic matter, which is called the A1 horizon or the surface layer, or it can be the horizon of maximum leaching of dissolved or suspended materials, which is called the A2 horizon, or the subsurface layer.

The B horizon lies immediately beneath the A horizon and is sometimes called the subsoil. It is a horizon of maximum accumulation of suspended materials, such as clay and iron. Commonly, the B horizon has blocky structure and is firmer than the horizons immediately above and below it.

Beneath the B horizon is the C horizon, which has been little affected by the soil-forming processes, though the C horizon can be materially modified by weathering. In some young soils, the C horizon immediately underlies the A horizon and has been slightly modified by living organisms as well as by weathering.

Several processes have been active in the formation of soil horizons in Pulaski County. Among these processes are (1) the accumulation of organic matter, (2) the leaching of bases, (3) the oxidation or reduction and transfer of iron, and (4) the formation and translocation of silicate clay minerals. In most of the soils of the county, more than one of these processes has been active in soil formation.

Physical weathering of rocks through heating and cooling and through wetting and drying slowly breaks the rocks into small pieces that form the parent material for the residual soils in the county. This is most evident in the Linker and Mountainburg soils.

Accumulation of organic matter in the upper part of the profile to form an A1 horizon has been an important process of soil formation. The A1 horizon is evident in profiles that have a light-colored subsurface layer from which organic

TABLE 11.—*Classification of soil series*

Series	Family	Subgroup	Order
Amy	Fine-silty, siliceous, thermic	Typic Ochraquults	Ultisols.
Bruno	Sandy, mixed, thermic	Typic Udifluvents	Entisols.
Carnasaw	Clayey, mixed, thermic	Typic Hapludults	Ultisols.
Crevasse	Mixed, thermic	Typic Udipsamments	Entisols.
Guthrie[1]	Fine-silty, siliceous, thermic	Typic Fragiaquults	Ultisols.
Keo	Coarse-silty, mixed, thermic	Dystric Fluventic Eutrochrepts	Inceptisols.
Latanier	Clayey over loamy, mixed, thermic	Vertic Hapludolls	Mollisols.
Leadvale	Fine-silty, siliceous, thermic	Typic Fragiudults	Ultisols.
Linker	Fine-loamy, siliceous, thermic	Typic Hapludults	Ultisols.
Moreland	Fine, mixed, thermic	Vertic Hapludolls	Mollisols.
Mountainburg	Loamy-skeletal, siliceous, thermic	Lithic Hapludults	Ultisols.
Norwood	Fine-silty, mixed (calcareous), thermic	Typic Udifluvents	Entisols.
Perry	Very fine, montmorillonitic, nonacid, thermic	Vertic Haplaquepts	Inceptisols.
Rexor	Fine-silty, siliceous, thermic	Ultic Hapludalfs	Alfisols.
Rilla	Fine-silty, mixed, thermic	Typic Hapludalfs	Alfisols.
Saffell	Loamy-skeletal, siliceous, thermic	Typic Hapludults	Ultisols.
Sallisaw	Fine-loamy, siliceous, thermic	Typic Paleudults	Alfisols.
Smithdale	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols.
Tiak	Clayey, mixed, thermic	Aquic Paleudults	Ultisols.
Wrightsville	Fine, mixed, thermic	Typic Glossaqualfs	Alfisols.

[1] The Guthrie soils in this survey area are taxadjuncts to the series. They are outside the range of the Guthrie series in that they have patchy clay films and are less leached in the horizon above the fragipan, but have slightly less clay in the textural control section.

TABLE 12.—*Mechanical and*

Soil name and sample number	Depth from surface	Horizon	Mechanical					
			Very coarse sand to medium sand (2.0–0.25 mm)	Fine sand (0.25–0.1 mm)	Very fine sand (0.1–0.05 mm)	Total sand (2.0–0.05 mm)	Silt (0.05–0.002 mm)	Clay (less than 0.002 mm)
	Inches		*Percent less than 2.0 mm*	*Percent less than 2.0 mm*	*Percent less than 2.0 mm*	*Percent less than 2.0 mm*	*Percent less than 2.0 mm*	*Percent less than 2.0 mm*
Bruno fine sandy loam: S66-Ark-60-9.	0.6	Ap	----	10	48	58	37	5
	6–16	C1	----	6	41	47	49	4
	16–23	C2	----	51	40	91	(2)	(2)
	23–25	C3	----	1	20	21	74	5
	25–52	C4	----	48	45	93	(3)	(3)
Carnasaw gravelly silt loam: 3503–3508.	0–2	A1	4	9	9	22	66	12
	2–6	A2	3	6	11	20	60	20
	6–12	B21t	1	3	4	8	42	50
	12–23	B22t	----	1	2	3	28	69
	23–38	B23t	----	3	4	7	40	53
	38–49	B24t	1	1	5	7	57	36
Keo silt loam: S66-Ark-60-3.	0–10	Ap	----	3	25	28	56	16
	10–20	B1	----	8	34	42	46	12
	20–27	B2	----	1	12	13	64	23
	27–38	B3	----	----	32	32	62	6
	38–41	IIAb	----	----	1	1	74	25
Latanier silty clay: S66-Ark-60-1.	0–9	Ap	----	----	1	1	47	52
	9–30	B2	----	6	16	22	45	33
	30–34	B31	----	----	1	1	57	42
	[4] 34–39	IIB32	----	----	----	----	----	----
	39–56	IIC	----	22	46	68	27	5
Leadvale silt loam: S71-Ark-60-2.	0–7	Ap	1	1	5	7	76	16
	7–16	B2t	1	1	4	6	70	24
	16–24	Bx1	1	1	3	5	69	26
	24–36	Bx2[5]	1	2	4	7	73	20
	36–48	Bx2[5]	2	2	4	8	67	25
	48–60	Bx3[5]	2	3	4	9	60	31
	60–72	Bx3[5]	2	3	4	9	54	37
Moreland silty clay: S66-Ark-60-8.	0–8	Ap	----	----	----	----	44	56
	8–19	B21	----	----	----	----	41	59
	19–32	B22	----	----	----	----	41	59
	32–41	B3	----	----	----	----	44	56
	41–43	IIC	----	----	----	----	66	34
Norwood silty clay loam: S66-Ark-60-5.	0–6	Ap	----	----	1	1	71	28
	6–8	A1	----	----	----	----	69	31
	8–10	C1	----	----	----	----	74	26
	10–14	C2	----	----	----	----	63	37
	14–20	C3	----	----	----	----	62	38
	20–22	C4	----	----	----	----	77	23
	22–27	C5	----	----	1	1	62	37
	27–30	C6	----	----	6	6	84	10
	30–35	C7	----	----	2	2	62	36
	35–41	C8	----	----	4	4	86	10
	41–52	C9	----	1	2	3	73	24
	52–57	C10	----	1	47	48	48	4
Rexor silt loam: S71-Ark-60-3.	0–2	Ap1	----	6	7	13	77	10
	2–8	Ap2	----	6	7	13	73	14
	8–19	B1	----	4	7	11	67	22
	19–25	B21t	----	4	6	10	67	23
	25–37	B22t	----	5	6	11	69	20
	37–50	B23t	----	5	7	12	66	22
	50–66	B24t	----	9	10	19	61	20
Sallisaw gravelly silt loam: S71-Ark-60-4.	0–7	Ap	19	11	8	38	49	13
	7–13	B1	12	12	9	33	50	17
	13–27	B21t	24	13	8	45	35	20
	27–51	IIB22t	31	10	7	48	34	18
	51–64	IIB3	15	10	8	33	48	19
	64–72	IIC	17	12	8	37	45	18

[1] Contains Calcium carbonate.
[2] Silt plus clay = 9 percent.
[3] Silt plus clay = 7 percent.

chemical analyses of selected soils

Chemical								
Exchangeable bases				Extractable acidity	Base saturation	Reaction (soil-water ratio of 1:1)	Organic-matter content	Available phosphorus
Calcium	Magnesium	Sodium	Potassium					
Meq per 100 g of soil	*Meq per 100 g of soil*	*Meq per 100 g of soil*	*Meq per 100 g of soil*	*Meq per 100 g of soil*	*Pct*	*pH*	*Pct*	*p/m*
(1)	0.6	0.1	0.2	(1)	(1)	7.7	0.5	------
(1)	.5	.1	.2	(1)	(1)	8.0	.3	------
(1)	.2	.1	.1	(1)	(1)	7.8	.0	------
(1)	.1	.6	.2	(1)	(1)	7.8	.4	------
(1)	.2	.1	.0	(1)	(1)	7.6	.6	------
1.8	.3	.1	.2	8.6	22	5.9	3.0	5
.4	.2	.1	.1	5.7	12	5.2	1.3	3
.8	.4	.2	.1	8.2	15	5.1	.5	3
.8	.6	.2	.1	11.6	13	4.9	.5	3
.3	.4	.2	.1	10.4	9	5.0	.3	3
.2	.6	.4	.1	9.5	12	4.1	.2	1
6.5	2.0	.1	.6	1.9	83	6.4	.9	41
5.8	1.5	.1	.2	1.8	81	7.0	.3	16
8.0	2.3	.2	.3	.8	93	6.9	.4	9
4.0	1.1	.1	.1	1.1	83	7.0	.0	9
14.0	2.0	.2	.3	.2	99	7.8	.4	2
15.5	4.8	.2	.8	3.9	85	6.4	1.5	27
13.0	2.7	.2	.5	1.6	91	7.1	.8	8
14.9	3.5	.2	.6	1.9	91	7.0	.9	3
3.3	.9	.1	.2	.5	90	6.9	.1	14
1.9	.8	.2	.1	6.9	30	5.4	.9	2
1.7	1.0	.2	.1	8.0	27	5.2	.6	2
1.3	1.0	.2	.1	8.4	24	5.0	.4	4
.9	.8	.2	.1	9.4	18	5.2	.3	2
.7	1.4	.3	.1	10.2	20	5.5	.2	1
1.4	3.8	.5	.1	11.9	33	5.3	.2	2
2.5	8.2	1.1	.2	7.5	62	5.5	.2	1
15.0	4.2	.1	.9	5.8	78	6.4	1.8	52
19.0	3.8	.2	.8	5.9	80	6.8	1.2	16
21.3	4.4	.2	.7	2.8	90	6.9	1.2	10
25.8	1.8	.2	.7	1.2	96	7.8	.5	3
9.3	.5	.1	.2	1.2	89	7.8	.2	6
(1)	1.8	.2	.7	(1)	(1)	7.7	1.6	------
(1)	1.7	.2	.5	(1)	(1)	7.6	1.3	------
(1)	1.4	.2	.4	(1)	(1)	7.7	1.0	------
(1)	2.1	.3	.5	(1)	(1)	7.7	1.1	------
(1)	2.0	.3	.5	(1)	(1)	7.6	1.4	------
(1)	1.3	.2	.3	(1)	(1)	7.8	.9	------
(1)	2.5	.3	.6	(1)	(1)	7.8	1.1	------
(1)	.8	.2	.2	(1)	(1)	8.1	.3	------
(1)	2.0	.3	.5	(1)	(1)	7.8	1.3	------
(1)	.7	.2	.1	(1)	(1)	8.1	.4	------
(1)	1.3	.3	.2	(1)	(1)	8.0	1.1	------
(1)	.5	.2	.1	(1)	(1)	8.1	.2	------
3.8	1.2	.2	.2	6.8	44	6.0	3.0	23
3.9	.8	.2	.1	4.8	51	5.9	1.4	6
4.2	1.0	.2	.1	4.8	53	5.9	.6	8
4.2	1.1	.2	.1	3.4	62	5.8	.4	8
3.8	1.3	.2	.1	3.9	58	6.0	.4	4
4.0	1.4	.2	.1	4.9	54	5.9	.3	3
3.8	1.6	.2	.1	4.3	57	5.7	.3	3
2.8	.7	.2	.1	10.3	27	5.4	2.3	5
2.2	.6	.2	.1	8.0	28	5.7	1.6	2
1.8	.4	.2	.3	4.9	36	5.5	.6	1
1.4	.6	.2	.2	4.6	34	5.5	.6	5
1.6	1.6	.2	.1	4.7	43	5.6	.3	2
1.6	1.5	.2	.1	3.9	47	5.8	.3	2

[4] Horizon not sampled.
[5] Horizon subdivided by sampling analysis.

matter, clay, and iron oxides have been removed. These processes are readily evident in the Wrightsville soils.

Leaching of bases has occurred to some degree in nearly all the soils of Pulaski County. Among soil scientists, it is generally accepted that bases are leached downward in soils before silicate clay minerals begin to move. Most of the soils in the county are moderately leached, an important factor in horizon development. Some, such as the Norwood soils, are only slightly leached, whereas others, such as the Carnasaw, Linker, and Mountainburg soils, are strongly leached.

Oxidation of iron is evident in the moderately well drained and well drained soils in the county. Oxidation of iron is indicated by the red and brown colors in the B horizon of soils such as the Linker, Mountainburg, and Carnasaw soils on the uplands, the Sallisaw soils on the terraces, and the Rilla soils on the natural levees.

Reduction and transfer of iron has occurred to a significant degree in the poorly drained and somewhat poorly drained soils. In the naturally wet soils, this process is called gleying. Gray colors in the horizons below the surface indicate the reduction and loss of iron. Some horizons contain reddish or yellowish mottles and concretions derived from segregated iron. Gleying is most pronounced in the Amy, Guthrie, and Wrightsville soils.

Translocation of silicate clay minerals has contributed to horizon development in most of the soils in the county. In cultivated areas most of the eluviated A2 horizon has been destroyed, but where it occurs the structure is blocky or platy; clay content is less than in the lower horizons where it has accumulated; and the horizon is lighter in color. Generally, clay films have accumulated in pores and on surfaces of peds in the B horizon. The soils were probably leached of carbonates and soluble salts to a great extent before translocation of silicate clay occurred, even though the content of bases is still high in some of the lowland soils.

Leaching of bases and translocation of silicate clay are among the most important processes in horizon differentiation in the soils of Pulaski County.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in developments of the current system should search the latest literature available (*9, 12*).

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. In table 11, the soil series of Pulaski County are placed in four categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Ent-i-sol).

SUBORDER: Each order is subdivided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquent* (Aqu, meaning water or wet, and *ent*, from Entisol).

GREAT GROUP: Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and those that have thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark-red and dark-brown colors associated with basic rocks, and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Udifluvents (*Ud*, meaning humid, *fluv* for water deposited, and *ents*, from Entisols).

SUBGROUP: Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Udifluvents (a typical Udifluvent).

FAMILY: Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reactions, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae (see table 11). An example is the sandy, mixed, thermic family of Typic Udifluvents.

Mechanical and Chemical Analyses

Mechanical and chemical data resulting from laboratory analyses can be useful to the soil scientist for the classification of soils. These data are helpful in estimating available water capacity, acidity, base-exchange capacity, mineralogical composition, organic-matter content, and other soil characteristics that affect management. Recently, laboratory data have proved helpful in rating soils for nonfarm uses; that is, for residential, industrial, recreational, or transportational use. The data are also helpful in developing concepts of soil formation.

Several factors are involved in selecting soils for laboratory analyses. Soils that are extensive and are the most important in the survey area are considered first. A review of available laboratory data is made to determine the need for additional information on these particular soils. Generally, priority is given to soils for which little or no laboratory data are available.

In Pulaski County soils representing nine soil series were selected for laboratory analyses. Profiles of these soils are described in the section "Description of the Soils." The analyses were made by the University of Arkansas in Fayetteville. Table 12 shows the results.

Particle-size distribution was determined by the hydrometer method (*7*).

The bases were extracted with pH 7 1 *N* ammonium acetate. Magnesium was determined colormetrically (*8*). The other bases were determined by flame photometry. The extractable acidity was determined by the barium chloride-triethanolamine method (*5*).

The total of extractable calcium, potassium, magnesium, and sodium and the extractable acidity is an approximation of the cation-exchange capacity of the soil. Base saturation was determined by dividing this total into the sum of calcium, potassium, magnesium, and sodium and multiplying by 100.

Soil pH was determined by using a Beckman pH meter on mixtures of soil and water at a 1 : 1 ratio.

Organic carbon was determined by the Walkley-Black method of digestion with potassium dichromate-sulfuric acid (*8*). Content of organic matter was then calculated using the equation, percent organic carbon X 1.72 = percent organic matter.

Available phosphorus was extracted by the Bray No. 1 solution (0.03*N* NH4F in 0.025*N* HCl) and determined colorimetrically.

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Glossary

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

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Chiseling. Tillage of soil with an implement having one or more soil penetrating points that loosen the subsoil and brings *clods* to the surface. A form of emerging tillage to control soil blowing.

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

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

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

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

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

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

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

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

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

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

Cemented.—Hard and brittle; little affected by moistening.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation 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 the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

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

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to relatively level plots surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops, or in orchards, to confine the flow of water to one direction.

Furrow.—Water is applied in small ditches made by cultivation implements used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Irrigation water, released at high points, flows onto the field without controlled distribution.

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

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

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

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

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on relatively steep slopes and in swelling clays, where there is marked change in moisture content.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

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

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

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