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Soil Survey

Calloway County Kentucky

By
W. J. LEIGHTY, in Charge, and HOWARD WM. HIGBEE
United States Department of Agriculture
and
W. S. REED and C. E. WYATT
Kentucky Agricultural Experiment Station

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils, and Agricultural Engineering
In cooperation with the
Kentucky Agricultural Experiment Station

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HOW TO USE THE SOIL SURVEY REPORT

SOILS SURVEYS PROVIDE a foundation for all land use programs. This report and the accompanying map present information both general and specific about the soils, the crops, and the agriculture of the area surveyed. The individual reader may be interested in the whole report or only in some particular part. Ordinarily he will be able to obtain the information he needs without reading the whole. Prepared for both general and detailed use, the report is designed to meet the needs of a wide variety of readers of three general groups: (1) Those interested in the area as a whole; (2) those interested in specific parts of it; and (3) students and teachers of soil science and related agricultural subjects. Attempt has been made to meet the needs of all three groups by making the report comprehensive for purposes of reference.

Readers interested in the area as a whole include those concerned with general land use planning—the placement and development of highways, power lines, urban sites, industries, community cooperatives, resettlement projects, and areas for forest and wildlife management and for recreation. The following sections are intended for such users; (1) Description of the County, in which location and extent, physiography, relief, and drainage, climate, water supply, vegetation, organization, settlement, and population, transportation, cultural development and improvements, and industries are discussed; (2) Agriculture, in which a brief history and the present status of the agriculture are described; (3) Productivity Ratings and Physical Land Classification in which the soils are grouped according to their relative physical suitability for agricultural use and their present management requirements and productivity are discussed; (4) Generalized Land Map, which shows the distribution of soils according to five broad land types; (5) Land Use and Soil Management, in which the present uses of the soils are described, and suggestions made for improvement; and (6) Water Control on the Land, in which problems pertaining to drainage and control of runoff are treated.

Readers interested chiefly in specific areas—as some particular locality, farm, or field—include farmers, agricultural technicians interested in planning operations in communities or on individual farms, and real estate agents, land appraisers, prospective purchasers and tenants, and farm loan agencies. These readers should (1) locate on the map the tract with which concerned; (2) identify the soils on the tract by locating in the legend on the margin of the map the symbols and colors that represent them; and (3) locate in the table of contents in the section on Soils the page where each type is described in detail and information given as to its suitability for use and its relations to crops and agriculture. They will also find useful information in the sections on Productivity Ratings and Physical Land Classification, Land Use and Soil Management, and Water Control on the Land.

Students and teachers of soil science and allied subjects—including crop production; forestry, animal husbandry, economics, rural sociology, geography, and geology—will find their special interest in the section on Morphology and Genesis of Soils. They will also find useful information in the section on Soils, in which are presented the general scheme of classification of the soils of the area and a detailed discussion of each type. For those not already familiar with the classification and mapping of soils, these subjects are discussed under Soil Survey Methods and Definitions. Teachers of other subjects will find the sections on Description of the County, Agriculture, Productivity Ratings and Physical Land Classification, and the first part of the section on Soils of particular value in determining the relations between their special subjects and the soils of the area.

This publication on the soil survey of Calloway County, Ky., is a cooperative contribution from the—

BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
ROBERT M. SALTER, *Chief*

Division of Soil Survey
CHARLES E. KELLOGG, *Head Soil Scientist, in Charge*

KENTUCKY AGRICULTURAL EXPERIMENT STATION
THOMAS D. COOPER, *Director*

Series 1937, No. 15 Issued August 1945

SOIL SURVEY OF CALLOWAY COUNTY, KENTUCKY

By W. J. LEIGHTY, in Charge, and HOWARD WM. HIGBEE, Division of Soil Survey,[1] Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, United States Department of Agriculture, and W. S. REED and C. E. WYATT, Kentucky Agricultural Experiment Station

Area inspected by MARK BALDWIN, Senior Soil Scientist, Division of Soil Survey

United States Department of Agriculture in cooperation with the Kentucky Agricultural Experiment Station.[2]

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SUMMARY

Calloway County is in the southwestern part of Kentucky, just west of the Tennessee River. It has an area of 412 square miles. Physiographically, the county is part of the East Gulf Coastal Plain.

Large areas of the original plain, which have only been slightly dissected and consist of nearly level to gently rolling topography, remain

[1] The field work for this survey was done while the Division was a part of the Bureau of Chemistry and Soils.

[2] The Tennessee Valley Authority also cooperated by supplying a part of the funds and materials used in this survey.

in the western two-thirds of the county. These smoother uplands occupy about 50 percent of the area. Parts of them are poorly drained. The eastern, northern, and southwestern parts have been rather thoroughly dissected by a dendritic drainage system into strongly rolling to hilly relief. These rougher uplands occupy about 26 percent of the area. Approximately 24 percent of the area is occupied by alluvial first and second bottoms. The elevation ranges from 302 to about 569 feet above sea level, with an average of about 500 feet. Originally the county was covered with an oak-hickory type of forest.

The climate is humid, mild, temperate, and continental. The annual precipitation averages about 52 inches, which is fairly well distributed over the year. It includes about 10 inches of unmelted snow.

Calloway County has been almost wholly agricultural throughout its history. The predominant system of farming in the county as a whole consists of a tobacco-general type. The principal crops grown are corn, tobacco, lespedeza, wheat, cotton, redtop, and soybeans. Less important crops are cowpeas, timothy, sorgo, strawberries, oats, and sweetpotatoes. The livestock consist principally of dairy cattle, hogs, chickens, mules, and horses. There are no livestock specialties.

About 28 percent of the land is in forests. In a general way, forests occupy the steeper slopes and the poorest drained bottoms, neither of which are well suited for crop production. There are many idle open fields. Corn occupies a much larger acreage than any other crop, although most of the soils of the uplands and terraces are not well suited to it. Tobacco is by far the main cash crop and has been throughout most of the history of the county. Much of the smoother uplands is suited to the production of a high grade of western fire-cured tobacco.

Calloway county is situated near the northern edge of the region of Red and Yellow Podzolic soils and near the southern edge of the region of Gray-Brown Podzolic soils. The soils are predominantly light in color, silt loam in texture, low in organic matter and nitrogen, medium to very strongly acid in reaction, and medium to low in natural fertility. They vary greatly in drainage, relief, conditions of erosion, content of gravel and stones, and susceptibility to flooding.

For discussion the soils are grouped, largely on the basis of their physical capabilities for use, into (1) brown soils of the smoother uplands and stream terraces, (2) gray soils of the uplands and stream terraces, (3) soils of the rougher uplands, and (4) soils of the alluvial first bottoms.

The group of brown soils of the smoother uplands and stream terraces is the most important agriculturally, and it comprises about 47 percent of the county. These soils have brown or grayish-brown surface layers and yellowish-brown upper subsoil layers. They occur on slopes of 0 to 10 percent. A tobacco-corn type of farming predominates. Tobacco is the principal source of cash income, although corn occupies a much larger acreage. All the common crops of the region are grown. These soils are responsive to good treatment. The principal soils of this group are Grenada silt loam and its level and slope phases; Providence silt loam; Lexington silt loam, smooth phase; and Olivier silt loam.

Grenada silt loam and its level phase occupy a large part of the area of the county and are the most important soils agriculturally.

They have grayish-brown surface layers, yellowish-brown friable upper subsoil layers, and gray mottled, compact, dense, slowly permeable lower subsoil layers. The slope ranges from 0 to 5 percent. These soils are developed from loessial or silty deposits. Erosion on the soil of the level phase is negligible, but the typical soil is subject to some harmful erosion. A good grade of western fire-cured tobacco is produced on these soils. Yields equal or slightly exceed the average for the county. Grenada silt loam, slope phase, has a slope of 5 to 10 percent and is subject to severe erosion when unprotected. It is less well suited to intertilled crops and requires more care in its use and management than the other Grenada soils.

Providence silt loam is similar to Grenada silt loam, slope phase, in the upper soil layers, crop adaptations, and erosion conditions. It differs in that the lower soil layers are developed from coastal plain gravelly or sandy materials.

Lexington silt loam, smooth phase, occurs on gently undulating relief where the silty layer is thinner than about 3½ feet. The lower part of the soil is developed from sandy Coastal Plain materials. It is well drained and is subject to harmful sheet erosion and slight gullying. The surface soil is light brown, and the subsoil is yellowish brown with a slightly reddish cast. This soil is slightly better adapted to most crops, except western fire-cured tobacco, than is Grenada silt loam.

Olivier silt loam is developed on terraces the material of which has been washed chiefly from silty deposits. It closely resembles Grenada silt loam, level phase, in important features and use.

The group of gray soils of the uplands and stream terraces comprises about 9 percent of the area of the county. Occupying nearly level areas or depressions, they have developed under poor natural drainage. They have gray or gray mottled surface layers and subsoils, including a gray mottled, slowly permeable claypan. The principal soil in this group is Calloway silt loam. The nearly level to depressed areas of this soil have slow to poor surface drainage. The compact dense layer occurs at a depth of 22 to 30 inches. Crops on it are susceptible to injury in wet seasons. Yields are rather low. It is not adapted to deep-rooted crops or cotton.

The soils of the rougher uplands comprise about 24 percent of the area of the county and are predominantly on strongly rolling to steep relief. Because of steep slope, erosion, droughtiness, or excessive quantities of gravel or chert fragments, these soils are not physically suited to the production of field crops and are often used for pasture or forestry. The principal soils in this group are Brandon silt loam and its steep phase; Brandon gravelly loam, steep phase; Lexington silt loam; Bodine loam; and Bodine cherty loam. The materials of all the soils include a shallow surface covering of loessial material. The Brandon soils overlie gravelly Coastal Plain materials; the Lexington soils overlie sandy Coastal Plain materials; and the Bodine soils overlie highly weathered cherty limestone materials.

The soils of the alluvial first bottoms comprise about 20 percent of the area of the county. These soils are developed on the first bottoms, and most of them are subject to overflow. They are used chiefly for a system of farming based on the production of corn and are the best soils for corn in the county. The principal soils in this group are Collins

silt loam, Waverly silt loam, Shannon loam, Hymon loam, and Beechy loam. The first two are developed from materials that are high in silt and the latter three from a mixture of silty and Coastal Plain materials. The Shannon soils are well drained, the Collins and Hymon soils are imperfectly drained, and the Waverly and Beechy soils are poorly drained.

Approximately 309.7 square miles is considered to be physically adapted under average conditions to field crops; about 36.4 square miles, though not well adapted to field crops, is thought to be physically adapted to pasture; and 65.9 square miles is not physically well adapted under average conditions to either field crops or pasture and therefore is probably best used for forest. Any effort to readjust the agriculture of the county, with the thought of soil conservation and a permanent agriculture in mind, will require adjustments in both the use and the management of each soil with respect to its physical limitations.

DESCRIPTION OF THE COUNTY

LOCATION AND EXTENT

Calloway County is situated in the southeast corner of the Jackson Purchase area, or that part of Kentucky that lies west of the Tennessee River (fig. 1). The county is rectangular in shape.

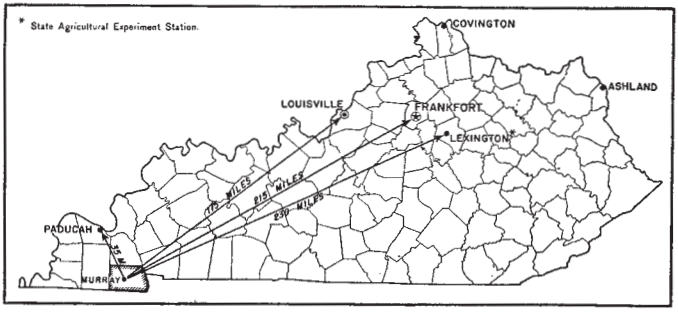


FIGURE 1.—Location of Calloway County in Kentucky.

except for the irregular course of the Tennessee River on the east, and comprises an area of 412 square miles, or 263,680 acres. It is approximately 17 miles from north to south and 24 miles from east to west. Murray, the county seat, is 35 miles southeast of Paducah and 175 miles southwest of Louisville by air line.

PHYSIOGRAPHY AND DRAINAGE

Physiographically, Calloway County is a plain, sloping gently to the north and east. It is in that part of the northern extension of the East Gulf Coastal Plain section known as the Mississippi embayment area of Kentucky. Subsequent to deposition, the marine deposits underlying this area were uplifted, causing some local tilting or warping but no folding of strata (*4*).[3] This plain has

[3] Italic numbers in parentheses refer to Literature Cited, p. 94.

since been changed by a dendritic system of drainageways into three subdivisions of relief: (1) Smoother uplands (2) rougher uplands, and (3) alluvial valleys.

The smoother uplands occupy approximately 50 percent of the county. This subdivision covers a large part of the southwestern quarter, which includes the headwaters of the Clarks River, West Fork Clarks River, and Mayfield Creek, and, in addition, extensive areas in other parts of the county. The area on the southern county line extends from about 3 miles west of Crossland to about 4 miles east of Hazel. Going northward, the area widens, then separates into three lobes, one extending from Cherry to a point near Hico, another from points south of Stella and Penny to Kirksey and Oak Grove Church, and the third from Lynn Grove to Browns Grove. This area represents a youthful stage of relief. It is characterized by relatively level interstream areas, or remnants of the original plain, and by rounded gentle slopes from these level areas to the branches forming the headwaters of the principal creeks. Dissection is slight, and the difference in elevations of the interstream areas and the alluvial valleys nowhere exceeds 50 feet. Drainage channels have penetrated practically all of the area, including most of the interstream divides, except in a few localities. The largest of these localities is bordered roughly by lines drawn from Perry Store, near the Kentucky-Tennessee State line, to New Providence; thence to Whiteoak School, and thence southward to the county line. This district is locally known as the "Flatwoods." Other areas in which drainage is slightly developed are about 4 miles northeast of Murray, about 3 miles northwest of Hazel, south of Taylors Store, and in the vicinity of Lynn Grove. Also, interstream divides contain many very small scattered areas of insufficient drainage.

The second subdivision of relief occupies many areas of the rougher uplands, totaling about 26 percent of the area of the county. Most of these areas lie east of a line drawn from Perry Store through New Providence and Pottertown to Faxon. Other areas are the lower watersheds of Jonathan Creek and the Clarks and West Fork Clarks Rivers and the extreme southwest corner of the county. This subdivision represents a more advanced stage of relief than that of the smoother uplands, and here the original plain has been thoroughly dissected. Drainage channels thoroughly penetrate the interstream areas. All that remains of the original plain are long, relatively narrow divides or ridges having many short spurs on either side. These divides are gently sloping, but they generally break sharply into steep slopes, which extend down to the small branch or creek bottoms. In the eastern part of the county, in the breaks of the Tennessee River, the river and streams have cut from 125 to 175 feet below the interstream ridges; elsewhere in this subdivision the small rivers and creeks have cut from 75 to 125 feet below the interstream ridges.

The alluvial valleys occupy about 24 percent of the county. This subdivision of relief consists of the first bottoms and terraces of the Tennessee River, Mayfield and Terrapin Creeks, and their tributaries. The first bottoms are level to very gently sloping, except along the Tennessee River, where distinct natural levees and other low ridges roughly parallel the river in most places. The larger streams have very wide valley floors; those of the Clarks, West Fork Clarks, and

Blood Rivers and Jonathan Creek are from ¾ to 1 mile wide in their lower courses. These streams in their lower courses have nearly reached grade and flow sluggishly through meandering courses in wide, flat flood plains that are poorly drained in many places. In the more hilly parts of the county the smaller streams have steeper gradients, and many of them follow U-shaped valley floors that are seldom flooded. These streams have cut deep channels into the unconsolidated sand and gravel of the Coastal Plain. These swift-flowing streams carry large quantities of silt, sand, and gravel, much of which is deposited as alluvial fans where the streams enter the broader valleys that have a more gentle gradient. Streams of the hilly eastern part of the county, where the underlying material is highly weathered cherty limestone, however, have not cut deep channels. They flow over wide, shallow, chert-covered beds and are not actively cutting downward. Most of the valleys of the larger creeks and smaller rivers are bordered by discontinuous gently sloping terraces, generally separated from the first bottoms by slight rises of 2 to 5 feet.

The valley floor of the Tennessee River ranges in width from 40 rods to about 1 mile. The first bottom is as wide as 80 rods in places and is somewhat undulating, consisting of natural levees near the river-bank and other low ridges and intervening swales or sloughs running nearly parallel to the river. A few of the sloughs are very low, appearing to be old channels, and hold water most of the year. Most of the terraces are separated from the first bottoms by abrupt escarpments from 20 to 30 feet in height. The terraces are characterized by alternate gentle ridges and swales. Most of the swales are poorly drained.

All the county north and east of the flat to gently undulating ridge, extending from the Kentucky-Tennessee State line 2 miles west of Crossland to the Calloway-Graves County line 2 miles north of Browns Grove, lies within the Tennessee River Basin. Drainage waters reach the Tennessee River through the Clarks, West Fork Clarks, and Blood Rivers, Jonathan Creek, and other smaller streams. The drainage waters from a small area west of this ridge and north of the line from Lynn Grove to the county line 2 miles south of Browns Grove reach the Mississippi River through Mayfield Creek. The rest of the drainage waters from the area west of this ridge flow into Terrapin Creek and reach the Mississippi River through the North Fork Obion and Obion Rivers in Tennessee.

There are no natural lakes in the county, but there are a few intermittent ponds in the lower sloughs of the Tennessee River bottoms and terraces. Most of the small streams are intermittent and are dry most of the year, although some of them have holes that do not dry up in the summer. The Blood River and the lower parts of the Clarks and West Fork Clarks Rivers and Wildcat, Panther, Sugar Tree, Wades, and Duncan Creeks are permanent streams. They are fed largely by springs emerging at the base of hills, which generally contain sandy strata overlying clay or a cherty limestone formation. Most of these springs are in rather isolated valleys in the northwestern and north-central parts of the county and in the vicinities of Pottertown, New Concord, and Brandon. They supply water for both home use and livestock.

ELEVATION

The general elevation of the county above sea level is about 500 feet. The highest known point, having an altitude of 569 feet, is one-half mile west of Lynn Grove, which is on the gently undulating divide between the Mississippi and Tennessee Rivers. The average altitude of this ridge is about 550 feet in the southern part and gradually decreases toward the north to about 500 feet. The same is true for the broad ridge extending northward from the flatwoods area in the vicinity of New Providence. The more rolling ridge between the Blood and Tennessee Rivers ranges from 425 to 475 feet in elevation. The elevation near the railroad station at Murray is 478 feet and at the southwest corner of the Kentucky State Teachers College campus near Murray is 553 feet. The elevation along the railroad in Dexter is 411 feet, and at New Concord it is 423 feet. The lowest elevation in the county is 302 feet on the Tennessee River in the northeastern corner of the county, making a total range in elevation of 267 feet.[4]

WATER SUPPLY

Probably about half of the homes in the undulating part of the county and on the ridges extending into the hilly area have wells. It is necessary to dig wells to a depth of 40 to 60 feet in these localities in order to obtain a continuous supply of water. The rest of the farms depend on cisterns for the home supply and on small artificial ponds or reservoirs of surface rain water for livestock needs. These cisterns and ponds often go dry during long periods of drought, and and at such times water has to be hauled from deep wells or springs. In the valleys a durable supply of well water is available at a depth of 10 to 30 feet.

VEGETATION

According to testimony of older inhabitants and available descriptions of the earlier conditions of the county, many of the more level interstream areas of the southwestern quarter of the county and the flatwoods area near New Providence were largely prairies and were covered with tall grass when white men first came (*4*). The untimbered areas were formerly called "barrens," as they were considered infertile. The adjacent hilly areas, as well as the hilly land of the northern and eastern parts of the county, and all the valleys, had a forest cover of hardwoods. The treeless condition of the barrens apparently was due to fires started by the Indians (*3*). Beginning about 1863, after the removal of the Indians and the increase in white settlers, fires decreased, the forests extended in area, and the prairies became more restricted. Later, many of the original prairies had to be cleared of forests before they could be plowed. The first trees to gain a foothold in the barrens proper were probably blackjack oaks, followed by red oaks and a few post oaks (*2*). At present the forest cover on these prairies consists mainly of post, southern red, and black oaks, hickory, and, to a less extent, red, blackjack, white, and swamp white oaks, winged elm, and dogwood. Post oak and

[4] All elevations obtained from correspondence with the Tennessee Valley Authority and from their planimetric maps (advance sheets).

southern red oak are dominant in the more poorly drained areas, and black oak, white oak, and hickory are dominant on the better drained areas.

In the forested uplands the forest consisted largely of white, black, post, southern red, red, and blackjack oaks and hickory. Scarlet, shingle, and chestnut oaks, chestnut, beech, dogwood, and winged elm are present in smaller quantities. Persimmon, sassafras, and wild plum, together with briers, sedge, and vines, are very common in cleared fields that have remained idle for a few years. On the cherty hills bordering the Tennessee River the forest consists largely of blackjack oak. White, black, red, and chestnut oaks, dogwood, and hickory are less common trees.

The creek bottoms and terraces originally were heavily timbered with a much greater variety of trees than the uplands. At present the forest consists of white, red, black, and post oaks, sweetgum, black tupelo (black gum), river birch, sycamore, honeylocust, beech, black cherry, tuliptree, hickory, and maple in the better drained areas, and of pin, shingle, willow, southern red, black, swamp white, and swamp chestnut oaks, red and silver maples, American and winged elms, sweetgum, and sycamore in the poorly drained areas. In the very wet areas and intermittent ponds, cypress, willow, water tupelo (tupelo gum), and buttonbush grow. Early settlers record numerous tuliptrees and white oak trees as large as 3 feet or more in diameter growing originally in the bottoms.

ORGANIZATION, SETTLEMENT, AND POPULATION

Calloway County is one of eight counties that represent the territory originally included in the Jackson Purchase. This territory was acquired from the Chickasaw Indians in 1818 (*4*). General Jackson was one of the negotiators with the Indians, and his name is usually associated with the area. In 1821 this territory was organized as Hickman County with the county seat at Columbus. Calloway County was formed from the east side of Hickman County in 1822, and the county seat was located at Wadesboro. The county was named for Col. Richard Calloway, who moved his family to Kentucky in 1776 and soon became active in the early settlements of the State (*2*). In 1842 Marshall County was formed from the northern part of Calloway County. At this time the county seat was moved from Wadesboro to a location near the geographical center of the county. The site was named Murray in honor of John L. Murray, a leading lawyer in west Kentucky.

According to available information, the first white men to settle in what is now Calloway County migrated from Caldwell County in 1818 and established a farm about 1 mile east of the present location of Wadesboro (*2*). Within the next 2 years several hunters and trappers visited the county. In 1820 settlements were made in the vicinity of Backusburg on the West Fork Clarks River, and in the next 2 years several settlers came to the northern part of the county. The first settlements were made in this vicinity probably because of the presence of several springs and the abundance of timber. Soon afterward settlements were made near the present site of Murray and in the southeastern part. The "barrens" were not settled until a later date, probably because of the difficulty of obtaining water and timber and also because the soil was considered

sterile. In 1822 a land office was established in the town of Wadesboro for the purpose of selling Government land. In 1827 the price of land was reduced from $1 to 50 cents an acre, and there was a great increase in immigration. During the next 3 years the population of Wadesboro, the first town of the county, is said to have increased to about 300. After all the public lands had been sold, Wadesboro lost its prominence, and its population gradually decreased. Settlement of New Concord started about 1828. Settlements were made in Murray in 1842, and the town was incorporated in 1844. In 1870, according to the United States census, the population of Murray was 179. Three years later it had increased to between 600 and 800 (*7*).

The early settlers came largely from counties farther east in Kentucky and from Virginia and the Carolinas. Almost all of them were of American birth. From the early settlements to the present the percentage of foreign-born population has been 0.2 percent or less (*4*).

The population of the county has increased gradually from 13,295 in 1880 to 19,041 in 1940. The 1940 census reported 95 percent native white and 4.9 percent Negroes. There were only 11 foreign-born white persons in the county in 1940.

The average density of population as a whole was 46.8 to the square mile in 1940, and the density of the rural population was 37.5. The rural population is the densest in the flat to undulating parts and sparsest in the hilly breaks of the Tennessee River. This distribution can be correlated with the difference in the soils of the two areas, the first area comprising more productive soils, which, for the most part, are easily worked and conserved, and the latter comprising less productive soils, which, to a large extent, are not well suited to the production of field crops. A large part of the arable land in the breaks of the Tennessee River is confined to the stream valleys.

Murray, the county seat and largest town, had a population of 3,773 in 1940. Centrally located, it is the most important trading and shipping point in the county. Hazel, the second largest town and important market and shipping center in the south-central part of the county, had a population of 396 in 1940. Almo and Dexter are other trading and shipping points in the north-central part of the county, located on the railroad. Other less important local markets are Lynn Grove, Kirksey, New Concord, Coldwater, Pottertown, Crossland, Browns Grove, and Brandon. There are a number of local stores. As the towns depend almost wholly on agriculture in the vicinity, the most prosperous towns are in areas of the more level land and in the more prosperous farming communities.

TRANSPORTATION

The transportation system is fairly adequate, although parts of the county lack entirely sufficient facilities. One railroad, the Nashville, Chattanooga & St. Louis Railway, crosses the county north and south between Dexter and Hazel. The extreme eastern and western parts of the county are over 10 miles from a railroad station. Seven State-maintained highways radiate from Murray; four of these are hard-surfaced and the others are well graveled. Bus and trucking service is available to the surrounding cities. In the more level and undulating areas local public roads are very numerous, and many of

them follow section lines in a fairly regular mesh. In the more hilly parts of the county the local public roads are much less numerous and generally follow valleys and ridges, and fords through small creeks are common. About 50 percent of the local roads are graveled and can be traveled throughout the year. Many of the graded dirt roads, especially those of the hilly areas, are impassable with automobiles or heavy trucks during much of the winter and early spring. Neither the graveled nor the graded dirt roads are well maintained. Transportation by highway is also somewhat handicapped by the toll bridges and ferries on the large rivers surrounding much of the Jackson Purchase section.

The Tennessee River is navigable, and the eastern side of the county is served by river transportation. This is largely confined to the shipment by barges of cross ties, logs, lumber, and musselshells.

CULTURAL DEVELOPMENT AND IMPROVEMENTS

The schools of the rural districts are largely of the one-room type. Outside of Murray there are four accredited 4-year high schools, and combined grade schools are well distributed over the county. A State teachers college is situated at Murray. There are many churches throughout the county, and mail routes serve all communities. Most localities have a few telephones, and a few farms are equipped with electric lights and power.

In a general way, the prevailing conditions of buildings and general farm improvements and the number of modern farm conveniences are closely associated with the character of the soil and other land conditions. On the smoother uplands the prevailing farm buildings consist of a bungalow or one-and-a-half story frame house, garage, small chicken house, small barn for the work animals and dairy cows, small corncrib, and one or two tall tobacco barns, some of which are the new type having ventilators. Most of these buildings, with the exception of the house, are unpainted. The farms are fairly well fenced with woven or barbed wire. Nearly every farm has an automobile, and radios and telephones are rather common. On the rougher uplands the prevailing farm buildings consist of a small frame or log house, unimproved shed or small livestock barn, and tall log or frame tobacco barn of the old type without ventilators. Generally these buildings are unpainted, and farms are poorly fenced. Buggies and wagons are often used as means of transportation, and telephones and radios are not common. The prevailing farm buildings on the Tennessee River terraces are much the same as on the smoother uplands, except that the livestock barns are somewhat larger and the tobacco barns are fewer.

Farm equipment and farm machinery vary according to the character of the land in much the same way as do the farm buildings. Modern heavy farm machinery, however, is scarce nearly everywhere. One- and two-horse tools predominate. Several farms have tractors, especially in the river bottoms.

INDUSTRIES

The county is almost wholly agricultural. A hosiery mill in Murray employs a number of women. A pottery in Pottertown employs a few men and furnishes a market for considerable fuel wood. A number of men gather mussels in the Tennessee River during the summer.

CLIMATE

The climate of Calloway County is a rather mild, temperate, humid, continental type. Winters and summers are usually moderate, with a spread of about 38° F. between the mean winter and summer temperatures. Temperatures have been known to rise as high as 110° in the summer and to drop as low as −20° in the winter, but such extremes are very infrequent and of short duration. Winters are not long and are characterized by short cold spells, frequent sharp changes in temperature, and high humidity. The average annual minimum temperature is just below zero, and six times during the 20-year period 1895–1914 the lowest temperature was 6° or more below this average (*12*). The average annual number of days with temperature continuously below freezing during the day is approximately 12, and the average annual number of days with a minimum temperature of freezing or lower is approximately 65. Mild winters often occur when the weather is seldom freezing. Nearly every winter allows outdoor work, and during the milder winters such hardy vegetables as turnips and mustard are successfully grown.

Frequent alternate freezing and thawing causes considerable heaving and winter killing of grains, clovers, and other winter crops on the more poorly drained soils, but the damage is not great on the better drained and lighter textured soils. The average annual snowfall is only slightly more than 10 inches of unmelted snow, the average annual number of days with snowfall is 10, and the average annual number of days on which snow covered the ground is 10, showing that snow stays on the ground only a short time and affords little protection to grains and other winter crops (*11*).

At the United States Weather Bureau station in Mayfield, which is about 22 miles northwest of Murray in Graves County, the average frost-free season is 197 days, extending from April 8 to October 22, and the frost-free season should be practically the same in Calloway County. This provides a growing season long enough to mature all of the crops grown in the region, although early-maturing varieties of cotton are sometimes essential to a successful cotton crop. Killing frosts have occurred as late in the spring as April 22 and as early in the fall as October 7, although such extremes are rare. Fruit trees, strawberries, and raspberries are sometimes injured by late frosts in the spring, and these injuries are probably more frequent in the valleys of the most hilly parts of the county. Late-maturing cotton and corn in the bottoms are sometimes injured by early frosts in the fall. The grazing period extends from about the first of April to the last of November.

At Murray the mean annual precipitation is 51.30 inches. According to Kincer (*11*), the annual precipitation was less than 85 percent of the average in only about 3 years of the 20-year period 1895–1914. Although the heaviest rainfall is in the winter and early spring, it is fairly well distributed throughout the year. Short droughts may occur during the summer and early fall, but severe droughts are very infrequent. In the 20-year period 1895–1914 there were about 14 periods of 30 consecutive days or more in which less than 0.25 inch of rain fell in 24 hours during the season from March 1 to September 30. Rainfall comes largely in moderate to light

rains. The average annual number of days with more than 2 inches of rainfall ranges from 2 to 3, and a like number of days can be expected each year in which the precipitation is over 1 inch in an hour. During these downpours much water is lost by surface runoff, and, if they occur when the land is largely bare and not frozen, serious damage results from soil erosion. The rainfall is usually sufficient for all of the crops of the region. During droughts crops return reduced yields but seldom fail. Excessively wet springs often delay planting, and wet seasons sometimes produce partial crop failures on the more poorly drained soils.

An average of 1 to 2 days with hail can be expected each year during the frost-free season. Although many of the hailstorms are light and very local in character, considerable damage may be done to the tobacco and corn crops in some localities while adjoining localities may escape harm. Occasional sleet or ice storms in winter may damage fruit trees and ornamental shrubs considerably. Dense fog can be expected on an average of about 10 days a year. Thunderstorms are frequent, occurring on the average about 60 days a year.

The prevailing winds are southerly or southwesterly. In the winter much of the wind is northerly or northwesterly. Wind velocities are rather low. Tornadoes and destructive windstorms are rare.

Table 1, compiled from records of the United States Weather Bureau station at Murray, gives the mean monthly, seasonal, and annual temperature and precipitation, and the monthly, seasonal, and annual precipitation for the driest and wettest years; and these climatic data are fairly representative of Calloway County.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Murray, Calloway County, Ky.*

[Elevation, 412 feet]

Month	Mean temperature	Precipitation		
		Mean	Total for the driest year (1930)	Total for the wettest year (1933)
	°F.	Inches	Inches	Inches
December	39.2	4.69	2.80	5.80
January	38.2	5.53	9.80	5.61
February	40.6	3.30	4.36	4.43
Winter	39.3	13.52	16.96	15.84
March	48.6	5.95	2.61	8.99
April	57.5	4.71	1.61	6.92
May	67.1	4.50	4.20	8.78
Spring	57.7	15.16	8.42	24.69
June	74.7	4.76	1.38	.71
July	79.4	3.33	(1)	9.40
August	77.6	3.39	.32	3.28
Summer	77.2	11.48	1.70	13.39
September	72.2	4.28	1.61	7.68
October	60.0	3.46	2.27	3.40
November	48.1	3.40	2.50	1.87
Fall	60.1	11.14	6.38	12.95
Year	58.6	51.30	33.46	66.87

[1] Trace.

AGRICULTURE

EARLY AGRICULTURE

The area that is now Calloway County apparently was not inhabited by Indians at the time of the coming of white men, and agriculture was not in progress (*3*). As elsewhere in Kentucky, the early settlers' main crop was corn for the first few years after clearing the land. Corn was well adapted to the productive newly cleared land, yielded well, was comparatively easy to grow and harvest, and served both as human food and as grain and forage for the livestock. Since most of the early settlers migrated from tobacco-growing sections, they soon began to grow tobacco as an important crop. Tobacco has continued to be the most important cash crop up to the present time. Most of the tobacco was exported to European countries by way of the Mississippi River and New Orleans. Wheat also was grown, largely for consumption in the home. A considerable number of hogs were raised, chiefly in the open woods on acorns, and pork was the principal meat. A cow or two were kept for milk, but beef cattle, sheep, and poultry were scarce. Horses and mules were raised for work animals.

PRESENT AGRICULTURE

Calloway County has been and still is almost wholly agricultural. Gradually the agriculture became somewhat more diversified; and oats, rye, cotton, sweetpotatoes, and sorgo have become minor crops. Hay and forage crops have increased in importance as the raising of livestock has become more general and the need for a legume or grass in a rotation of cultivated crops has been recognized.

Changes in the relative importance of the several sources of farm income are indicated in table 2.

TABLE 2.—*Value of certain agricultural products in Calloway County, Ky., in stated years*

Products	1909	1919	1929	1939
Crops:				
Cereals	$643,393	$1,646,840	$649,346	$647,282
Other grains and seeds	1,891	3,500	5,897	8,141
Hay and forage	131,918	319,071	222,878	176,512
Vegetables (including sweetpotatoes and potatoes)	114,096	243,329	49,038	20,848
Fruits and nuts	64,089	135,542	27,493	61,306
Farm garden vegetables for home use only (excluding potatoes and sweetpotatoes)			129,373	143,971
All other field crops (mostly tobacco and cotton)	654,315	3,732,595	1,232,672	761,409
Forest products sold			91,586	6,629
Livestock products:				
Dairy products sold	9,412	37,054	303,517	110,602
Poultry and eggs produced	142,550	277,436	273,654	188,361
Wool shorn	2,986	4,317	2,065	806
Honey and wax	1,168	3,226	1,376	869
Animals sold or slaughtered	560,530	(1)	(1)	328,835

[1] Not reported by the census in 1920 and 1930.

CROPS

The main crops grown in the county in 1879, according to the United States census, were corn, tobacco, wheat, and oats. Less important were rye, cotton, sweetpotatoes, dry peas, sorgo, and hay and forage crops. Between then and the present time the most significant changes in the crops grown are a decrease in the production of small

grains, a large increase in the production of hay and forage crops, and the increase in production of two special crops, cotton and strawberries. The most important crops grown at present are corn, tobacco, lespedeza, wheat, cotton, and redtop. Less important but nevertheless significant crops are sorgo, timothy, cowpeas, soybeans, strawberries, and sweetpotatoes. Minor crops are oats, crimson clover, red clover, sweetclover, alfalfa, and raspberries.

Table 3 gives the acreages of the principal crops of Calloway County in stated years, as compiled from United States census reports.

TABLE 3.—*Acreages of principal crops in Calloway County, Ky., in stated years*

Crops	1879	1889	1899	1909	1919	1929	1939
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Corn (harvested for grain)	35, 209	32, 698	38, 588	45, 955	43, 682	34, 986	38, 413
Oats	3, 420	4, 724	713	553	185	37	112
Wheat	8, 076	4, 330	7, 152	3, 072	5, 915	1, 498	5, 728
Rye	304	16	6	77	24	20	12
Sweetpotatoes	218	149	158	163	190	242	121
All hay	1, 096	5, 732	7, 184	12, 923	13, 270	14, 758	17, 104
Lespedeza and sweetclover						1, 394	[1] 10, 394
Timothy and clover, alone or mixed				2, 088	1, 407	3, 373	1, 665
Grains cut green			3, 001	3, 120	1, 058	192	74
Legumes cut for hay					1, 117	2, 186	1, 099
Other tame hay			4, 166	7, 682	8, 626	7, 009	3, 629
Wild grasses			17	33	1, 062	604	243
Silage and coarse forage (corn)			14	76	1, 834	1, 240	345
Tobacco	5, 035	5, 454	9, 639	10, 268	20, 285	10, 021	7, 787
Cotton	316	13				782	1, 312
Sorgo		1, 028	480	1, 336	905	498	237
Strawberries			1	1	3	23	209

[1] Only 78 acres of this is sweetclover.

Corn always has been and still is the most important crop grown in acreage, although the acreage has fluctuated somewhat, increasing gradually to a peak about 1909 and decreasing since then. It yielded an average of about 23 bushels to the acre throughout the county in 1939, which is a higher yield than that of other grains. Corn furnishes considerable forage and requires inexpensive tools. The fact that it can be stored easily and can be used directly on the farm is an advantage in areas of poor roads and considerable distances to markets.

Corn is grown on practically every farm in the county, but the proportion of farm land in corn is much higher on the soils of the first bottoms than on those of any other group. This is due to their higher natural fertility, more favorable moisture conditions, benefits from overflows, and suitable lay of the land for tillage operations. The soils of the more level uplands and second bottoms have a larger proportionate acreage in corn than the more hilly areas, largely because of better relief and more favorable conditions for the control of runoff. Except in some places on the first bottoms, however, the yields of corn, in general, are low, because of the low organic-matter content and relatively low fertility of the soils.

Corn usually follows a meadow or pasture crop, and except on the first bottoms it is rarely grown on the same land more than 2 years in succession. Some of the corn is cut, and the fodder, or stover, is used for winter feed. There are a few silos, and very little of the corn is hogged down. In favorable years a small surplus of corn is shipped out of the county. Practically all of this surplus comes from the Tennessee River and other river bottom lands.

Hay crops rank second to corn in acreage, largely as a result of the recent expansion in the production of lespedeza. This crop is by far the most important of the hay and pasture crops and is practically the only legume used for pasture. It furnishes good summer and early fall grazing, unless the season is exceptionally droughty; it is adapted to a wide variety of soils; and it grows fairly well on unlimed soils, although its growth is improved by liming. The proportion of farm land in lespedeza is from two to three times greater on the level to undulating soils of the county than on the soils of the more hilly parts. Common and Korean are the most important varieties, and some Kobe and a very small acreage of sericea lespedeza are grown. The Common variety grows wild or voluntarily on much of the land and furnishes some pasture. Korean and Kobe are more commonly used for hay because of their larger growth. A few farms produce Korean seed.

Redtop is another important pasture and hay grass. It grows wild on acid soils, does well on poorly drained soils, stands considerable drought, and has a low cost of seeding. Ordinarily, redtop is mixed with lespedeza when seeded for pasture. Some timothy is grown, either alone or mixed with redtop or lespedeza. It is a better hay crop than redtop on well-drained bottom soils, but it requires more fertile soils for satisfactory growth. Bluegrass generally does not do well on most of the soils of Calloway County, and very little is grown. Soybeans and cowpeas are other important leguminous hay crops and are grown largely on soils of the first-bottom lands and in districts where dairy cows are more numerous. In addition to the acreage grown for hay, 1,537 acres of soybeans and 551 acres of cowpeas were grown alone in 1929; comparable data in 1939 were 729 acres and 755 acres, respectively. A very small acreage of red clover, sweetclover, and alfalfa is grown, but these legumes do not grow well unless the soil has been limed. Crimson clover is infrequently grown as a winter cover and pasture crop.

Tobacco is by far the most important cash crop. The peak production of this crop, according to the census, was in 1919, when 16,051,997 pounds were harvested from 20,285 acres. Since then, however, production has greatly decreased, largely because of unfavorable prices. The importance of this crop is due to several reasons: Most farmers have had long experience in handling the crop; barns and equipment are suited to its production; it produces a large return from a small acreage; the labor supply has been plentiful; and it has a small bulk and is not perishable. This last item is a distinct advantage where the roads are bad and the farms are long distances from markets. A large acreage of land is well adapted to the growth of a good grade of fire-cured tobacco. This crop is grown to some extent in most parts of the county, but it occupies a larger acreage and furnishes a higher proportion of the income on the level and undulating uplands, where the soils have compact subsoils, are subject to very little erosion, and produce a high grade of tobacco. The erosion and moisture conditions on the more hilly soils are unfavorable, and a lighter, thinner leaf of lower quality is generally produced. The soils of the first-bottom lands produce a high yield, but the leaf is generally coarse and of lower grade. According to the 1940 census, the average yield of fire-cured tobacco for the county was 880 pounds to the acre in 1939.

Type 23 of fire-cured tobacco, also called western fire-cured, is grown almost exclusively (*5*). This is a dark, heavy-bodied type and is used in the manufacture of snuff, "black fat" (a low grade of chewing tobacco), plug wrappers, fillers, and smoking tobacco. A large part of this has been grown for export.

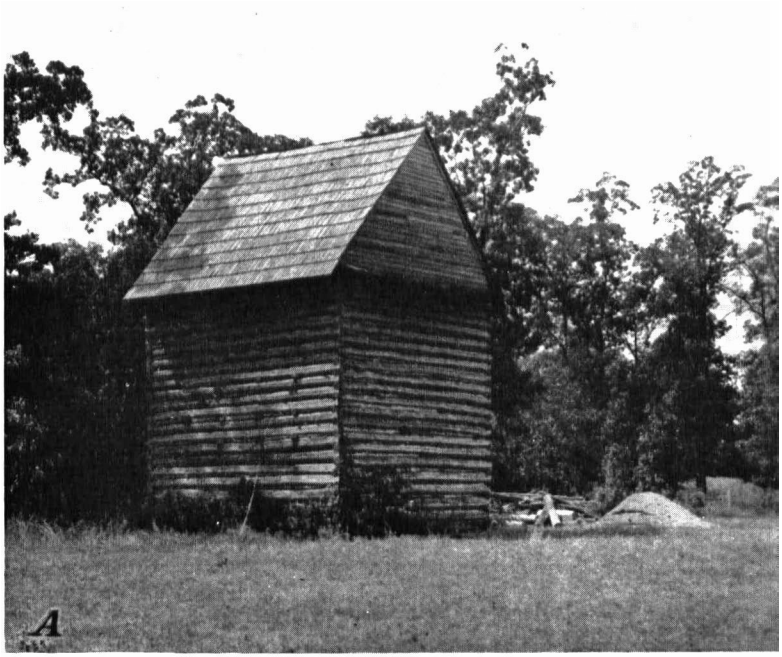
Tobacco beds are usually prepared in February or early March, preferably in a new clearing in the woods (pl. 1, *B*), and are usually sterilized by burning poles and brush on the beds. Manure and nitrate of soda are generally applied to these beds. Plants are transplanted by hand to the fields from May 1 to June 10. Land that has been in a meadow or hay crop is usually chosen for tobacco. A complete commercial fertilizer of about 3–8–6 [5] or 4–8–4 analysis is nearly always applied, either broadcast or in the hills, at the rate of 100 to 400 pounds to the acre. Manure also is generally used.

The plants are topped in August, leaving from 10 to 16 leaves, after which they are suckered two or three times. When entirely mature, usually in September, the stalks are split nearly to the ground, cut off, and hung on laths, which are suspended in the curing barn. Although many of the barns are of the old log or frame type without ventilators (pl. 1, *A*), the newer ones are equipped with ventilators so as to control better the humidity and temperature during the curing process. After the tobacco has yellowed in the barn for 3 or 4 days, slow-smoking open fires are started to hasten curing. After the thoroughly cured tobacco has become pliable by the absorption of moisture during a damp period, the leaves are stripped off, sorted into grades, and tied into hands of about six leaves each (*19*). Most of the tobacco is marketed by loose-leaf auction at Murray, although some of it is sold direct to buyers at the barn.

Cotton ranks as the second most important cash crop in the county. It has partly displaced tobacco as a cash crop in certain parts of the county during the last 15 years. The unfavorable price of tobacco has probably contributed to this trend. Cotton is grown mainly on the soils of the Tennessee River terraces, although some is grown on the lighter textured soils of the ridges and the better drained soils of the first bottoms in the more hilly areas. This crop is confined to these soils because of their greater warmth, which allows earlier germination, growth, and maturity. The average yield for the county was 0.5 of a bale to the acre in 1939, according to the United States census. About half of the cotton land is fertilized, the chief material being superphosphate applied at the rate of 100 to 250 pounds an acre. Practically all of the cotton is sold to the gin in Murray in the form of seed cotton.

Wheat is the only important cereal crop besides corn. Its acreage, however, has decreased considerably since 1879, according to the Federal census. The proportion of the farm land in wheat is higher on the soils of the smoother uplands and stream terraces than on the soils of the more rolling and rougher areas or the soils of the first bottoms. Some wheat is grown on the soils of the first bottoms, although the quality is generally poor, and it is susceptible to pests, lodging, and flood damage. The more rolling or rougher areas are less suited to wheat because of their rougher relief, greater erodibility, and smaller,

[5] Percentages, respectively, of nitrogen, phosphoric acid, and potash.



A, Log tobacco barn, one of the older types of barns for curing and smoking western fire-cured tobacco. Sawdust is commonly used as an aid in producing the necessary smoke in the curing process. *B*, Tobacco plant beds on virgin Grenada silt loam, level phase, about 2½ miles southeast of Murray. New ground is preferred for tobacco beds.

A, Terraces to help control water on Grenada silt loam and its slope phase, about half a mile northwest of Cherry. *B*, Representative farmstead on Grenada silt loam, level phase, about 2 miles northwest of New Providence. Lespedeza on Calloway silt loam in right foreground.

more irregular shaped fields. The average yield of wheat in 1939 was 12 bushels to the acre, according to the census. Wheat usually follows tobacco, corn, cotton, or soybeans in the rotation. About half of the wheatland is fertilized with 100 to 200 pounds of superphosphate to the acre. Most of the wheat is usually consumed on the farm or sold to flour mills at Murray, Lynn Grove, or nearby towns in neighboring counties. According to statements of local flour-mill operators, the county does not produce enough wheat to fill its own needs.

The production of oats has greatly decreased until now it is of very minor importance. Most of this crop is now grown for pasture or cut for hay, although a small quantity of winter oats is threshed for grain in the vicinity of Lynn Grove. Rye is not grown to any considerable extent for grain, but a small acreage is grown as a winter cover crop.

Sweetpotatoes are grown as a commercial crop on a few farms in the southern part of the county in the vicinity of Hazel, where a storage shed is available. Commercial growing of this crop is much more important in Henry County, Tenn., and marketing facilities are available in that county within hauling distances of the Hazel district. Usually only 1 to 3 acres of sweetpotatoes are grown to a farm, and most of this acreage is on the smooth, well-drained to imperfectly drained soils of the uplands. Superphosphate or a complete commercial fertilizer of about 2–8–4 or 4–8–4 analysis is commonly applied at the rate of from 200 to 400 pounds to the acre. About 71 bushels an acre was the average yield in 1939, according to the 1940 census, and yields of 150 bushels an acre are not uncommon.

An acre or less of sorgo is grown on many farms. About half of the total acreage is for sirup, and the rest is for forage. The best quality of sirup, according to growers, is from sorgo grown on the gray soils of the uplands and stream terraces. Yields of sirup averaged about 47 gallons to the acre in 1939. Most of this is for home use, although a small surplus is sold on local markets.

Strawberries have become an important cash crop on many farms in the northern part of the county in recent years. They are grown on several soils, although they do better on well-drained soils of good organic-matter content. Only a part of the growers use commercial fertilizer, but stable manure is commonly applied. Most of the strawberries are shipped by motortruck to Benton or Paducah, from which points they are shipped to northern markets by growers' shipping associations. Yields vary greatly, the average being about 52 crates to the acre. The more successful growers produce from 100 to 150 crates an acre, and yields of over 200 crates are not uncommon. Red raspberries are grown on a few farms in the strawberry-growing district and are marketed in the same way as strawberries.

Only a very small acreage of other fruits and vegetables is grown on a commercial scale. A few acres of late tomatoes are grown for local markets, and a few acres of cabbage are grown and shipped by motortruck to outside markets. A few farmers sell a surplus of turnip roots and greens, potatoes, radishes, corn on the cob, beans, peas, and blackberries to the local markets. A small acreage of melons is grown commercially, especially on the sandy soils. Most farms have a vegetable garden.

Most of the farms have a few apple and peach trees, and there are a few pear, cherry, and plum trees. The 1940 census reported 20,329

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apple trees, 17,631 peach trees, 1,425 pear trees, 751 plum trees, and 1,962 cherry trees in 1939. In general, the number of fruit trees has declined since 1879. There were 2,602 grapevines in 1939.

LIVESTOCK

Table 4 gives the number of important classes of livestock on the farms in the stated years, as compiled from the United States census reports.

TABLE 4.—*Number of livestock on farms in Calloway County, Ky., in stated years*

Livestock	1920 [1]	1930 [2]	1940 [3]	Livestock	1920 [1]	1930 [2]	1940 [3]
Horses	4,633	2,488	2,221	Swine	10,144	5,685	7,737
Mules	5,682	4,072	4,024	Chickens	120,314	84,025	96,210
Cattle	8,851	11,003	8,384	Other poultry	5,162	----------	[4] 595
Sheep	1,917	1,560	635	Bees (hives)	1,115	674	530
Goats	422	200	217				

[1] Animals of all ages on Jan. 1, 1920.
[2] Animals of all ages on Apr. 1, 1930, excluding chickens under 3 months of age.
[3] Animals of all ages on Apr. 1, 1940, excluding horses, mules, and cattle under 3 months, pigs, goats, and chickens under 4 months, and sheep under 6 months. Comparable numbers in 1930 were 2,457 horses, 4,053 mules, 9,120 cattle, and 919 sheep. There were 3,678 hogs over 3 months of age in 1930.
[4] Turkeys, ducks, geese, and guinea fowls.

About two-thirds of the work animals are mules, and one-third are horses. There was an average of two work animals to the farm in 1940. The number has decreased considerably in the last two decades, owing in part to the decrease in the number of farms and the increase in the number of tractors. Most of the work animals are medium to small, and, especially in the hilly areas, many of them are inferior in quality. There are practically no purebred horses in the county. A fairly large number of young mules are being raised, although not enough to supply the demand, and good mules bring a high price at present. Many of them are sold or traded on "mule day," held monthly in Murray.

The number of cattle decreased slightly from 1920 to 1940. Dairying is the most important livestock enterprise at present. It is not highly specialized, and most farms have two or three cows and sell a small quantity of cream. Only a few have more than five or six cows and sell largely whole milk. A few of these larger dairies retail milk in Murray, and the milk from the others goes chiefly to the milk-products plant in Murray. This plant has a number of truck routes along the better roads in all parts of the county, over which milk and cream are hauled to the plant. In general, the farms situated on the truck routes sell surplus whole milk, whereas the farms located off the truck routes sell surplus cream. Several other cream-buying stations are scattered over the county, and a small quantity of cream is shipped to Evansville, Ind., and Mayfield, Ky. Practically all of the dairy cows are Jerseys.

In 1940 there was an average of slightly less than three hogs to a farm. The majority of farms only produce enough for their home supply of meat. A few farms on the Tennessee River terraces and bottoms feed a number of hogs and derive a considerable part of their income from the sale of them. They are shipped, along with veal calves, cutter and canner cows, and a few beef cattle, by local buyers to East St. Louis. Practically none of the hogs are purebred. Grades

of Duroc-Jersey, Poland China, and Chester White breeds predominate.

In 1940 there was an average of about 35 chickens to the farm. Very few farms specialize in chickens, although practically every farm raises some for home use, and a surplus of eggs and chickens is sold to the local markets. There is a hatchery in Murray.

Other poultry, beef cattle, sheep, goats, and bees are of minor importance.

FERTILIZERS AND FEED

According to the United States census, the amount expended for fertilizers was $53,283 in 1939, when 2,327 farms, or 76.5 percent of all farms, spent an average of $22.90. This was slightly more than the amount of $45,823 expended in 1919. The greatest increase in the amount of fertilizer used was during the 10-year period from 1909 to 1919. This was due partly to the greatly increased tobacco acreage during those years.

Both complete and unmixed fertilizers are used. Practically all of the complete fertilizer is factory mixed. Several years ago many farmers mixed their fertilizer on the farm, but this practice has been discontinued. A large proportion of the total amount of fertilizer is used for tobacco, and a complete fertilizer is usually used for this crop. A 3–8–6 mixture is perhaps the most popular, although 2–10–4, 2–8–4, 4–10–6 and other mixtures are often used. Nitrate of soda is sometimes used as a top dressing for tobacco and is commonly used for the plant beds. Superphosphate is the chief fertilizer used for wheat, corn, and cotton. Lime is applied for alfalfa, sweetclover, and red clover. The quantity of lime used has greatly increased since 1935.

Feed represents a fairly large item of farm expense. In 1939 $60,953 was spent for this purpose on 1,570 farms, or 51.6 percent of the total, an average of $38.82 for the farms reporting. Most of this feed was purchased for dairy cattle, chickens, and hogs.

LABOR

Less was spent for farm wages in 1929 than in 1909. In 1909, according to the census, $28,787 was spent for labor on farms, and in 1929 only $24,347 was spent. In 1939, however, the amount spent for this purpose increased to $48,620. The payment of wages was reported in the latter year by 595 farms, or 19.6 percent of all farms, which is an average of $81.71 for the farms reporting. Local farm labor is fairly plentiful at present. It consists almost wholly of local whites, although a few Negroes are employed in the vicinity of Murray and Hamlin. For the tobacco, corn, wheat, and hay crops it is customary for neighbors to exchange work with one another. The labor supply has been plentiful for picking strawberries, women and children being largely employed. Considerable labor is hired for picking cotton.

SIZE, VALUE, AND TENURE OF FARMS

With the increase of population the number of farms increased from 1,976 in 1880 to 3,040 in 1940 and the average size of farms diminished from 102.5 acres to 75.6 acres. The maximum number of farms was

reported in the 1920 census, when 4,293 farms were reported, having an average size of 56.6 acres. During the period 1880–1940 the total area of farm land increased from 202,552 acres to 229,906 acres, or from 76.8 to 88.3 percent of the total area of the county. The 1920 census reported a maximum of 92.2 percent of the total area of the county in farms. Thus, it appears that the increase in the number of farms is due to subdivision of previously existing farms, with an accompanying reduction in size of the individual farms, as well as to expansion of the total farm acreage. The small size of farms is made profitable by the importance of the tobacco crop, which produces a high cash return per acre and demands a large amount of family labor.

Improved land expanded from 79,029 acres in 1880 to 153,136 acres in 1940, or from 39 to 67 percent of the farm land, including cropland and plowable pasture. However, during the 60-year period the area of improved land per farm has increased only from 40 to 50.4 acres, with a minimum of 38 acres reported in 1920.

The average value of all property per farm in 1880 was $1,052. This value remained about stationary until 1900; then it rose to $4,246 in 1920. The 1930 census gives an average value of all property per farm of $2,702, 55.3 percent of which was in land, 25.9 percent in buildings, 4.6 percent in implements and machinery, and 14.2 percent in domestic animals. Since then the value has increased, and the 1940 census reports an average value of land and buildings alone as $2,351 a farm, or $31.08 an acre, as compared with $2,194 a farm and $30.38 an acre in 1930.

In 1940, 70.3 percent of the farms of the county were operated by owners and 29.7 percent by tenants. The percentage of tenancy has increased only slightly since 1880, when it was 24 percent.

SOIL SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road or railroad cuts, gullies, ditches, pits, and other excavations, are studied. Each excavation exposes a series of distinct soil layers or horizons, called collectively the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, is studied in detail, and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The content of lime in the soil is determined by simple tests. The drainage, both internal and external, and other external features, such as stoniness and the relief or lay of the land, are taken into consideration, and the interrelation of the soil and vegetation is studied.

The soils are classified according to their characteristics, both internal and external, special emphasis being given to the features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. On the bases of these characteristics, soils are grouped into classification units, the principal three of which are (1) series, (2) type, and (3) phase. Some areas of land, such as riverwash, that have no true soil, are called (4) miscellaneous land types.

The most important of these units is the series, which includes soils having the same genetic horizons, similar in their important characteristics and arrangement in the soil profile, and developed from one type of parent material. Thus, the series includes soils having essentially the same color, structure, and other important internal characteristics, the same natural drainage conditions, and the same range in relief. The texture of the upper part of the soil, including that commonly plowed, may differ within a series. The soil series are given names of places or geographic features near which they were first found. Grenada, Lexington, and Huntington are names of important soil series in this county.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Lexington silt loam and Lexington loam are soil types within the Lexington series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping, and because of its specific character it is usually the soil unit to which agronomic data are definitely related.

A phase of a soil type is recognized for the separation, within a type, of soils differing in some minor soil characteristic that may, nevertheless, have an important practical significance. Differences in relief, stoniness, and degree of accelerated erosion are frequently shown as phases. For example, within the normal range of relief for a soil type, certain parts may be adapted to the use of machinery and the growth of cultivated crops and other parts may not. Even though there may be no important difference in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, there may be important differences in respect to the growth of cultivated crops (*10*). In such an instance the more sloping parts of the soil type may be segregated on the map as a sloping or hilly phase, as, for example, Grenada silt loam, slope phase.

The term "texture" refers to the relative amounts of clay, silt, and various grades of sand making up the soil mass. Light-textured soils contain much of the coarser separates (sand), and heavy-textured soils contain much clay. Structure refers to the natural arrangement of the soil material into aggregates, or structural particles, or masses. "Consistence" is a term that has come into rather recent use in this connection and refers to such conditions as friability, plasticity, stickiness, hardness, compactness, toughness, and cementation. Permeability and perviousness connote the ease with which water, air, and roots penetrate the soil. The term "surface soil" ordinarily refers to the lighter textured surface layer, which usually ranges between 5 and 10 inches in thickness. The layer just below the surface soil, which is generally heavier textured, is called the subsoil. In this county its thickness ranges from about 15 to 30 inches. The substratum is beneath the subsoil and is characteristically splotched or mottled with two or more colors. In a practical sense, the degree of acidity may be thought of as the degree of poverty in lime (available calcium). An acid soil is low in relative content of lime, a neutral soil is about me-

dium, and an alkaline soil is high. The term reaction [6] refers to the condition of the soil as regards degree of acidity.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types, in relation to roads, houses, streams, lakes, and other local cultural and natural features of the landscape. To accompany the map he prepares a report describing the soils, agriculture, and other significant natural and cultural features and showing their significant relationships.

SOILS

The soils of Calloway County in most respects are similar to those in the adjoining Marshall and Graves Counties, Ky., and Henry County, Tenn. The soils are variable in color, texture, consistence, nature of parent material, relief, natural fertility, and in conditions of erosion, moisture relations, stoniness, and susceptibility to flooding, all of which are important in determining the productivity, workability, and conservability.

The soils have developed in a relatively warm climate of moderately high rainfall. This has allowed leaching to take place more rapidly and more nearly continuously than in a cooler or drier climate, but it has not been so rapid as in the warmer, more humid climate farther south. Although the first white settlers found large areas of the more level parts of the county covered partly with a grass vegetation and largely treeless, it is very likely that this condition had existed for only a relatively short period of time and that all of the county was originally heavily timbered (*4*). Because of these conditions only a relatively small quantity of organic matter had accumulated in the soils, and much of this soon disappeared under heavy cropping. Except for a thin surface layer, 1 inch or less in thickness, in which organic matter has accumulated in the undisturbed forests, the soils are predominantly light in color and moderately low in organic matter and nitrogen. They are also relatively low in fertility. The reaction of the soils ranges from medium to very strongly acid, except that a few of the soils in the first bottoms are medium acid to neutral.

The color of the soils is very closely related to the slope and drainage conditions, especially the natural or original drainage conditions under which the soil was developed. Naturally poorly drained soils have gray or gray mottled surface soils and subsoils; imperfectly drained soils have brown or yellowish-brown subsurface layers or upper subsoil layers and gray mottled lower subsoil layers; and well-drained soils have brown, yellowish-brown, or reddish-brown subsoils and no gray mottlings. In most of the soils of the uplands and stream terraces important consistence and structure characteristics are associated with

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[6] The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality; higher values, alkalinity; and lower values, acidity. Terms that refer to reaction and are commonly used in this report are defined in the Soil Survey Manual (*9, p. 86*) as follows:

	pH value
Extremely acid	<4.5
Very strongly acid	4.5–5.0
Strongly acid	5.1–5.5
Medium acid	5.6–6.0
Slightly acid	6.1–6.5
Neutral	6.6–7.3
Mildly alkaline	7.4–8.0
Strongly alkaline	8.1–9.0
Very strongly alkaline	>9.0

these three groups. The naturally poorly drained soils of the uplands and terraces have a gray-mottled, dense, compact clay lower subsoil layer, commonly called a pan or claypan. This layer greatly impedes the movement of water within the soil.

The imperfectly drained soils have a heavy, gray-mottled lower subsoil layer that is not so dense and compact as that in the poorly drained soils. The well-drained soils do not have this development of a heavy, gray-mottled lower subsoil layer; their subsoils are less compact and allow fairly good penetration of water and roots. The gray-mottled, more or less impermeable lower subsoil layer is present in some state of development in about 52 percent of the area of the county, and it generally occurs in those soils of the uplands and stream terraces having a relief or lay of the land more suitable for the growing of cultivated crops and least conducive to erosion.

The textures of the soils of Calloway County range from a loamy sand to a silty clay loam. Accelerated erosion and the character of parent materials are important factors. These parent materials can be divided into four groups: Loessial materials, unconsolidated Coastal Plain sandy and gravelly materials, highly weathered cherty limestone, and Tennessee River alluvium. Most of the uplands have a surface covering of materials derived from what appears to be loess, a silty, wind-blown deposit. This covering of loessial materials is about 8 feet thick on the smoother ridges of the uplands in the western part of the county and from 2 to 4 feet thick on the ridges in the eastern part. On the slopes this covering ranges from a few feet to only a few inches in depth or is entirely lacking. Soils with a silt loam texture have been produced from these loessial materials, and this texture is the dominant one in the county, occupying approximately 75 percent of the area.

The surface layer of loessial materials is underlain in most of the county by unconsolidated sandy and gravelly Coastal Plain material. Where the covering of loessial materials is very shallow, or where the Coastal Plain materials outcrop on the slopes, loam, fine sandy loam, loamy sand, gravelly loam, and gravelly loamy sand textures have been developed. Ferruginous cemented conglomerate and sandstone rocks are common on the surface, in the soil, or in the substratum in these areas. Similar textures also occur in the first bottoms adjacent to these areas.

These Coastal Plain materials are underlain by cherty limestone, which outcrops to influence the soils only in a strip of very hilly country, ranging from 1 to 4 miles in width and bordering the Tennessee River bottom and terraces. In this area the original cherty limestone rock has been highly weathered and leached of its lime to a depth of many feet, leaving a mass of angular, highly resistant chert fragments, commonly called flint rocks. Where this occurs near the surface, loam and cherty loam textures have resulted.

The Tennessee River alluvium has been washed largely from limestone areas, although materials from other sources are mixed with it. This condition has resulted in a variety of soils from fine sandy loam to silty clay loam. The most fertile soils of the county have developed from this Tennessee River alluvium.

The slope or lay of the land, erodibility, and degree of erosion are important factors in determining the use to which these soils are being put. The soils of the uplands that have a slope of more than 2 percent

and lack a sufficient covering of vegetation are more or less erodible. Susceptibility to and degree of erosion vary with the slope, the kind of soil, the amount, distribution, and intensity of the rainfall, and the method of management practiced, including kind of crops grown, method of tillage, and length of time the land has been left bare or nearly so.

Approximately 174 square miles, or 42 percent of the area of the county, including 81 square miles of bottom land, has a nearly level surface, that is, a slope of 0 to 2 percent; this land is susceptible to little or no erosion. About 94 square miles, or 23 percent of the area of the county, has a gently undulating relief, the slope ranging from 2 to 5 percent. This land is susceptible to harmful sheet erosion and slight gully erosion if unprotected by a vegetative cover or other means. About 9 percent of this undulating land remains in forest; 9 percent has lost from one-third to two-thirds of the original surface soil, which once was 7 inches thick, by sheet erosion; 6 percent has lost two-thirds or more of this surface layer by sheet erosion; and 3 percent is gullied. Approximately 39 square miles, or 10 percent of the area of the county, has a gently rolling relief, that is, a slope of 5 to 10 percent. This gently rolling land is subject to severe sheet and gully erosion if unprotected by a sufficient vegetative cover. About 18 percent of this land remains in forest, 5 percent has lost two-thirds or more of the original 7-inch surface soil by sheet erosion, 7 percent is moderately gullied, and 5 percent is severely or very severely gullied. The rest of this land, where it has been cultivated for a few years under the usual conditions of management, has lost from one-third to two-thirds of the surface soil by sheet erosion. Areas that are more eroded than the soil or type as a whole are generally indicated by symbols, representing moderate sheet erosion (S), severe sheet erosion (SS), moderate gully erosion (G), and severe gully erosion (GG), or moderate sheet and gully erosion (MG), as the case may be.

About 42 square miles, or about 10 percent of the area of the county, has a strongly rolling relief, that is, a slope of about 10 to 15 percent. It is estimated that 30 percent of this land remains in forests, 13 percent is moderately gullied, and 8 percent is severely or very severely gullied. The rest of the strongly rolling land, where it has been cultivated for a few years under the usual conditions, has lost two-thirds or more of the original 7-inch surface soil by sheet erosion. About 63.5 square miles, or 15 percent of the area of the county, has a steeply sloping or hilly relief, that is, a slope of 15 percent or more. It is estimated that 78 percent of this land is in forests, 5 percent is moderately gullied, and 2 percent is severely or very severely gullied. The rest of the steeply sloping land has undergone as much sheet erosion as, or more than, the strongly rolling land.

The soil classification used in the Calloway County soil survey is comprised of 48 soil units representing 23 series. Of these 48 units, 29 are soil types, 17 are soil type phases, and 2 are miscellaneous land types. The types were classified chiefly on the basis of internal characteristics of the soils, whereas the phases were classified largely on external features such as relief, erosion conditions, and susceptibility to flooding.

Each soil type or phase has individuality, and its respective relationships to agriculture are determined by these individual characteristics. In order to describe these relationships better, the soils are grouped

in this section largely on the basis of natural features into four major groups, as follows: (1) Brown soils of the smoother uplands and stream terraces; (2) gray soils of the uplands and stream terraces; (3) soils of the rougher uplands; and (4) soils of the alluvial first bottoms. The soils of the alluvial first bottoms are further subdivided into well-drained soils, imperfectly drained soils, and poorly drained soils.

In the following pages of this section these soil types and phases are described in detail and their agricultural relationships are discussed. Their areal extent, location, and distribution are shown on the accompanying soil map, and their acreage and proportionate extent in the county are shown in table 5.

TABLE 5.—*Acreage and proportionate extent of the soils mapped in Calloway County, Ky.*

Soil type	Acres	Percent	Soil type	Acres	Percent
Grenada silt loam	48,512	18.4	Rough gullied land (Brandon soil material)	2,496	1.0
Grenada silt loam, level phase	31,232	11.9	Brandon gravelly loam	1,536	.6
Grenada silt loam, slope phase	6,720	2.6	Brandon gravelly loam, steep phase	16,064	6.1
Providence silt loam	12,032	4.6	Brandon gravelly loam, smooth phase	768	.3
Memphis silt loam	576	.2	Atwood fine sandy loam	640	.2
Lexington silt loam, smooth phase	8,320	3.2	Bodine loam	3,840	1.5
Lexington silt loam, slope phase	1,792	.7	Bodine cherty loam	4,480	1.7
Lexington loam, smooth phase	832	.3	Vicksburg silt loam	2,944	1.1
Brandon silt loam, smooth phase	1,216	.5	Shannon loam	4,928	1.9
Brandon silt loam, slope phase	1,856	.7	Shannon loam, colluvial phase	2,816	1.1
Bodine loam, smooth phase	1,344	.5	Shannon cherty loam	1,856	.7
Olivier silt loam	2,624	1.0	Huntington silt loam	640	.2
Olivier silt loam, slope phase	1,664	.6	Egam silty clay loam	1,600	.6
Sciotoville silt loam	2,176	.8	Collins silt loam	10,048	3.8
Sciotoville silt loam, slope phase	1,216	.5	Hymon loam	7,488	2.8
Sciotoville very fine sandy loam	320	.1	Hymon loam, colluvial phase	2,816	1.1
Wheeling silt loam	384	.1	Waverly silt loam	9,280	3.5
Henry silt loam	2,048	.8	Beechy loam	5,632	2.1
Calloway silt loam	18,560	7.0	Beechy loam, sanded phase	448	.2
Calhoun silt loam	2,048	.8	Melvin silt loam	1,088	.4
Ginat silt loam	1,600	.6	Melvin silty clay loam	576	.2
Lexington silt loam	3,200	1.2	Riverwash	64	(1)
Lexington loam	1,664	.6			
Lexington loam, steep phase	2,432	.9			
Brandon silt loam	17,408	6.6			
Brandon silt loam, steep phase	9,856	3.7	Total	263,680	100.0

[1] Less than 0.1 percent.

BROWN SOILS OF THE SMOOTHER UPLANDS AND STREAM TERRACES

The brown soils of the smoother uplands and stream terraces are the most important agriculturally and comprise 47 percent of the area of the county. They occur on the nearly level to gently rolling uplands and on the stream terraces and are principally in the western two-thirds of the county. They occupy slopes ranging from 0 to 10 percent.

The soils of this group have brown, light-brown, or grayish-brown surface soils and yellowish-brown upper subsoil layers. The texture of the surface soil is predominantly silt loam, although some loams are included. Tilth conditions of the surface soil range from fair to good, and surface drainage ranges from slow to good. The soils are relatively low in organic matter and nitrogen content and are medium to very strongly acid in reaction.

The system of agriculture practiced on these soils is based largely on the production of tobacco and corn. Tobacco is the main cash crop and the chief source of income, although corn is the most important crop in acreage. The soils are about average in fertility compared with other soils in the county, respond well to good treatment, and produce fairly good yields of most of the crops of the region under good systems of farm and land management. The parts of the county in which these soils predominate support the most prosperous farming communities.

The soils comprising this group belong to the Grenada, Providence, Memphis, Lexington, Brandon, Bodine, Olivier, Sciotoville, and Wheeling series. The Grenada and Memphis soils have been formed wholly from loessial materials. The Grenada soils differ from the Memphis soils in having a gray mottled compact lower subsoil that is moderately impermeable to water. The Providence, Lexington, and Brandon soils have developed from a shallow covering of loessial materials over Coastal Plain materials. The Providence soils are similar to the Grenada soils in having gray mottled compact lower subsoils; whereas the Lexington and Brandon soils have yellowish-brown or reddish yellow-brown subsoils but no gray mottlings. The Coastal Plain material in the Lexington soils consists of sands, clayey sands, or sandy clays; in the Brandon soils it consists of stratified gravelly materials. The Bodine soils have developed from a shallow covering of loessial materials over a highly weathered cherty limestone. All the above soils occur on the uplands except the Olivier, Wheeling, and Sciotoville. The Olivier soils occur on terraces of the creeks and smaller rivers and have been formed largely from loessial materials. Members of the Wheeling and Sciotoville series occupy terraces of the Tennessee River and have been developed largely from alluvium deposited by that river. The Olivier and Sciotoville soils have profiles similar to those of the Grenada soils; the Wheeling soils have a profile more similar to that of the Memphis soils.

Grenada silt loam.—Grenada silt loam is the most extensive soil in the county, occupying about 76 square miles in the smooth uplands throughout the western two-thirds of the county.

Under conditions of cultivation the surface soil consists of light-brown or slightly grayish-brown mellow smooth silt loam. It appears grayer when dry. At a depth of about 7 inches the surface soil is underlain by yellowish-brown friable silt loam that breaks into small, soft to firm, rounded to subangular particles. At a depth of about 20 inches this grades into pale-yellow or brownish-yellow heavy silt loam mottled with gray. At a depth of 24 to 30 inches this grades rather abruptly into gray silty clay mottled with yellow, rusty brown, and grayish brown. This lower subsoil layer is commonly called a siltpan or hardpan. It is moderately to very compact and dense, is sticky and plastic when wet, and breaks into large hard subangular particles. The upper part of this horizon has a coating of very light-gray floury or silty material in all of the cracks and channels and on all of the soil particles. This light-gray material is more evident when the soil is dry. This lower subsoil layer is most compact and dense in the upper 10 to 15 inches; with increase in depth it becomes less gray and more yellow, more massive, and lighter textured. Below a depth of about 45 inches the material is pale brownish-yellow moderately

compact massive light silty clay loam or heavy silt loam with some gray mottling. This is underlain by reddish-brown or red unconsolidated sandy, gravelly, or sandy clay material at a depth of 4 to 10 feet. The depth to this material is greatest in the western part of the county and is less toward the eastern part. Small areas are included in which the gravelly material occurs at a depth of less than 3½ feet.

Rusty-brown and dark soft to semihard concretions are present throughout. They are smaller and less numerous in the upper part and larger and more numerous in the layer just above the compact lower subsoil layer. When these concretions become consolidated into semihard or hard pellets they are commonly known as buckshot.

In undisturbed forests the surface one-half inch is dark, owing to the presence of considerable organic matter in varying stages of decomposition. Below this the soil is grayish brown, grading at a depth of 2 to 4 inches into light-brown material, which extends to a depth of about 7 inches. The rest of the profile is similar to that in cultivated fields. Tillage mixes this more highly organic material with the rest of the soil to plow depth, and the organic-matter content is soon depleted by continuous cropping unless measures are taken to replenish the supply.

The reaction is strongly to very strongly acid, except in the thin dark surface layer in virgin areas and in the substratum below a depth of 7 to 8 feet, which are slightly acid to neutral in places. This soil is developed from loess or from loesslike materials. The surface layer is uniformly smooth and free from grit or sand of appreciable size, and there are no stones.

This soil has a gently undulating surface, the slope ranging from 2 to 5 percent. External or surface drainage is good. The upper part of the soil allows good percolation of water, but the compact lower subsoil layer retards the movement of water. Even after periods of heavy rainfall, when the soil above the compact layer is very wet or nearly saturated, the compact layer is often dry below a few inches from its top. During many wet seasons water runs out from the subsoil just above the compact layer in vertical cuts along roadsides. Such slow internal drainage reduces the storage capacity for water and causes greater surface runoff in wet seasons. Because of this reduced water-holding capacity, crops are more easily injured by droughts on this soil than on one having a more favorable subsoil. Roots readily penetrate the soil above the compact layer, but few extend into it, and these generally run vertically in cracks.

This soil is susceptible to harmful sheet erosion and slight gully erosion where the unprotected land is tilled. Several factors combine to make this an erodible soil. Surface runoff is increased by the presence of the compact subsoil layer, as stated above. The low organic-matter content and lime content cause poor granulation in the surface soil and decrease the rate of and capacity for absorption. The poor granulation and the uniformly fine texture allow the soil particles to be easily washed away. As the surface soil gradually washes away, these conditions are aggravated and erosion is accelerated.

The extent of accelerated erosion is associated directly with the slope and management practiced during the entire period of cropping. The extent of erosion is shown on the map by the various symbols where

the sheet or gully erosion is greater than normal for the type or phase. Under average or usual management, one-third or less of the original 6- or 7-inch surface has been removed by sheet erosion. Areas from which one-third to two-thirds of the surface soil has been removed are designated by symbols representing moderate sheet erosion. Areas from which more than two-thirds of the surface soil has been removed are designated by symbols representing severe sheet erosion. Moderately and severely gullied conditions are likewise represented by appropriate symbols. It is estimated that 8 percent of this soil has lost from one-third to two-thirds of its surface soil by sheet erosion, 6 percent has lost two-thirds or more, and 3 percent is gullied.

According to the available information, this soil was originally timbered with an oak-hickory forest, although the "barrens" probably extended over part of it, especially in the western part of the county. The present forest growth consists largely of red, southern red, white, black, and post oaks and hickory.

This soil is of great importance agriculturally, because of its large area, fairly good relief, fairly good workability, and its good adaptation for the production of a high quality western fire-cured tobacco. Its natural productivity is only moderate, but it responds well to good management. Together with the soil of the level phase, it supports the most prosperous agriculture in the county. It is estimated that 9 percent of this soil is in forest, 17 percent in corn, 11 percent in lespedeza, 7 percent in tobacco, 4 percent in wheat, 2 percent in redtop and timothy, and 46 percent in idle open fields; and the rest is in farmsteads and minor crops.

Although this soil is not naturally well adapted to the production of corn, it does respond well to good management. Under the usual farm practices, where no lime, fertilizer, or manure is used, yields of corn average about 18 bushels an acre. After lime, phosphate, and some manure are applied and where corn is grown in a rotation containing a legume, it yields an average of about 35 bushels and often as much as 45 bushels (*16*). Only a small proportion of the land is fertilized for corn, and little of it has been limed.

Western fire-cured tobacco does very well on this soil, and a high grade is produced if properly grown and cured. Tobacco usually follows a hay or pasture crop, and it is nearly always fertilized with 100 to 250 pounds of a complete fertilizer, such as 3–8–6 or 4–8–4. Under these conditions the average yield is about 850 pounds an acre. Where the soil is fertilized and manured rather heavily, the more successful growers get from 1,000 to 1,200 pounds to the acre.

Without lime or fertilizer, wheat yields average about 6 bushels an acre; but after an application of lime and phosphate and where the crop is grown in a rotation with a legume, yields average about 13 bushels. Lespedeza is fairly well adapted to this soil, and yields average about 1,400 pounds an acre without lime or phosphate, and about 2,600 pounds with lime and phosphate. Redtop succeeds well, both as hay and in pasture mixtures, and yields of hay average about 1,000 pounds without treatment. Red clover, alfalfa, and sweetclover generally fail on this soil unless it has been limed. Where lime and phosphate fertilizer are used, however, good yields of these legumes have been obtained. Some strawberries are grown and succeed fairly well where the land is fertilized and some organic matter has been added. Most of the sweetpotatoes destined for market are grown

on this soil and the soil of the level phase which produce from 75 to 125 bushels an acre when fertilized. Little cotton is grown, and yields average about 350 pounds of seed cotton when the land is fertilized lightly or not at all.

Under a good system of management for this soil, it is important that rotations include legumes and grasses and winter cover crops after all clean-cultivated crops and that cultural practices include incorporation of organic matter, use of lime and phosphate fertilizer, and use of terraces (pl. 2, *A*) or other water-control devices on the greater slopes (*1*).

Grenada silt loam, level phase.—This phase differs from the typical soil chiefly in that it has a level or nearly level surface and a slope of 0 to 2 percent. Other important differences are that the yellowish-brown layer just below the surface is slightly less bright in color and slightly thinner, the compact lower subsoil layer is slightly heavier and more compact and dense, and the surface soil is slightly deeper in cultivated fields, as compared with those features of the typical soil. Otherwise, the profile is very similar to that of the latter soil.

This soil is susceptible to little or no erosion. External drainage is slow to good, and internal drainage is slow to poor, as in Grenada silt loam. According to available information, much of this phase was included in the "barrens" at the time white men first settled in the county. Forest later encroached on much of the land, however, and it is likely that all the land was covered with timber originally.

Approximately 49 square miles of this soil is mapped. It occurs in large areas throughout most of the western two-thirds of the county, where it is closely associated with Grenada silt loam and Calloway silt loam (pl. 2, *B*).

Agriculturally, this soil is probably the most important of any in the county, because of its large area, very favorable relief, lack of harmful erosion, good workability, and adaptation to the production of high-grade western fire-cured tobacco (pl. 3, *A*). It is the best soil in the county for this type of tobacco. Together with typical Grenada silt loam, it supports the most prosperous agriculture in the county at present. It is used in much the same way as the typical soil. Because of the smaller hazard from excess runoff, however, less of it is idle. It is estimated that 4 percent of this soil remains in forest, 25 percent is in corn, 18 percent in lespedeza, 8 percent in tobacco, 5 percent in wheat, 2 percent in redtop, and 34 percent in idle open fields. Because of less erosion and a consequent deeper surface soil, this phase is slightly higher in fertility and productivity than Grenada silt loam. Yields of most crops average from 10 to 15 percent higher than on the latter soil. Recommendations for the management of this soil are similar to those made for Grenada silt loam, except that terraces or other mechanical devices for the control of water are not necessary.

Grenada silt loam, slope phase.—This soil of the slope phase is similar in significant profile characteristics and parent material to typical Grenada silt loam. It differs from the latter soil in having a gently rolling relief, the slope ranging from 5 to 10 percent, with resultant differences in erosion, moisture conditions, and depth of the surface soil. Generally the yellowish-brown layer is slightly brighter colored, the depth to the compact subsoil layer is slightly less, and this

lower subsoil layer is thinner, less dense and compact, and slightly more permeable to water than in typical Grenada silt loam. The depth to reddish sandy, gravelly, or sandy clay material also is less than in that soil, generally about 4 or 5 feet.

External drainage is good to free, and internal drainage is slow because of the compact lower subsoil. Where unprotected by a sufficient vegetative cover, this soil is subject to severe sheet and gully erosion. Under the usual conditions of cultivation, from one-third to two-thirds of the original 6-inch surface soil has been lost by sheet erosion. Areas from which more than two-thirds of the surface soil has been removed are designated by symbols representing moderate sheet erosion. Gully symbols are used for Grenada silt loam. It is estimated that about 6 percent of this soil has lost more than two-thirds of its original surface layer by erosion, 7 percent of it is moderately gullied, and 5 percent is severely or very severely gullied.

The comparative thinness of the surface soil adversely affects crop productivity in several ways. A large part of the original content of organic matter and nitrogen, which was already low, has been lost. Part of the yellowish-brown layer beneath the surface is mixed with the surface in plowing, increasing the tendency to bake or to become hard and crusted on top during dry weather. This condition reduces absorption of rainfall and speeds up runoff; consequently more injury results to crops during droughts.

This soil occupies comparatively small areas scattered throughout the gently rolling parts of the county, especially in the western half, in association with areas of Grenada silt loam, Providence silt loam, Brandon silt loam, and Lexington silt loam.

Approximately 14 percent of this soil remains in forest, 9 percent is in corn, 9 percent in lespedeza, 3 percent in wheat, 1 percent in tobacco, and 54 percent in idle open fields. Crop yields average about 25 percent less than on Grenada silt loam. On the severely eroded areas, yields are very low and crops often fail in droughty seasons. Practically all of the severely eroded areas are in idle open land.

This soil is not especially well suited to the growing of clean-cultivated crops, and, if such crops are grown, special precautions must be taken to check the erosion. Terraces (pl. 2, *A*) or other mechanical devices for control of runoff are necessary, and contour farming is advisable. It is important that winter cover crops be used after all cultivated crops. Other recommendations for the use of Grenada silt loam also apply to this soil.

Providence silt loam.—Providence silt loam is very similar in profile characteristics to Grenada silt loam, slope phase, except that the lower part of the soil contains varying quantities of gravelly or sandy materials and the compact lower subsoil layer is not so compact and impermeable to water.

In virgin areas the surface half inch of Providence silt loam consists of dark grayish-brown silt loam containing much organic matter in various stages of decomposition. It is underlain by 6 inches of grayish-brown mellow silt loam, which overlies yellowish-brown friable heavy silt loam. This grades into all dull yellowish-brown, rusty-brown, and gray mottled silty clay loam or clay loam that is somewhat friable but slightly compact. This is underlain at a depth of

24 to 32 inches by moderately compact and dense clay, sandy clay, or heavy clay loam that is gray mottled with yellow and rusty brown. It breaks into firm to hard subangular particles and contains varying quantities of sand grains, gravel pebbles, or both. Below a depth of 36 to 45 inches it is less compact, less dense, and less gray, grading with increase in depth into stratified beds of gravel or sandy materials, generally gravel. In most places these gravelly or sandy materials are unconsolidated, but in some places they contain layers or lenses that have been cemented by ferruginous compounds into sandstone or conglomerate rocks.

Rusty-brown and dark soft to semihard concretions are present throughout and are generally most numerous in the gray mottled layers. The quantity of gritty sand grains and pebbles in the subsoil and the depth at which they occur vary, but a considerable quantity is everywhere present above a depth of about 42 inches. When the soil is cultivated, the accumulated organic matter in the thin surface layer mixes with the rest of the plow layer, and much of it soon disappears by erosion, leaching, and heavy cropping. The surface layer of cultivated fields is light brown, slightly grayish brown, or yellowish brown, depending on the way it has been managed. The reaction is strongly to very strongly acid, except in the dark thin surface layer, which is slightly acid in places.

Occupying slopes of 5 to 10 percent, this soil is susceptible to severe sheet and gully erosion. The erosion, moisture, and tilth conditions are practically the same as those of Grenada silt loam, slope phase, although more of the land is gullied. It differs from the latter soil in parent material, the upper part of the soil being derived from loessial material and the lower part wholly or in part from Coastal Plain materials.

Comparatively small bodies of this soil are scattered over most of the uplands, except in the more level parts, in association with bodies of Grenada silt loam and its slope phase, Lexington silt loam, and Brandon silt loam.

The total area is fairly large. The present use of this soil, crop adaptations, yields, and recommendations for its use are very similar to those given for Grenada silt loam, slope phase.

Memphis silt loam.—Like the Grenada soils, Memphis silt loam is developed in the uplands from loessial materials. It differs from the latter in being developed under conditions of good drainage, and no gray, compact, dense layer has developed in the lower subsoils.

In cultivated fields the surface soil of Memphis silt loam is light-brown, or in many places slightly grayish brown, smooth mellow silt loam to a depth of from 7 to 9 inches where not eroded. It is underlain by yellowish-brown friable heavy silt loam that breaks into rounded to soft small subangular particles. At a depth of about 15 inches this grades into bright yellowish-brown slightly compact slightly dense silty clay loam. This breaks readily into firm, medium-sized, subangular particles that are coated with a reddish yellow-brown fine-textured material containing some dark-colored staining. Below a depth of from 27 to 33 inches this grades into yellowish-brown light silty clay loam that is more friable than the above layer. At a depth of 4 to 10 feet it overlies Coastal Plain material that generally consists of reddish-brown clay loam, sandy

clay, clayey sand, or gravelly material. A small number of dark and rusty-brown soft to semihard concretions are present throughout the soil in many places.

In virgin conditions the surface half inch of this soil is dark grayish-brown silt loam, underlain by a 4- or 5-inch layer of grayish-brown mellow silt loam. This overlies light-brown mellow silt loam. Plowing thoroughly mixes the darker surface layer with the rest of the soil material to plow depth, and the organic matter is soon depleted by cropping, erosion, and oxidation. As mapped in this county, this soil in many places has a few gray mottlings below a depth of about 36 inches, although this layer is not compact and dense as in the Grenada soils. The reaction is medium to very strongly acid, except in the dark, thin surface layer, which is slightly acid to neutral in places.

Only a very small total area of this soil is mapped. It occupies undulating ridge tops in the hilly southwestern and northwestern parts of the county and is associated with Grenada silt loam, Lexington silt loam, and the smooth phase of the latter soil.

In most places the slope ranges from 2 to 5 percent, although a few acres in the southwestern corner of the county have a gradient of 5 to 10 percent. Surface and internal drainage are good. The subsoil retains moisture well and allows good internal circulation of air.

Memphis silt loam is subject to harmful sheet erosion and to a moderate gullying under poor systems of management, although it is not so highly erodible as Grenada silt loam. Otherwise, the erosion conditions are similar and the symbols used in showing them on the map are similar to those of Grenada silt loam.

Memphis silt loam is of little importance in this county because of its small extent, but it is better adapted to most crops commonly grown than are the other soils of the uplands. It is not so well adapted to western fire-cured tobacco, however, as are the Grenada soils, because it usually produces a lighter, thinner leaf of poorer quality. The present use of this soil is similar to that of Lexington silt loam, smooth phase. Memphis silt loam is very responsive to good management. Without lime or fertilizers, corn averages about 22 bushels, wheat 9 bushels, cotton 480 pounds of seed cotton, strawberries 50 crates, sweetpotatoes 90 bushels, and lespedeza 1,600 pounds of hay to the acre. With proper applications of lime and fertilizers and with a suitable crop rotation and other good management practices, corn yields an average of about 42 bushels, wheat 16 bushels, cotton 1,000 pounds of seed cotton, strawberries 80 crates, sweetpotatoes 150 bushels, and lespedeza 2,900 pounds of hay to the acre. Tobacco yields average about 825 pounds. Red clover, alfalfa, and sweetclover should do well on this soil after lime and phosphate fertilizer are applied. Fruit trees should grow successfully on it.

Recommendations for the use of this soil are very similar to those made for Grenada silt loam.

Lexington silt loam, smooth phase.—This phase is similar in all significant profile characteristics and parent material to typical Lexington silt loam. It differs from the latter soil in occupying gently undulating relief where the slope ranges from 2 to 5 percent, which

results in differences in drainage, erosion, and depth of surface soil. In general, the surface soil is slightly deeper and the depth to sandy Coastal Plain materials is greater than in the typical soil.

Surface and internal drainage are good, and the soil is fairly drought-resistant. It is susceptible to harmful sheet and gully erosion when unprotected. It is estimated that 13 percent of it has lost from one-third to two-thirds of its original 7-inch surface soil by sheet erosion, 6 percent has lost two-thirds or more of the surface soil, and 3 percent is gullied. The erosion is shown on the map in the same way as for Grenada silt loam.

This soil lies chiefly on narrow ridge tops in the more hilly parts of the county, and it is associated with Grenada silt loam; Providence silt loam; Lexington silt loam, slope phase; and Memphis silt loam.

The crop adaptations and present use of this soil are similar to those of Memphis silt loam. It is estimated that 12 percent of this soil is in forest, 8 percent in corn, 3 percent in cotton, 3 percent in tobacco, and 63 percent in idle open land. Yields on it correspond closely to those on Memphis silt loam, although they average slightly lower. Corn yields about 21 bushels, wheat 9 bushels, and cotton 480 pounds of seed cotton to the acre without lime and fertilizer. With proper applications of lime and fertilizer and with other good management practices, corn averages about 40 bushels, wheat 16 bushels, and cotton 1,000 pounds of seed cotton to the acre. Crops on this soil are injured slightly more by droughts than on Memphis silt loam. It responds well to good management, and recommended management practices are similar to those made for Grenada silt loam.

Lexington silt loam, slope phase.—This soil is similar in all significant profile characteristics and parent material to Lexington silt loam. It differs from the latter soil in having a more gentle slope (5 to 10 percent), which results in differences in drainage, erosion, and depth of surface soil.

External drainage is good to free, and internal drainage is good. This phase is subject to severe sheet and gully erosion under conditions of poor management. Under the usual or average methods of management practiced, 2 to 4 inches of the original 6-inch surface soil layer has been removed by sheet erosion. It is estimated that 5 percent of this soil has lost more than two-thirds of this surface layer by erosion, 7 percent is moderately gullied, and 5 percent is severely or very severely gullied. These erosion conditions are shown on the map in the same way as for Grenada silt loam, slope phase.

Small bodies of this soil are scattered over much of the more rolling parts of the county, especially northeast, east, and southeast of Pottertown and New Concord, northwest of Hico, and in the southwest corner of the county. It is associated with Lexington silt loam and its smooth phase and with Lexington loam, Grenada silt loam, and Providence silt loam.

About 20 percent of this soil is in forests, 5 percent in corn, 3 percent in cotton, 1 percent in lespedeza and redtop, 1 percent in tobacco, and 65 percent in idle open fields. The crop adaptations, yields, and suggested methods of management are similar to those for Grenada silt loam, slope phase. It is somewhat better adapted to deep-rooted crops but is not so well adapted to tobacco.

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Lexington loam, smooth phase.—This phase is very similar to typical Lexington loam in significant profile characteristics and parent material. It differs chiefly from the latter soil in having an undulating to gently rolling relief, the slope ranging from 2 to 10 percent, which results in differences in drainage, erosion, and depth of surface soil.

External drainage is good to free, and internal drainage is good. The soil is susceptible to harmful sheet erosion and moderate to severe gully erosion. Approximately 6 percent of this soil has lost two-thirds or more of its original 6-inch surface soil by sheet erosion, 6 percent is moderately gullied, and 4 percent is severely gullied. The depth of the surface soil after a few years of cultivation under average management ranges from 2 to 6 inches, depending largely on the slope.

Only a small total area of this soil is mapped. Small scattered bodies are on narrow ridges and gentle slopes in the strongly rolling to hilly uplands, especially east and southeast of Pottertown and New Concord. It is associated with Lexington loam; Lexington silt loam, smooth phase; and Atwood fine sandy loam. About 100 acres are included that would be mapped as Atwood fine sandy loam, smooth phase, if the soil were more extensive. This variation has a grayish-yellow or grayish-brown fine sandy loam surface soil and a reddish-brown clay loam subsoil. This inclusion occurs chiefly south, southeast, and southwest of New Concord. There are also a few included areas that would be mapped as Atwood loamy fine sand, smooth phase, if the soil were more extensive. This second inclusion has a grayish-yellow or grayish-brown loamy fine sand surface soil and a reddish-brown loose loamy fine sand or fine sandy loam subsoil. Bodies of this inclusion also lie south of New Concord.

It is estimated that 15 percent of this soil is in forest, 5 percent in corn, 5 percent in cotton, 3 percent in tobacco, and 60 percent in idle open fields. Corn yields an average of about 15 bushels, tobacco 750 pounds, and cotton 400 pounds of seed cotton to the acre. This soil responds well to good treatment. Recommended management practices are similar to those for Grenada silt loam.

Brandon silt loam, smooth phase.—This phase resembles typical Brandon silt loam in all significant profile characteristics and parent material. It differs from the latter soil chiefly in having a gently undulating surface, the slope ranging from 2 to 5 percent, which results in differences in drainage, erosion, and depth of surface soil.

Both external and internal drainage are typically good. The soil is susceptible to harmful sheet erosion and slight gullying. The present erosion conditions and the method of showing them on the map are similar to those used for Lexington silt loam, smooth phase. The surface soil is somewhat deeper, the subsoil is slightly heavier in texture, and the gravelly substratum typically lies at a slightly greater depth than in Brandon silt loam.

The total area of this soil is small. It occurs chiefly near the ends of long narrow ridge tops in the hilly eastern part of the county, where it is associated with Brandon silt loam and its slope and steep phases, Brandon gravelly loam and its smooth phase, and Lexington silt loam, smooth phase.

The present use, crop adaptations, and recommended management practices are very similar to those of Lexington silt loam, smooth

phase, except that somewhat more of this soil remains in forests. Because of the gravelly substratum and the greater injury to crops from droughts, yields are not so high as on Lexington silt loam, smooth phase. Corn yields about 15 bushels, wheat 6 bushels, and cotton 400 pounds of seed cotton to the acre without the use of lime and fertilizers, and 30 bushels, 13 bushels, and 800 pounds, respectively, with the use of those amendments.

Brandon silt loam, slope phase.—This soil resembles typical Brandon silt loam in all important profile characteristics and parent material. It differs from the latter soil chiefly in having a gently rolling surface, the slope ranging from 5 to 10 percent, which results in differences in drainage, erosion, and depth of surface soil.

Drainage is good to free. The soil is not very drought-resistant and is subject to severe sheet and gully erosion. The erosion conditions and the method of showing them on the map are similar to those for Lexington silt loam, slope phase.

This is not an extensive soil. It occurs chiefly at the ends of long, narrow ridge tops and around the heads of drains in the hilly eastern part of the county. It is closely associated with Brandon silt loam and its smooth phase and Brandon gravelly loam and its smooth phase.

The crop adaptations, present usage, and recommendations for the management of this soil are similar to those of Lexington silt loam, slope phase, except that a slightly larger proportion of this soil is in forest. This soil is rather poorly suited to the growing of crops because of its susceptibility to severe erosion, its moderately low resistance to drought, and the presence of the gravelly substratum. Without lime or fertilizers and under the usual method of management, corn returns about 12 bushels, wheat 5 bushels, cotton 300 pounds of seed cotton, and lespedeza 900 pounds of hay to the acre.

Bodine loam, smooth phase.—This phase differs from typical Bodine loam principally in having a gently undulating to gently rolling relief and a slope of 2 to 10 percent. Surface drainage is good to free, and internal drainage is slow because of the moderately to slightly compact, extremely cherty substratum. It is subject to moderate to severe sheet and gully erosion when unprotected. The erosion conditions are similar to those of Grenada silt loam and are shown by similar symbols on the map. In general, the depth to the cherty substratum is slightly greater and the surface soil is deeper than in Bodine loam.

The total area of this soil is small. It occurs in the hilly eastern part of the county, principally as long, narrow ridge tops. A few bodies are included that have a large quantity of angular chert fragments on the surface. These cherty areas are represented on the map by chert symbols. Part of the included area has a silt loam surface soil.

Approximately 45 percent of this soil is in forest, 45 percent in idle land, 5 percent in corn, 2 percent in lespedeza, and the rest in other crops and farmsteads. Yields of corn average about 15 bushels to the acre. Other yields are about 10 percent lower than on Grenada silt loam. The crop adaptations and recommended methods of management are very similar to those of the latter soil.

Olivier silt loam.—Olivier silt loam is developed under imperfect drainage conditions on stream terraces from old alluvium that has been derived largely from loessial materials. It closely resembles Grenada silt loam, level phase, in profile and other characteristics.

Most of the areas of this soil are on the terraces of the Blood, Clarks, and West Fork Clarks Rivers. This soil is associated with Olivier silt loam, slope phase; Calhoun silt loam; Collins silt loam; and Waverly silt loam. About 0.3 square mile has a loam surface soil and a slightly lighter textured subsoil that contains varying quantities of sand or gravel. This variation occurs as scattered areas along the West Fork Clarks and Blood Rivers and Beechy, Panther, Wildcat, and Sugar Tree Creeks. The slope ranges from 0 to 2 percent. The surface drainage is slow but generally adequate. Internal drainage is greatly restricted by the compact horizon in the lower subsoil, which is relatively impermeable to water. The presence of this layer causes crops on this soil to be injured by extremes of both wet and dry seasons. Erosion is not a problem.

The crop adaptations, present use, yields, and recommended methods of management are very similar to those of Grenada silt loam, level phase.

Olivier silt loam, slope phase.—This soil resembles Olivier silt loam in profile characteristics and in conditions under which it has developed. It differs from the latter soil chiefly in having a slope of 2 to 5 percent. Surface drainage is good, and internal drainage is slow. This phase is susceptible to harmful sheet erosion and slight gullying when unprotected. The erosion conditions and the symbols used to indicate them on the map are similar to those for Grenada silt loam.

This is not an extensive soil. It occurs chiefly on the terraces of the Blood, Clarks, and West Fork Clarks Rivers, where it is associated with Olivier silt loam and Calhoun silt loam. About 0.5 of a square mile is included that has a loam surface layer and a slightly lighter textured subsoil containing a variable amount of sand or gravel. This variation occurs as scattered areas along West Fork Clarks and Blood Rivers and Beechy, Panther, Wildcat, and Sugar Tree Creeks.

The crop adaptations, present use, yields, and recommended methods of management are very similar to those for Grenada silt loam.

Sciotoville silt loam.—Sciotoville silt loam, developed under imperfect drainage conditions, occupies alluvial terraces of material deposited largely by the Tennessee River. These deposits were derived from many different kinds of soils and rocks in the Tennessee River Basin, but they are predominantly from limestone and soils developed from limestone materials.

The surface soil consists of 6 to 7 inches of light-brown or slightly grayish-brown friable silt loam, underlain by yellowish-brown friable silt loam. Below a depth of about 12 inches the subsoil is yellowish-brown slightly compact silty clay loam. At a depth of 18 to 22 inches this overlies mottled yellowish-brown, gray, and rusty-brown slightly compact silty clay loam. Below a depth of 28 to 32 inches the material is gray moderately compact heavy silty clay loam or clay loam mottled with yellowish brown and rusty brown. This material is moderately plastic and sticky when wet. With increase in depth below

a depth of about 45 inches the soil material is less gray and more brown, less compact, and lighter in texture than the material above, although generally it is clay loam. The substratum consists of stratified old alluvium, generally of medium to light textures.

The entire soil mass contains varying quantities of small mica flakes. In most places the surface soil and the upper subsoil layer contain small to moderate quantities of dark and rusty-brown soft to semihard small concretions, and the gray mottled lower subsoil layer contains numerous rusty-brown and dark soft to semihard concretions. The entire soil is medium to strongly acid.

Under virgin conditions the surface half inch contains a considerable proportion of organic matter. On some of the ridges nearer the river, especially adjacent to Sciotoville very fine sandy loam, the surface soil is smooth loam and the subsoil is light clay loam.

This is not an extensive soil. It occurs on terraces along the Tennessee River and occupies long, generally rather wide ridges that are nearly parallel to the river. Associated with this soil on the ridges are its slope phase, Sciotoville very fine sandy loam, Wheeling silt loam, and Ginat silt loam. Short, steep slopes or escarpments separate many of the ridges from the first bottoms. The ridges lie from 10 to 20 feet above the first bottoms and are above the usual overflows, although an exceptionally high flood may cover some of the lower lying areas.

The surface of Sciotoville silt loam is gently undulating, the gradient ranging from 0 to 2.5 percent. Surface drainage is slow to good, and internal drainage is restricted by the moderately compact lower subsoil layer, but not to so great an extent as in Grenada silt loam. The subsoil limits the penetration of roots to some extent. Tilth conditions of the surface soil are moderately good. Erosion is negligible.

This is a rather important soil in the eastern part of the county. It is better adapted than Grenada silt loam, level phase, to all the commonly grown crops except western fire-cured tobacco. Practically all of the land is cleared. Approximately 34 percent of it is in corn, 9 percent in wheat, 8 percent in cotton, 8 percent in lespedeza, 6 percent in soybeans and cowpeas, 4 percent in tobacco, 2 percent in redtop, and 22 percent in idle open fields. It is slightly higher in fertility than the soils of the uplands, and it responds well to good management. Probably lime has been applied to about 10 percent of this soil, and fertilizer is used on about 10 percent of the cornland, 50 percent of the wheatland, and 30 percent of the land devoted to cotton. The fertilizer is mainly 20-percent superphosphate applied at the rate of about 100 pounds to the acre. Practically all of the tobacco land is fertilized with a complete fertilizer, such as 3–8–6 or 4–8–4, usually at about the same rate as used for superphosphate.

Without applications of lime and fertilizers and under the usual farm practices, corn yields about 26 bushels, wheat 12 bushels, lespedeza 1,800 pounds, and cotton 650 pounds of seed cotton to the acre. After proper applications of lime and fertilizers and under good management practices, corn yields about 40 bushels, wheat 18 bushels, lespedeza 3,000 pounds, and cotton 1,100 pounds of seed cotton. Western fire-cured tobacco yields average about 850 pounds, although the quality of leaf tobacco is usually not so good as on the Grenada soils, and lower prices are generally obtained. It appears that cotton is better suited to this soil than is this type of tobacco. Deep-rooted crops, such

as alfalfa, sweetclover, and fruit trees, are not especially well suited to this soil because of its imperfectly drained subsoil. Redtop, timothy, soybeans, cowpeas, and most vegetable crops do fairly well on it. An application of lime is necessary for the successful growth of alfalfa, sweetclover, and red clover.

In obtaining a high state of productivity on this soil, it is important that lime be applied, crop rotations be used that include legumes and grasses, winter cover crops be used after all cultivated crops, and organic matter be incorporated by the return of manure and crop residues. Application of phosphate fertilizer on this soil will probably prove economical, although it appears that phosphate is not needed in so large quantities as on the soils of the uplands. Potash and nitrogen in addition to phosphate fertilizers are advisable for tobacco and cotton.

Sciotoville silt loam, slope phase.—This soil differs from typical Sciotoville silt loam chiefly in having a more sloping surface, the gradient in most places ranging from 2.5 to 5 percent, although in some places it is as much as 10 percent. Drainage, erosion conditions, and thickness of the surface soil differ correspondingly from those features of the soil on smoother relief. Surface drainage is good to free, and internal drainage is restricted as in the typical soil. Even though the slopes are relatively gentle and short, this soil is more subject than the typical soil to harmful sheet erosion and moderate gullying under unfavorable systems of management; and a large part of it has undergone some sheet erosion. Under average management the light-brown surface layer ranges from 2 to 6 inches in thickness. Areas that have lost from 2 to 4 inches of the surface soil as the result of erosion are indicated on the map by symbols representing moderate sheet erosion, and areas that retain less than 2 inches of the original surface soil are indicated on the map by symbols representing severe sheet erosion.

The aggregate area of this phase is small. All this soil is on the alluvial terraces along the Tennessee River, generally between Sciotoville silt loam and soils of the first bottoms. About 0.2 of a square mile has a very fine sandy loam surface soil and a slightly lighter textured subsoil than are typical. If it were more extensive this inclusion would be mapped as Sciotoville very fine sandy loam, slope phase.

Practically all of the land is cleared. It is estimated that 27 percent of it is in corn, 12 percent in wheat, 3 percent in cotton, 3 percent in lespedeza, 3 percent in soybeans and cowpeas, and 45 percent in idle open fields. Crop adaptations and fertilizer practices are similar to those described for Sciotoville silt loam. Yields average about 20 percent lower than on the latter soil.

Considerable care must be exercised in the methods of cropping on this soil because of its slope and erosion conditions. Contour tillage and terraces are some of the water-control practices that may be of value, especially on the more sloping areas. The suggestions for improving Sciotoville silt loam also apply to this soil.

Sciotoville very fine sandy loam.—This soil differs from Sciotoville silt loam mainly in texture. The surface soil consists of about 6 inches of light-brown or slightly grayish-brown mellow very fine sandy loam, and it is underlain by yellowish-brown very friable loam

or heavy very fine sandy loam. At a depth of 9 to 12 inches this grades into yellowish-brown light clay loam that is moderately friable but slightly compact. At a depth of about 20 inches this in turn grades into mottled yellowish-brown, gray, and rusty-brown light clay loam that is moderately friable but slightly compact. Below a depth of about 30 inches it is more gray and less yellow. With increase in depth below about 48 inches the material is less gray and more brown and lighter textured, generally a light clay loam.

The entire soil mass contains a moderate quantity of small mica flakes. The surface soil and the upper part of the subsoil generally contain few dark, small, soft iron concretions, and the lower part of the subsoil contains numerous soft to semihard dark iron concretions that are larger than those in the upper part. The entire soil is medium to strongly acid.

Under virgin conditions the surface half inch contains a considerable amount of organic matter, but in cultivated fields the surface soil is low in organic matter. The lower part of the subsoil ranges from slightly to moderately compact; however, it generally allows fairly good penetration of roots.

The slope ranges from 0 to 2.5 percent. Surface drainage is slow, although sufficient in most places. Internal drainage is restricted to some extent, although it is generally better than in Sciotoville silt loam. The soil is subject to only a negligible degree of sheet erosion. Tilth conditions are very good, and the soil is easily worked under a considerable range of moisture conditions.

The aggregate area of this soil is very small. It occurs on long, comparatively wide ridges on the terraces of the Tennessee River and is associated with Sciotoville silt loam, Wheeling silt loam, and Ginat silt loam. It lies from 10 to 20 feet above the first bottoms and is above the usual level of overflow.

Sciotoville very fine sandy loam is fairly well adapted to a variety of crops. It is about equal to Sciotoville silt loam in fertility, and it responds slightly better to good management. All but a few acres is cleared. It is used in about the same way as Sciotoville silt loam, except that the proportionate acreage in cotton is greater and the proportionate acreage in tobacco is less. Because of the lighter texture and the ability to warm earlier in the spring, it is better adapted to cotton than Sciotoville silt loam. Cotton has almost wholly replaced tobacco as a cash crop on this soil. Probably about a third of the cotton land is fertilized, usually with superphosphate. Yields of about 750 pounds of seed cotton are obtained without fertilization, and yields of 1,200 pounds are common when the land is fertilized and manured. The grade of western fire-cured tobacco raised is not good. The yields of other crops are similar or slightly higher than on Sciotoville silt loam. The recommended management practices are similar on the two soils.

Wheeling silt loam.—Wheeling silt loam is developed under good drainage conditions on alluvial terraces composed of materials deposited chiefly by the Tennessee River. The surface soil consists of 6 to 8 inches of brown to light-brown or slightly grayish-brown mellow silt loam, and it is underlain by about 5 inches of yellowish-brown friable heavy silt loam. The subsoil is bright yellowish-brown, in many

places slightly reddish, silty clay loam or heavy clay loam that is slightly to moderately compact, somewhat friable, and slightly dense. This material breaks into firm medium-sized subangular particles, coated on the surface with a slightly reddish very fine textured material. The subsoil below a depth of about 28 inches is generally less compact, more friable, and lighter textured than above that depth. At a depth of about 50 inches it grades into light-brown or brownish-yellow rather friable loam or light clay loam that generally contains appreciable quantities of fine sand. Rusty-brown mottlings are more or less common in this layer, and a few gray mottlings occur. The substrata below this consist of stratified light and heavier textured old alluvium.

Small mica flakes occur throughout. Small quantities of black or rusty-brown stains or soft concretions are common in the subsoil in some places but are uncommon in the surface layer. The entire soil is medium to strongly acid. The surface half inch contains a considerable accumulation of organic matter in the wooded areas, but where the land is cultivated the organic-matter content is low.

Only a very small area is mapped. About 0.3 of a square mile has a lighter texture than is normal for the silt loam type and would be mapped as Wheeling very fine sandy loam if the acreage justified the separation. This variation has a brown or light-brown mellow very fine sandy loam surface layer, underlain by yellowish-brown friable heavy very fine sandy loam. It has a reddish-yellowish-brown clay loam subsoil that is slightly compact but friable. The substratum is generally more sandy than that underlying the typical soil.

Wheeling silt loam occupies long, generally rather narrow ridges on the terraces of the Tennessee River in association with the Sciotoville soils. Many of the ridges are bordered by short escarpments or steep slopes that separate them from the first bottoms. They are above the level of usual overflows. This soil occupies slopes having a gradient of 0 to 10 percent, although about half of it has a gradient of 0 to 2.5 percent. Surface drainage is slow to good, and internal drainage is good. The soil has a good water-holding capacity and is moderately drought-resistant. Those areas having a slope greater than 2.5 percent, however, are subject to harmful sheet erosion and moderate gullying under poor management. The erosion conditions on these steeper slopes are similar to those of Sciotoville silt loam, slope phase. This soil is one of the most fertile and productive in the county, and it responds quickly to good management.

Because of the favorable features mentioned above, this soil is well adapted to a wide variety of crops. The present use is similar to that of Sciotoville silt loam except that a larger proportionate acreage is devoted to cotton. Yields are good as compared with average yields for the county. Practically none of the land has been limed. Fertilizers are rarely used for corn, which yields about 31 bushels an acre, although yields of 40 to 50 bushels are common on the better managed farms. This soil is well adapted to cotton. Probably less than a third of the cotton land is fertilized. Without fertilization, cotton yields about 750 pounds of seed cotton, and with fertilization and good farming practices it often yields from 1,200 to 1,400 pounds. Very little tobacco is grown, because of the lower grade of western fire-cured tobacco produced. Wheat does well and yields from 15 to 20 bushels with an application of superphosphate. Soybeans, lespe-

deza, timothy, and redtop also do well. Alfalfa, sweetclover, and red clover should do well on this soil after it has been limed. This soil is also well adapted to strawberries, raspberries, peaches, and apples. The more sandy variation is very similar in crop adaptation and productivity to the typical soil, and it is the best soil in the county for cotton, producing an average of about 900 pounds of seed cotton without fertilization and 1,350 pounds with fertilization and other good treatment.

Light applications of lime, the incorporation of organic matter, the use of rotations that include legumes, and mechanical means of controlling erosion on slopes having a gradient of more than 2.5 percent are considered good management practices for this soil.

GRAY SOILS OF THE UPLANDS AND STREAM TERRACES

The gray soils of the uplands and stream terraces have brownish-gray or gray mottled surface soils, gray mottled moderately friable subsurface layers or upper subsoil layers, and gray mottled very compact dense claypan subsoils or lower subsoil layers. The surface soils have silt loam textures and often pack and become hard after rains. Few roots penetrate the claypan subsoils, and water penetrates them slowly. The organic-matter content is low, and the reaction is strongly to extremely acid. These soils occupy nearly flat to depressed areas. Surface and internal drainage are slow to poor.

The soils of this group occupy 9 percent of the area of the county. The Henry and Calloway soils are developed in the uplands from loessial materials. The Henry soils differ from the Calloway soils mainly in having a lighter gray color with only a few mottlings and in having the claypan layer much closer to the surface. The Calhoun soils are developed on terraces of the smaller streams, and the material composing the terraces was derived from loessial deposits. The Ginat soils are developed from old alluvium deposited principally by the Tennessee River.

These soils are limited in their crop adaptations chiefly because of poor drainage. Fair crops are produced in favorable seasons, but either dry or wet seasons are injurious to them. Artificial drainage should be beneficial, although the degree of improvement will vary according to the depth and imperviousness of the hardpan. The present use of these soils is somewhat similar to that of the brown soils, although a much larger acreage is in woods and they are not so well adapted to most of the crops grown. Deep-rooted crops are not suited to these soils.

Henry silt loam.—Henry silt loam is developed in the uplands from loessial materials under very poor natural drainage conditions. It is commonly called white or glade land.

The surface soil in cultivated fields to a depth of 5 or 6 inches is light-gray mellow silt loam having a few light brownish-gray, pale-yellow, and rusty-brown mottlings. Dry fields appear very light gray. In many wooded areas the surface 1 or 2 inches is medium gray, although sufficient organic matter is accumulated in a few places to produce a dark surface layer. The subsurface layer is lighter in color, contains fewer mottlings, and consists of mellow silt loam. This overlies a 2-inch layer of very light-gray or almost white mellow ashy floury silt loam having very little or no mottlings. Beginning at a depth of 11 to 14 inches, the subsoil is medium-gray silty clay contain-

ing very slight tinges of pale yellow and grayish brown. It is very plastic and sticky when wet, and hard and tough when dry. This very compact dense material breaks into medium-sized subangular particles that are hard when dry. The particles in the upper part of the layer are coated with much very light-gray or almost white silty material, the amount of this coating decreasing with increase in depth. Below a depth of about 35 inches the subsoil is light-gray moderately compact and quite dense silty clay loam containing slight tinges of yellow and rusty brown. At a depth of about 50 inches this material becomes lighter in texture and somewhat less compact. It overlies gravelly, sandy, or clayey Coastal Plain materials at a depth of 5 to 8 feet.

Rusty-brown and black small soft to semihard concretions are commonly present throughout, especially in the surface and subsurface layers. They are not so numerous or so large as those in Calloway silt loam. The organic-matter content is very low. The reaction is very strongly to extremely acid, except in the substratum below a depth of 5 to 7 feet, which is medium to strongly acid. This soil occurs in almost flat areas where the slope is less than 1 percent. Generally, surface drainage is poor, although small drainageways have formed in many of the areas, allowing better surface runoff. The heavy subsoil or claypan layer is moderately or very impermeable to water. Because of the slight depth to this layer, the permeable layers above it are soon saturated with water in wet seasons, and water often stands on the surface for long periods. These conditions, together with poor circulation of air within the soil, seriously retard or prevent the action of beneficial bacterial and other processes favorable to good production of crops.

The claypan layer also is moderately impervious to roots, and only a few roots generally penetrate it. Root systems are thus largely limited to the layers above the claypan, which reduces the feeding zone of most crops. Crops are seriously injured by prolonged droughts because of these features.

This soil is not important agriculturally, chiefly because its aggregate area is small, its natural productivity is low, and its adaptation is narrow. According to several farmers, this soil is about half as valuable for crops as Grenada silt loam. It is associated with Calloway silt loam; Grenada silt loam, level phase; and Waverly silt loam—especially in the vicinity of Taylors Store, Lynn Grove, New Providence, and Kirksey and northeast of Murray.

Approximately 40 percent of the land is in forest and probably should remain so; 15 percent of it is used for corn, 3 percent for tobacco, 4 percent for redtop, and 10 percent for lespedeza; and 25 percent is in idle land. Only a little of it has been limed. Without lime, yields are very low. Corn averages about 10 bushels an acre without fertilizer; but, when the land is limed and manured and a rotation including a legume is followed, yields of about 20 to 25 bushels are obtained in favorable seasons. Failure often results, however, in wet or extremely dry seasons. Tobacco yields from 600 to 800 pounds when the land is fertilized, but the grade is only fair, a thin leaf generally being produced. The soil is not adapted to cotton, sweetpotatoes, alfalfa, sweetclover, red clover, or wheat. Farmers state that it is best adapted to sorgo, and that a high quality of molasses is produced from sorgo grown on it. Strawberries, redtop, lespedeza, and cowpeas do fairly well.

Where it occurs in a large enough area, this soil probably can be most economically used for pasture. If used for crops, it is important that it be limed rather heavily, that organic matter be incorporated by the addition of manures, green manures, and crop residues, that phosphate and probably potash fertilizers be added, and, where feasible, that artificial drainage be provided. Drainage can be provided best by open ditches.

Calloway silt loam.—Calloway silt loam is developed in the uplands from loessial materials under poor natural drainage conditions. It is commonly called buckshot or gray land.

Where the land has been cultivated, the surface soil consists of about 5 or 6 inches of brownish-gray mellow silt loam that contains more or less gray and rusty-brown mottlings and is decidedly more gray when dry. Below this is highly mottled gray, brownish-gray, pale-yellow, and rusty-brown very friable silt loam. This grades at a depth of 10 to 15 inches into heavy silt loam or light silty clay loam that is light gray and shows some yellow and rusty-brown coloration. This is underlain by a layer about 2 inches thick that contains a very large quantity of very light-gray or almost white ashy silty material, especially between particles and in channels. At a depth of 22 to 30 inches this changes rather abruptly into medium-gray silty clay containing some rusty-brown and yellow mottles. This material is very compact and dense, breaks into large subangular hard particles, and is very plastic and sticky when wet. In many places it has a prismatic structure. Below about 45 inches it is brownish-yellow, massive moderately compact light silty clay loam containing some gray and rusty-brown mottlings. Gravelly, sandy, or clayey Coastal Plain materials underlie this at a depth of 5 to 10 feet.

In virgin areas the surface half inch is slightly dark and contains a large quantity of organic matter in varying stages of decomposition. In cultivated fields, however, the organic-matter content is relatively low. Rusty-brown and black soft to hard iron concretions are more or less numerous throughout the soil mass and are most numerous in the upper layers. Many semihard to hard pellets or concretions are on the surface, causing the name "buckshot" to be given to this soil. The reaction is very strongly to extremely acid, except in the thin dark surface layer in virgin areas and in the substratum below a depth of about 6 feet, which are medium to slightly acid.

This soil occupies nearly level to depressed areas having a slope of 0 to 2 percent. In the nearly level to gently undulating sections of the county it generally occupies small areas in the depressions around the heads of drainageways, and in many places narrow strips follow either side of the drainageways for considerable distances. Many of these areas have received some sediment washed from the surrounding slopes, and the claypan horizon in such areas lies at a greater depth than elsewhere. The claypan layer, however, is everywhere present, and the soil differs from Waverly silt loam in this respect.

In the broad practically level areas, drainageways are absent or only faintly developed and surface drainage is very poor. In the smaller depressions around drain heads, at least one drainageway is established and surface runoff is poor to slow. The layers above the claypan layer allow fairly good absorption and percolation of water, but the claypan layer is moderately or very impermeable to water.

Because of these conditions, this soil becomes very wet in rainy seasons, frequently having standing water on it, and is slow in drying out. The limited storage capacity for available moisture results in more injury to crops on this soil in prolonged droughts than on a soil with a more favorable subsoil. The claypan seems to be fairly impervious to roots, and the root system of deep-rooted crops is considerably limited.

This is the third most extensive soil in area; 29 square miles of it is mapped. Fairly large areas are located west of New Providence, north of Hazel, northwest of Murray, and in the vicinity of Taylors Store, Lynn Grove, Kirksey, and Cherry. It is associated with Grenada silt loam, level phase, and Henry silt loam. Its profile features differ from those of the former soil chiefly in having a grayer surface and a gray mottled layer just beneath the surface; it differs from Henry silt loam chiefly in having more yellow and brown coloring in the upper part and in having a greater depth to the claypan. It is intermediate between the Grenada and Henry soils in color, drainage conditions, claypan development, productivity, and adaptation. It resembles both of these soils in being largely treeless when the county was first settled, and it was a part of the area locally known as the barrens.

The present use of this soil is similar to that of Grenada silt loam, level phase, in most respects, except that a much larger proportionate acreage is in forest. It is estimated that 18 percent of this soil is used for corn, 5 percent for tobacco, 15 percent for lespedeza, 2 percent for redtop, 2 percent for wheat, and 32 percent for forests; and 24 percent is in idle open fields. Because of its drainage conditions, this soil is not so well adapted to most of the crops grown in the region as is Grenada silt loam, level phase, and yields are lower (pl. 3, *B*). Under the ordinary farm practices where no lime or fertilizer is used, corn yields average about 15 bushels, wheat 5 bushels, strawberries 40 crates, and lespedeza 1,500 pounds to the acre. After liming, proper fertilization, and other good treatment, corn yields about 30 bushels, wheat 12 bushels, strawberries 70 crates, and lespedeza 2,700 pounds to the acre. Tobacco yields average about 825 pounds with fertilization, and a fairly good quality is produced in favorable seasons. Tobacco is often damaged, however, by excess water in wet seasons. Redtop, cowpeas, and soybeans succeed fairly well on this soil; but cotton, alfalfa, red clover, and fruit trees are not well adapted to it. Sorgo grown on this soil makes a very good quality of sirup.

One of the first essentials in the improvement of this soil for the production of field crops is artificial drainage, although practically no attempt has been made toward draining it. Proper drainage probably can be obtained most effectively by open ditches and bedding, although tile drains may prove successful in some areas. Good yields of field crops require rather heavy liming, the incorporation of organic matter, the addition of phosphate and probably potash fertilizers, and the use of crop rotations that include legumes. The feasibility of these improvements, however, must be determined before they can be considered as justified practices.

Calhoun silt loam.—Calhoun silt loam is developed under poor drainage conditions on alluvial terraces composed chiefly of loessial material deposited by the creeks and smaller rivers of the county. It

A, Western fire-cured tobacco on Grenada silt loam, level phase. This crop is very well adapted to this soil. Lespedeza and corn in background are on typical Grenada silt loam. Although this landscape is in Graves County, it is representative of an extensive acreage in Calloway County. *B*, Corn on Calloway silt loam. This soil is not so well adapted to most crops commonly grown in the area as is Grenada silt loam, level phase. Artificial drainage, where feasible, can be expected to increase its adaptation considerably.

A, Cut in Brandon silt loam, showing the silty loessial material overlying gravelly Coastal Plain material. *B*, Badly eroded area, classified as rough gullied land (Brandon soil material). It is considered infeasible to reclaim these areas for the production of crops except through very slow processes.

differs from Calloway silt loam mainly in being developed on alluvial terraces or benches rather than in the uplands. The profile features, drainage, and erosion conditions of the two soils are similar, except that the hardpan of Calhoun silt loam lies at a slighter depth in many areas.

This soil occupies flat, depressed, or very gently sloping areas where the gradient in few places exceeds 2 percent. The areas are located chiefly along Blood, Clarks, and West Fork Clarks Rivers, and they are commonly associated with areas of Olivier silt loam. They lie from 1 to 5 feet above the first bottoms and are above usual overflows.

The crop adaptations and the present use of this soil are practically the same as those of Calloway silt loam, but the yields average slightly less.

Ginat silt loam.—Ginat silt loam is developed under poor natural drainage conditions on alluvial terraces or benches and is composed chiefly of material deposited by the Tennessee River. It differs from Sciotoville silt loam in having a gray mottled surface soil and upper subsoil layer. It is commonly referred to as white or buckshot land.

In cultivated fields the surface soil is light-gray friable silt loam, mottled with yellow, grayish brown, and rusty brown. It is underlain by slightly heavier but friable material at a depth of about 10 inches. Below a depth of 21 to 30 inches the subsoil is gray silty clay mottled with rusty brown and yellow. This material is very plastic and sticky when wet, is very compact and dense, and breaks into large subangular nutlike particles that are hard when dry. With increase in depth below a depth of about 50 inches, the subsoil is less gray and more yellow, less dense, and lighter in texture. The substratum consists of stratified old alluvium.

Small mica flakes and numerous rusty brown and black soft to hard concretions are present throughout. The entire soil is strongly to extremely acid. In wooded areas a very thin surface layer contains a considerable accumulation of organic matter, although in cultivated fields the content is low.

This soil occupies practically level to depressed areas, the slopes of which are less than 2 percent. Many of the areas are in long swales or drainageways bordered by roughly parallel low ridges occupied by the Sciotoville or Wheeling soils. Surface drainage is slow to poor, and water may stand for a considerable time on some of the areas after heavy rains. A few areas are swampy and permanently wet or nearly so, and these are indicated on the map by swamp symbols. Internal drainage is greatly restricted by the impermeable claypan layer. Water accumulates above this layer in wet seasons and prevents proper circulation of air, good bacterial action, and other processes favorable to crop production. The claypan is fairly impervious to roots. Tilth conditions are fair. The surface soil tends to pack and clod when dry and to run together after hard rains. The lower areas are overflowed by high floods.

The aggregate area of Ginat silt loam is small. About 27 percent of the land remains in forest; 23 percent is used for corn, 4 percent for wheat, 5 percent for lespedeza, 4 percent for cowpeas and soybeans, and 4 percent for redtop; and 30 percent is in idle open fields. The crop adaptations and yields of this soil resemble those of Calloway silt loam, except that it is not nearly so well adapted to tobacco and

somewhat less well adapted to wheat. Yields vary according to the seasons, being materially reduced in either wet or extremely droughty periods. Only a small part of this soil has been limed or fertilized.

The suggestions for the improvement of this soil are similar to those for Calloway silt loam. A few areas have been partly drained by open ditches with good results. The use of either open ditches or tile drains should be very beneficial, although the feasibility of such improvements, at least for some areas, should be determined carefully before they are applied. The areas indicated on the map by swamp symbols probably can be used best for permanent pasture.

SOILS OF THE ROUGHER UPLANDS

Soils of the rougher uplands comprise about 24 percent of the area of the county. These soils are chiefly in the eastern one-third, in the southwestern and northwestern corners, and in the north-central part of the county. They occur on the more dissected and rougher uplands and generally occupy slopes of 10 percent or steeper, with a few minor exceptions.

The soils have brown, light-brown, grayish-brown, or grayish-yellow surface soils and yellowish-brown to reddish-brown upper subsoil layers. The textures of the surface soils vary considerably. The organic-matter content is low, and the reaction is medium to very strongly acid. Having free to excessive surface drainage, the unprotected soil is susceptible to destructive sheet and gully erosion. All these soils were developed under an oak-hickory forest.

Because of steep slope, unfavorable erosion conditions, droughtiness, or excessive quantities of gravel or chert fragments, none of the soils of this group are suitable to the production of field crops under present economic conditions. Where erosion is not so severe and the slope is not so steep, some of these soils are best suited to permanent pastures, although it may be necessary to apply lime and phosphate for the successful growth of grasses and other pasture plants. It is also advisable to furrow on the contour or to terrace these slopes before seeding. Where erosion has been severe, however, these soils can probably be utilized best for forest. All these soils that now are forested should remain so. At present only about 4 percent of their aggregate area is in field crops of any kind. The crops consist largely of corn, lespedeza, wheat, and tobacco. About 50 percent of these soils is in forest, and the rest is in idle brushland, or idle open land.

The series included in this group are Lexington, Brandon, Atwood, and Bodine. The Lexington and Brandon soils are developed from a shallow covering of loessial materials over Coastal Plain materials. The Coastal Plain materials in the Lexington soils consist of sand, clayey sands, or sandy clays, whereas in the Brandon soils they consist of gravelly materials. The Atwood soils are developed almost wholly from sandy Coastal Plain materials. The Bodine soils are developed from a shallow covering of loessial materials over a highly weathered cherty limestone.

Lexington silt loam.—Lexington silt loam is developed under good drainage conditions from a shallow covering of loess over Coastal Plain material, the latter being chiefly stratified sands, sandy clay, or other sandy materials. It differs from Memphis silt loam mainly in having a large quantity of sandy material above a depth of about 42 inches.

The surface half inch of Lexington silt loam in undisturbed or virgin areas consists of dark grayish-brown silt loam and contains much organic matter in varying stages of decomposition. The organic matter is derived largely from oak and hickory leaves and twigs. This layer is underlain by light grayish-brown smooth mellow silt loam. After the land is cultivated the surface soil becomes light brown with a slightly grayish cast and becomes more gray when dry.

Below a depth of about 6 inches the material is yellowish-brown friable silt loam. At a depth of 9 to 12 inches this grades into bright yellowish-brown silty clay loam or clay loam that has a slightly reddish cast. This material is slightly compact and slightly dense but somewhat friable, and it breaks into firm subangular particles. This subsoil layer contains varying quantities of sand particles, especially in the lower part. The lower part of the subsoil below a depth of 30 to 36 inches is more friable and has a coarser, sandier texture than the upper part. Some gray coloration, especially in the cracks and channels, and a few dark or rusty-brown soft and semihard small iron concretions are common in this lower layer in places. The lower subsoil layer grades into reddish-brown or reddish-yellow stratified Coastal Plain sands or sandy materials, containing some gravel in places. Mica flakes and ferruginous or iron-cemented sandstone rocks are common in some of the Coastal Plain material. The reaction is medium to very strongly acid, except in the dark thin surface layer in virgin areas, which is slightly acid in places.

Lexington silt loam occurs only in the rougher sections of the uplands, and most of it has a slope of 10 to 15 percent. Surface drainage is free, and the subsoil is pervious to moisture and roots.

Where this soil has been cultivated in the customary manner for several years, only about 2 inches or less of the surface soil ordinarily remains, two-thirds or more of it having been lost as the result of sheet erosion. Where unprotected, this soil is very susceptible to gully erosion. Under clean cultivation, incipient gullies, from 5 to 8 inches deep, often form during one hard rain; and if not checked, these gradually increase until the gullies have cut to a depth of 2 to 5 feet or more. After the gully has cut through the heavier textured subsoil into the looser sand or sandy substratum, it enlarges rapidly. The loose sandy substratum washes away easily, undercutting the head and sides of the gully and causing the surface soil and subsoil to cave in above it. Some of these gullies are from 10 to 25 feet deep and from 10 to 50 or more feet wide. About 13 percent of this land is moderately gullied, and 8 percent is severely gullied.

This is not an extensive soil. The largest areas are in the extreme southwest corner of the county, north of Coldwater, west of Hico, northwest and east of Pottertown, and east and southeast of Brandon. Owing to differences in depth of the silty loess covering, the depth to and proportion of sandy materials in the subsoil varies considerably. Included in this type are areas, totaling about 0.2 of a square mile, in the southwest corner of the county where the sandy Coastal Plain material is deeper than it is in the typical soil. These areas would be mapped as Memphis silt loam, hilly phase, if their aggregate acreage justified the separation.

Approximately 70 percent of this land has been cleared and cultivated. Only about 12 percent, however, is used for crops at present;

the rest of the cleared land is covered with a growth of weeds, sedge, volunteer lespedeza, blackberries, and vines or a growth of persimmon, sassafras, wild plum, sumac, and other bushes. A large acreage has been abandoned permanently for the growth of crops, although much of it is pastured. Pastures on it are generally very poor. About 3 percent of the land is in corn, 4 percent in wheat, 4 percent in lespedeza, and 1 percent in tobacco and cotton. Yields are very low, except on newly cleared land.

Most of the merchantable timber has been cut. The present timber growth consists largely of white, black, blackjack, and red oaks, together with some dogwood, hickory, scarlet oak, shingle oak, post oak, chestnut, and beech.

Because of its slope, fairly low resistance to drought, eroded condition, or susceptibility to destructive erosion, this soil is not suited to the production of field crops under prevailing economic conditions. It can be used best either for permanent pasture or for forestry. Where the land is not gullied or has not undergone very severe sheet erosion, it can probably be used successfully for permanent pasture. If so used, it would be advisable to terrace or furrow the land on the contour and apply lime and phosphate. If this is done, a mixed pasture of lespedeza, hop clover, alfalfa, sweetclover, orchard grass, redtop, Canada bluegrass, and timothy should prove successful. Alfalfa should prove fairly successful after this treatment. Where the land is gullied or has undergone very severe sheet erosion, it can be used best for forestry. All the soil that is now forested should remain so.

Lexington loam.—Lexington loam is similar to Lexington silt loam except for texture. It has developed, however, from a thinner covering of loess or silty material, and the sandy Coastal Plain materials lie closer to the surface. Thus, a somewhat coarser texture has been produced in the surface soil and the subsoil than in the silt loam. The surface layer consists of light grayish-brown mellow loam, and the subsoil is fairly friable clay loam that is slightly plastic and sticky when wet. The subsoil is bright yellowish brown to reddish brown and in many places is somewhat more red than the subsoil of Lexington silt loam. Owing to the larger proportion of sand in the surface soil and the subsoil, the loam absorbs water slightly faster than the silt loam; consequently it is slightly less erodible. Its inherent fertility, however, is slightly lower. The slope ranges from 10 to 15 percent.

The total area of Lexington loam is not large. Many relatively small areas are scattered over the rougher uplands, especially east and southeast of Pottertown and in the vicinity of New Concord. It is associated with its smooth and steep phases, Lexington silt loam, and Atwood fine sandy loam.

The present use, crop adaptations, yields, and recommendations for this soil are very similar to those of Lexington silt loam.

Lexington loam, steep phase.—This phase differs from typical Lexington loam chiefly in having a steeper slope, the gradient ranging in most places from 15 to 30 percent, although a few areas have a somewhat steeper slope. Because of the steeper gradient, less rainfall is absorbed, surface runoff is excessive, and the soil is less drought-resistant, as compared with those features of the typical soil. Under

the usual field conditions two-thirds or more of the original 6-inch surface soil has been lost by erosion.

The surface soil of some of the areas of this phase consists of silt loam, and these areas would be mapped as Lexington silt loam, steep phase, if their size and aggregate acreage justified the separation. Several of these areas are in the southwest corner of the county, and here they are most common on the north- and east-facing slopes. In addition to this textural variation, there are also local variations in the color, texture, and consistence of the subsoil.

The total area of this phase is not large. The principal areas are south of Protemus, east and south of Pottertown and New Concord, and north of Backusburg. This soil is associated with Lexington loam, Lexington silt loam, Atwood fine sandy loam, and Brandon silt loam, steep phase.

Approximately 22 percent of this land has been cleared of its timber, although only 4 percent or less is used for the production of crops at present. The crops grown consist largely of corn, tobacco, cotton, and lespedeza. Yields are very low. The rest of the cleared land has been largely abandoned. Most of the merchantable timber has been cut. The present forest cover is predominantly oak, intermixed with some hickory and beech.

This soil is best adapted to forestry, because of its steep relief, marked erodibility, and low resistance to drought.

Brandon silt loam.—Brandon silt loam is developed under good drainage conditions from a shallow covering of loess, which overlies stratified gravelly Coastal Plain materials at a depth of less than 3½ feet. It resembles Lexington silt loam, except for the larger quantity of gravel in the soil proper and the extremely gravelly substratum (pl. 4, *A*).

Under cultivation but where no erosion has taken place, the 6-inch surface soil consists of light-brown, brown, in places slightly grayish-brown, silt loam. It is underlain by yellowish-brown silt loam, which grades at a depth of about 12 inches into bright yellowish-brown silty clay loam or clay loam having a slightly reddish tinge. This subsoil layer is somewhat friable, although slightly compact, and it generally contains a few small rounded pebbles. With increase in depth below a depth of about 22 inches the quantity of gravel increases. At a depth of 24 to 40 inches this material overlies the substratum, which consists largely of stratified gravel with some interstitial clayey and sandy materials. The gravel is slightly to moderately compact, but generally it is unconsolidated, although lenses or layers of it in some places are cemented by ferruginous materials into conglomerate rocks (pl. 4, *A*). The gravelly material is light brown, yellowish brown, or reddish brown, and slight gray mottling is present here and there in the interstitial material in the upper part of the layer. The gravel is well rounded and consists of chert and some quartz. The individual pebbles range from very small to as much as 5 inches in diameter in some places. Here and there a few pebbles occur in the surface soil and in the upper part of the subsoil.

In virgin areas the surface half inch is dark and contains a considerable proportion of organic matter, consisting largely of partly decomposed oak leaves and twigs. It is underlain by 2 or 3 inches of light grayish-brown silt loam. The reaction is very strongly to medium

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acid, except in the dark, thin surface of virgin areas, which is slightly acid in places. The depth of the silty loessial material over the gravel and the content of gravel in the surface soil and subsoil vary considerably.

This soil occurs throughout most of the rougher parts of the uplands and occupies a slope of 10 to 15 percent. Surface drainage is free, and the subsoil is porous enough to allow good percolation of water. Here and there, however, the downward movement of water and roots are checked by a cemented condition in the gravel beds. Where the gravelly substratum is loose or is near the surface, crops are easily injured by drought. The soil is susceptible to very severe sheet and gully erosion. Where it has been cultivated in the customary manner for a few years, two-thirds or more of the original 6-inch surface soil has been lost as a result of sheet erosion. It is estimated that 13 percent of this soil is moderately gullied and 8 percent is severely gullied. Gullies do not become extremely large, however, as in the Lexington soils.

This is an extensive soil. It is associated with its slope and steep phases, Brandon gravelly loam, Providence silt loam, and Grenada silt loam. Included in this type are about 4.4 square miles of a soil that has a gray mottled slightly compact lower subsoil layer just above the extremely gravelly substratum. This variation resembles Providence silt loam, except that it occurs on a slope of 10 to 15 percent and the lower part of the subsoil is less gray, less compact, thinner, and more permeable to water. It occurs as rather small areas scattered throughout the rougher uplands. In about 1 square mile of this variation the Coastal Plain material occurs at a depth greater than 3½ feet. This variation is slightly better than the typical soil.

The crop adaptations, present use, crop yields, and recommendations for the use of this soil are similar to those for Lexington silt loam. It is not suited to the production of field crops and can be used best for permanent pasture or forestry. Because of the gravelly substratum, however, it is not so well suited to either of these uses as is Lexington silt loam.

Brandon silt loam, steep phase.—This soil differs from typical Brandon silt loam chiefly in having a steeper slope, the gradient ranging from 15 to 30 percent. A few areas have a somewhat steeper slope. Because of the steeper slope, less rainfall is absorbed, surface runoff is excessive, and resistance to drought is lower, as compared with those features of Brandon silt loam. Under field conditions it is more susceptible to severe sheet and gully erosion than the latter soil.

This soil is variable in gravel content and in depth to the gravelly substratum. Many small areas are included that have a small to moderate quantity of gravel on and in the surface soil, especially on the slopes facing the south and west. Typically, the depth to the gravelly substratum is less than in Brandon silt loam, but this depth varies from place to place. The gravelly substratum generally lies at a greater depth near the top of the slopes and at a slighter depth in the lower part of the slopes. In general, the surface soil is slightly shallower and the subsoil is somewhat lighter in texture than in Brandon silt loam.

The total area of this soil is fairly large. It occurs throughout the rougher uplands except in the southwest corner of the county. It is

associated with Brandon silt loam and Brandon gravelly loam, steep phase. Approximately 65 percent of this soil is in forest, 30 percent in idle open farm land, and 3 percent in corn; the rest is in farmsteads or in other crops. The productivity is very low, except during the first 3 or 4 years after the soil is cleared. The soil is difficult to work, and it presents difficult problems of conservation when tilled regularly. Under average conditions this soil is probably best adapted to forest.

Rough gullied land (Brandon soil material).—This separation comprises areas that have been so severely eroded as to make them practically valueless as crop or pasture land and impracticable for reclamation as such except over very long periods of time (pl. 4, *B*). Gullies cover about 50 percent or more of the area, and they range from 2 to 10 feet or more in depth. Here and there isolated spots between the gullies retain a part of the original surface soil and furnish very scant pasturage. Many small areas of severely gullied land similar to this are too small to show on the map.

Approximately 4 square miles of this land is mapped. Less than 0.1 square mile of it lies on a slope of 2 to 5 percent, about 1 square mile lies on a slope of 5 to 10 percent, 2 square miles on a slope of 10 to 15 percent, and 1 square mile on a slope of 15 percent or greater. Although Brandon silt loam is the predominant soil in this separation, gullied areas of other Brandon soils and of Providence, Grenada, Lexington, Memphis, Bodine, and Atwood soils are included. Small areas are scattered throughout the rolling and hilly parts of the county.

It is impracticable to reclaim this land for field crops or pasture; consequently, it can be used best for the growing of trees during and after the checking of the erosion.

Brandon gravelly loam.—Brandon gravelly loam differs from Brandon silt loam chiefly in having a shallower covering of loessial material, a considerable amount of gravel on the surface, in the surface soil, and in the subsoil, and a redder subsoil.

In the undisturbed forest, the surface half inch is dark grayish-brown gravelly loam containing many partly decayed leaves and twigs, largely from oaks. The 6-inch surface soil is light-brown gravelly loam having a slightly grayish cast. It is underlain to a depth of about 12 inches by yellowish-brown gravelly loam. The subsoil is reddish-brown heavy gravelly loam or gravelly clay loam that is more or less friable but is sticky and plastic when wet. Below a depth of 24 to 30 inches the texture becomes lighter and the content of gravel increases, as the soil grades into reddish-brown stratified gravel containing some interstitial material.

This soil varies considerably from place to place on the slopes, owing to variation in thickness of the loess and in the nature of the stratified Coastal Plain material. Here and there strata of sandy materials underlie or are intermixed with the gravelly strata, and in some places they outcrop. In such places the surface soil is gravelly sandy loam or gravelly loamy sand, and the subsoil is gravelly clay loam, gravelly loamy sand, or sandy material that is largely free of gravel. The quantity of gravel on the surface varies considerably, generally being much greater on the south and west slopes.

The gravel is well rounded and consists largely of chert with some quartz. Individual pebbles are as much as 5 inches or more in

diameter, the larger pebbles being more common in the eastern part of the county. The gravel ranges from loose to moderately compact and generally is unconsolidated, although there are many lenses or layers of ferruginous cemented gravel in the soil and substratum. This conglomerate material outcrops in many places on steep slopes, as rocks several feet in diameter.

This soil has a medium to very strongly acid reaction, except in the dark, thin surface layer in virgin areas, which is only slightly acid in places. The organic-matter content is low. The soil occurs on the rougher uplands where the slope ranges from 10 to 15 percent. External drainage is free to excessive, and internal drainage is good to excessive. The soil is subject to very severe erosion when unprotected, the erosion conditions being similar to those of Brandon silt loam.

Only a small total area is mapped. Approximately 35 percent of the land is in forest, 60 percent is in idle open land, and less than 5 percent is used for crops, chiefly corn, wheat, and lespedeza. Yields are very low. This soil is best adapted to forestry because of its hilly relief, erodibility, large content of gravel, low resistance to drought, and low inherent fertility.

Brandon gravelly loam, steep phase.—This soil differs from typical Brandon gravelly loam chiefly in having a steeper slope—in excess of 15 percent—which increases surface runoff, droughtiness, and erodibility. It is somewhat more variable than the latter soil and generally has more gravel on the surface. It occurs throughout most of the rougher uplands, with the exception of the southwestern corner of the county. Several areas in the vicinity of Pottertown and New Concord are included that resemble Atwood gravelly sandy loam and Atwood gravelly loamy sand but could not be separated consistently on the map because of lack of uniformity.

A large area of this soil is mapped. About 76 percent of it is in forest, 19 percent is in idle open land, 2 percent is used for farmsteads, and 3 percent is used for crops, mostly corn, wheat, and lespedeza. This soil is best adapted to forestry because of its steep slope, very severely eroded condition, large content of gravel, low resistance to drought, and low inherent fertility.

Brandon gravelly loam, smooth phase.—This soil differs from typical Brandon gravelly loam chiefly in having an undulating to gently rolling relief, the slope ranging from 2 to 10 percent. Drainage is good to excessive, and the soil is subject to harmful sheet erosion and gullying when unprotected. The content of gravel in places is higher than in Brandon gravelly loam.

The aggregate area of this soil is very small. Bodies are scattered over the hilly eastern part of the county, generally at the ends of long, narrow ridge tops. A few areas of gravelly sandy loam are included.

Practically all of this land is in forest, and it is best adapted to this use because of its large content of gravel, very low resistance to drought, and very low fertility.

Atwood fine sandy loam.—Atwood fine sandy loam is developed in the uplands almost wholly from sandy Coastal Plain materials. Under virgin conditions the dark surface half inch is underlain by 3 to 5 inches of yellowish-gray or brownish-gray fine sandy loam, which in turn is underlain by grayish-yellow fine sandy loam. This layer

is slightly reddish in the lower part, and at a depth of about 13 inches it grades into reddish-brown clay loam or sandy clay loam. This subsoil layer is rather friable but is moderately sticky and plastic when wet. Below a depth of 26 to 30 inches the color is less red and the texture is lighter. The substrata consist of unconsolidated, stratified sandy materials. There are ferruginous cemented fragments of sandstone rock in these substrata, and loose fragments of these rocks are on the surface in places. Scattered gravel is present in some areas.

This soil is very low in organic matter and is strongly to medium acid. The slope ranges in most places from 15 to 30 percent, although areas are included that have a slope of 10 to 15 percent or more than 30 percent. Surface drainage is free to excessive, and internal drainage is good. When unprotected, the soil is subject to very severe sheet and gully erosion. Under cultivation, the soil has lost two-thirds or more of the original 5-inch surface soil by sheet erosion, and gullies are common.

The total area of this soil is small. Most of the bodies are south and east of Pottertown, in the vicinity of New Concord, and in the southwest corner of the county. The soil is associated with Lexington loam and its steep phase, Lexington silt loam, and Brandon gravelly loam. About 0.2 of a square mile has a loamy sand surface soil and a loose light-textured subsoil. This variation is near New Concord and Hico and in the southwest corner of the county.

Approximately 85 percent of this land is in forest, and less than 4 percent is used for field crops, chief of which are cotton and corn. This soil is best adapted to forestry, because of its steep slopes, susceptibility to erosion, fairly low resistance to drought, and low fertility.

Bodine loam.—Bodine loam is developed in the uplands from a thin covering of loess over highly weathered cherty limestone materials. Under virgin conditions the dark surface half inch is underlain with grayish-brown or light-brown material. The texture of this layer is generally loam, although in many areas it is silt loam. Below a depth of 5 or 6 inches the material is yellowish-brown heavy loam. At a depth of about 10 inches this grades into bright yellowish-brown, in places slightly reddish, silty clay loam that is somewhat friable but slightly compact. The above layers in some places contain small quantities of small angular chert fragments, these fragments gradually becoming more abundant with depth. At a depth of about 20 to 30 inches the subsoil grades into a moderately to slightly compact mass of angular chert fragments containing gray and yellowish-brown mottled light clay loam interstitial material. Gray mottling is also common in a thin layer immediately above the extremely cherty substratum. This cherty material extends downward for several feet. Although this cherty mass is derived from limestone, it contains calcareous material only here and there.

This soil is low in organic matter and is medium to very strongly acid, except in the dark, thin surface layer, which is only slightly acid in places. The slope generally ranges from 15 to 30 percent, although about 1.3 square miles of it has slopes of 10 to 15 percent and a few areas have slopes greater than 30 percent. Surface drainage is free to excessive; internal drainage is good in the upper part but is slow in the lower extremely cherty substratum. The upper part of this

substratum is slightly cemented in places. When unprotected the soil is subject to very severe sheet and gully erosion, although the cherty substratum prevents the gullies from becoming very deep. Under cultivation, two-thirds or more of the original 6-inch surface soil has been lost as a result of sheet erosion.

The total area of this soil is not large. It occurs only in the hilly eastern part of the county or in the breaks of the Tennessee River. It is associated with its smooth phase, Bodine cherty loam, Brandon gravelly loam, and Brandon silt loam, steep phase. A large part of it occupies slopes facing the north and east. On other slopes the amount of chert on the surface and in the soil is somewhat greater than typical.

It is estimated that 75 percent of this soil is in forests, and less than 3 percent is used for field crops, chiefly corn. This soil is best adapted to pasture or forestry. Where they are not gullied or very severely sheet eroded, the gentler slopes probably can be used successfully for permanent pastures, if lime and phosphate fertilizers are applied. Where the soil is gullied or severely sheet-eroded, it can be used best for forestry. All of the land now in forest should remain so.

Bodine cherty loam.—Bodine cherty loam differs from Bodine loam chiefly in having a much greater quantity of chert fragments on the surface and in the upper part of the soil (pl. 5, *A*). Angular chert fragments, ranging from small pieces to pieces about 10 inches in diameter, are common on the surface and are present throughout the surface soil and the subsoil in varying amounts. Many of the steeper slopes are practically covered with chert, especially those facing the south and west. Typically, the extremely cherty substratum layer lies at a shallower depth than in Bodine loam.

This soil is in the hilly eastern part of the county, on slopes of 15 percent or greater, although about 0.3 of a square mile is included with slopes of 10 to 15 percent. Because of the chert fragments on the surface, erosion is slightly less serious than on Bodine loam. The total area of this soil is 7 square miles. It is associated with Bodine loam.

Approximately 95 percent of this soil is in forest, and practically none of it is cultivated. This soil is best suited to forestry because of its high content of chert and its steep slope.

SOILS OF THE ALLUVIAL FIRST BOTTOMS

Soils of the alluvial first bottoms comprise about 20 percent of the area of the county. The soils vary greatly in color, texture, drainage conditions, source of parent material, reaction, and organic-matter content. Many of them are subject to frequent overflow and are limited in their crop adaptations. To show their agricultural relationships better, the soils of this group are further subdivided, on the basis of their natural drainage, into well-drained soils, imperfectly drained soils, and poorly drained soils.

WELL-DRAINED SOILS

The subgroup of well-drained soils includes all soils of the alluvial bottoms that are well drained. The soils have brown, light-brown, or grayish-brown surface soils and subsoils of similar or somewhat lighter colors but without gray mottling. The system of agriculture currently practiced on them consists largely of the raising of corn

together with small acreages of lespedeza, redtop, timothy, soybeans, wheat, tobacco, and strawberries. Because of susceptibility to overflow, good moisture relationships, and higher inherent fertility of these soils, corn is fairly well adapted to them, and it is often grown continuously on some of them. Fertilizer, lime, or manure is rarely used, except for tobacco.

The Vicksburg, Shannon, Huntington, and Egam series are included in this group. The Vicksburg soils are developed from alluvium derived almost wholly from loess. The Shannon soils are developed from alluvium derived from mixed Coastal Plain, loess, and cherty limestone materials. The Huntington and Egam soils are developed from Tennessee River alluvium. The Huntington soils have friable subsoils and are slightly acid to neutral in reaction. The Egam soils have compact subsoils and are medium to strongly acid.

Vicksburg silt loam.—Vicksburg silt loam occurs on well-drained first bottoms, the material of which has been washed largely from areas of loess. The surface soil consists of about 8 inches of brown to light-brown smooth mellow silt loam having a slightly grayish cast. It is underlain to a depth of 36 inches or more by brown or light-brown very friable silt loam that in many places is slightly yellowish or very slightly reddish. In places the material contains some gray and rusty-brown mottling below a depth of 36 inches. Dark iron concretions are not typical of this soil, although here and there a few occur in the lower part of the soil. Typically, the substratum below this depth consists of friable silt loam, but in many places it is stratified and consists of loam or sandy loam textures. Scattered pebbles or appreciable quantities of sand occur here and there in the surface soil or subsoil, especially near stream channels where the creeks have overflowed and deposited coarse-textured materials. Many scattered areas have a silt loam surface soil and a fine or very fine sandy loam subsoil below a depth of about 2 feet. This soil is medium to very strongly acid. The organic-matter content is low, but it is somewhat higher than in soils on the uplands or terraces.

The aggregate area of Vicksburg silt loam is not large. It is chiefly on the alluvial flood plains of the rivers and creeks in the western half of the county, especially Clarks River, West Fork Clarks River, and Rockhouse Creek, and it is commonly associated with Collins silt loam and Shannon loam. As mapped, it includes small areas of either of these two soils.

Surface drainage is generally slow. Although it retains moisture well, the subsoil allows good percolation and aeration, allows very good penetration of roots, and withstands drought well. All this land is subject to the usual overflow of the streams, although the overflow seldom lasts more than 1 or 2 days. Local scouring from the floods sometimes occurs, while depositing of sediments may be going on in other spots. Workability and tilth conditions are excellent.

Vicksburg silt loam is one of the most productive soils of the county, but its adaptation to crops is rather limited because of its susceptibility to floods. It is estimated that 65 percent of this soil is used for corn, 5 percent for lespedeza, 4 percent for wheat, 2 percent for cowpeas and soybeans, 2 percent for tobacco, 2 percent for redtop, and 10 percent for forest; and 8 percent is in idle open fields. The present

timber growth consists predominantly of white, red, black, post, southern red, swamp white, and swamp chestnut oaks, sweetgum, tupelo gum (black gum), sycamore, beech, tuliptree, silver maple, red maple, and river birch.

This is one of the best soils for corn in the county, because of its good moisture relationships, high fertility, and good workability; and corn is often grown on it continuously for several years. Only a little of it has been limed, and fertilizers are rarely used except for tobacco. Corn yields about 38 bushels an acre under the usual practices, and yields of 50 bushels are obtained after good cultural practices and liming. Failures of corn are very rare. Tobacco yields about 800 pounds, but this crop is subject to danger from overflows and diseases. Moreover, the tobacco tends to be coarse in quality and generally sells at a low price. Wheat yields about 8 bushels without the use of lime and phosphate and 14 bushels with it. This crop also is subject to danger from winter and spring floods. Lodging may result from a rank growth, and the grain is often chaffy and contaminated with onion and seeds of other weeds. Lespedeza, redtop, timothy, cowpeas, and soybeans succeed well on this soil. The latter two crops are commonly used as substitute crops after a spring flood, and yields average about 1.5 tons. Lespedeza yields average about 1 ton, timothy about 1.5 tons, and redtop about 1 ton without lime or phosphate. Strawberries and raspberries do very well if protected from overflows.

In the management of this soil, better results would be obtained if a rotation including legumes and grasses were followed, additional organic matter incorporated, and light applications of lime and phosphate added.

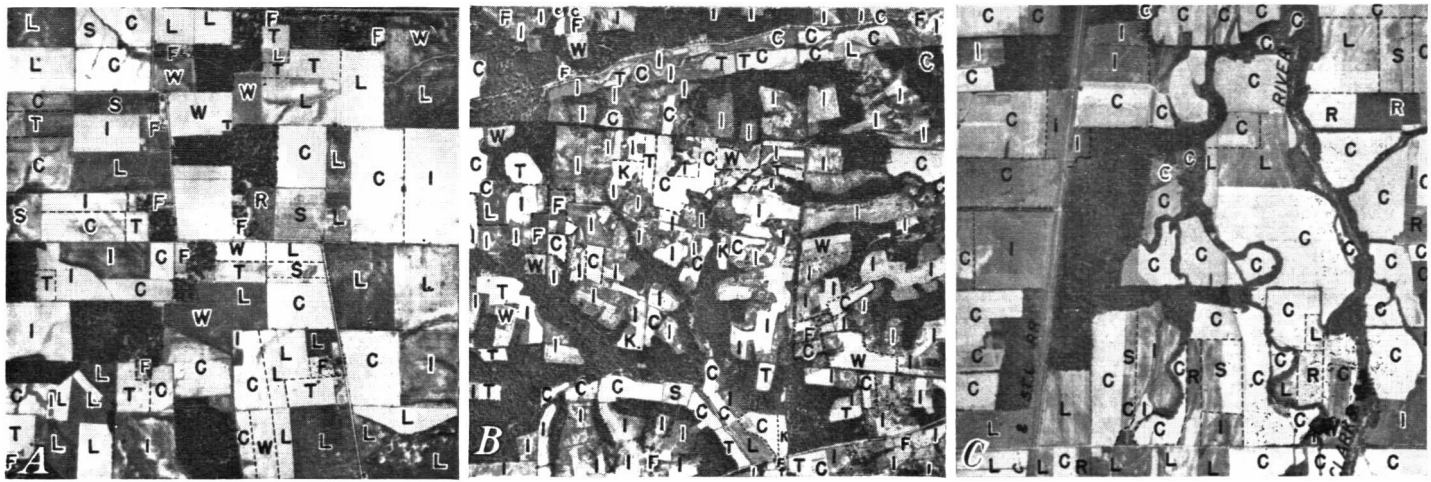
Shannon loam.—Shannon loam is developed on first bottoms under good natural drainage conditions from materials originally washed largely from soils developed from shallow loess and Coastal Plain materials. It resembles the Hymon and Beechy soils in source of parent materials but differs from them in being well drained. It resembles the Vicksburg soils in being well drained but differs from them in texture and source of parent material.

The surface soil to a depth of about 8 inches is light brown, in many places slightly grayish, mellow loam. It is underlain by light-brown or slightly yellowish-brown very friable loam. With increase in depth, the subsoil in many places becomes more yellow, although in some places it is slightly reddish. The subsoil is everywhere very friable and porous and allows very good internal movement of air and penetration of roots. In many places the subsoil and the substratum are stratified and in some places contain variable light-textured materials ranging from a loam to a gravelly sand. Varying quantities of pebbles are present in places throughout the soil.

Small mica flakes occur in this soil, especially along Jonathan, Beechy, Sugar Tree, Duncan, and Grindstone Creeks. Concretions are not characteristic. The organic-matter content is low. In wooded areas the surface inch has a slight accumulation of organic matter. The entire soil is medium to strongly acid. Tilth conditions of the surface soil are excellent.

The aggregate area of this soil is about 7.7 square miles. It occurs on the nearly level flood plains of the creeks and smaller rivers in the

A, Forest on Bodine cherty loam near Brandon. Generally the chertier the soil the lower the fertility and the sparser the vegetation. Chert is seen on the surface and it is present also throughout the soil mass. *B*, Shannon cherty loam in foreground, about 2 miles northeast of Hico. Forest in left background is on Bodine cherty loam.



Utilization of three typical square miles: *A*, Smoother uplands, 3 miles southeast of Murray. *B*, Rougher uplands, 3 miles northeast of Pottertown. *C*, Alluvial bottoms, 3½ miles north of Murray. Explanation of letters in the three areas: C, Corn; F, farmstead; K, cotton; I, idle open fields; L, lespedeza; R, redtop and timothy; S, soybeans and cowpeas; T, tobacco; W, wheat.

more hilly parts of the county, especially along the streams that drain areas of the Lexington, Brandon, or Atwood soils, and it is associated geographically with its colluvial phase, Vicksburg silt loam, and Hymon loam. Throughout an area of about 1 square mile the surface soil and generally the subsoil contain considerable quantities of gravel. These areas are indicated on the map by gravel symbols. There is also an aggregate area of 0.2 of a square mile that has a sandy loam or loamy sand surface soil. These variations are more droughty and less productive than the typical soil. A few small areas have a surface layer of silt loam.

The surface of this soil is flat, although there are small local undulating areas. Surface drainage is good to slow. The subsoil allows good percolation of water, and the water table is sufficiently low not to interfere with good drainage. The soil is subject to the usual overflow from the creeks and rivers that it borders. During these overflows, sediments may be deposited on the soil or channels may be scoured out by the running water.

Shannon loam is very similar to Vicksburg silt loam in crop adaptations and present use. Where sandy or gravelly materials are not abundant, this soil is practically as high in productivity as the latter soil; but considering the type as a whole, yields average from 5 to 10 percent below those on the latter. It is not quite so drought-resistant as Vicksburg silt loam. Suggestions for improving this soil are similar to those for the Vicksburg soil.

Shannon loam, colluvial phase.—This phase differs from Shannon loam chiefly in position. It occupies gently or very gently sloping alluvial fans formed by small streams emerging onto the flood plains of larger creeks, or narrow U-shaped bottoms along deeply entrenched stream beds. The subsoil may be slightly more yellow or red than that of Shannon loam, and the textures of the surface soil and the subsoil vary more than in the latter soil. Most of the areas are not flooded by the usual overflow, although the lower lying areas are flooded by exceptionally high waters. Surface drainage is good, and internal drainage is good to free.

The aggregate area of this soil is small. It occupies relatively small areas scattered throughout the rougher parts of the county having a slope of 0 to 5 percent. A few small areas are included that have slightly heavier and slightly more compact subsoil than is typical. These areas would be mapped as a distinct soil if their aggregate acreage justified the separation. Throughout about 2.4 square miles of this soil the surface soil is gravelly loam and the subsoil contains variable quantities of gravel. These gravelly areas are more droughty and less productive than the typical soil, and they are indicated on the map by gravel symbols.

This soil is better adapted to a wider variety of crops than is Shannon loam, owing to less danger from overflow. About 50 percent of it is used for corn, 10 percent for tobacco, 8 percent for lespedeza, 5 percent for wheat, 2 percent for redtop, 1 percent for strawberries, 2 percent for soybeans and cowpeas, and 10 percent for forest; and 10 percent is in idle open fields. Some of the lighter textured soil is used successfully for melons.

Tobacco, wheat, cotton, sweetpotatoes, and strawberries are better suited to this soil than to typical Shannon loam because of less danger of injury from overflow. Tobacco is usually of coarse quality, but

wheat and strawberries do well on it. It is one of the best soils in the county for strawberries and raspberries. In years when floods occur, yields of most crops are higher than on Shannon loam; but in years when floods do no damage, yields on it are about the same as or slightly less than on the latter soil. Under the usual farm practices where no lime or phosphate is used, corn yields an average of about 34 bushels, wheat 11 bushels, strawberries 65 crates, cotton 700 pounds of seed cotton, and lespedeza 1 ton to the acre. Tobacco yields average about 850 pounds with a complete fertilizer. Only a very little of this soil has been limed, and fertilizers are rarely used except for tobacco. Deep-rooted legumes should do well on it after liming. Fruit trees and vegetables also grow well on it. The suggestions for improving this soil are the same as for Vicksburg silt loam.

Shannon cherty loam.—Shannon cherty loam is developed from alluvium washed largely from the Bodine, Atwood, Brandon, and Lexington soils. The surface soil is grayish-brown or light-brown cherty loam, and the subsoil is light-brown friable cherty loam that is generally stratified. The surface soil and the subsoil contain a large quantity of angular chert fragments that are as much as 3 inches or more in diameter. Rounded pebbles are more or less common. The texture of the surface soil and the subsoil varies greatly from place to place. This soil is medium to slightly acid, and the organic-matter content is relatively low. It is well drained.

The aggregate area of Shannon cherty loam is small. The bodies are in the well-dissected eastern part of the county, associated with areas of the Bodine and other Shannon soils (pl. 5, *B*). They occupy gently sloping alluvial fans at the bases of steep hills where small streams emerge onto the flood plains of larger streams or as narrow U-shaped bottoms along streams. The bodies are above the ordinary floods, although some of the lower lying ones may be overflowed in exceptionally high floods. The slope ranges from very gentle to about 5 percent, but erosion is negligible.

About 25 percent of the total acreage of this soil is used for corn, 4 percent for tobacco, and 20 percent for forest; and 45 percent is idle open fields. The rest is used for cotton, lespedeza, and redtop. Because of the large quantity of chert fragments and gravel, yields are rather low. Corn yields about 20 bushels an acre. Tobacco yields about 700 pounds with fertilizers, although the quality of the leaf is generally poor. Yields of other crops are about 30 to 35 percent less than those on Shannon loam, colluvial phase. Recommended management practices are similar to those for the latter soil.

Huntington silt loam.—Huntington silt loam is a well-drained soil developed on the first bottoms along the Tennessee River. The surface soil consists of brown friable silt loam. It overlies a subsoil of similar material, although generally it is slightly lighter colored and slightly finer textured. In many places the subsoil is stratified and a darker layer is present below a depth of about 10 inches. Roots and water easily penetrate the friable subsoil. A large quantity of mica occurs throughout the entire soil mass, and a small quantity of iron concretions are common in a few places. This soil has a moderate content of organic matter, and it is slightly acid to neutral in reaction, although the subsoil of some areas is medium acid. It is the

least acid of any soil in the county. In many of the areas the texture of the surface soil is loam, and in a few places the subsoil is heavier textured than is typical.

This soil occurs in the first bottoms of the Tennessee River. The larger areas are near Fort Heiman and Pine Bluff Ferry and on the islands in the river. It is developed from material washed largely from the limestone uplands of the drainage basin of the Tennessee River, and it also contains material derived from the sandy, loessial. and other soils of the basin. The soil generally occupies a natural levee position adjacent to or near the riverbank. Occupying this position, it is somewhat higher in elevation than the bottom land farther away from the river; consequently it is not inundated by floods so quickly as are the associated soils of the first bottoms. It is covered by most of the floods of the river, however, and sediments are often deposited on it during inundations. Although lying on a flood plain, its surface has local undulations, and in places the slope is as steep as 10 percent. It has good drainage and is very drought-resistant.

Only a very small total area is mapped. About 0.3 of a square mile of this is sufficiently sandy to be classified as Huntington fine sandy loam, but because of its limited acreage it is included with the silt loam. The surface of this sandy variation is brown mellow fine sandy loam, and the subsoil is similar to that of the silt loam, although generally lighter colored. The lower part of the subsoil is distinctly stratified in most places.

Huntington silt loam is one of the most fertile soils in the county, and it is the most productive soil for corn. Practically all of it is cleared. About 90 percent of it is in corn; the rest is used for soybeans, lespedeza, and oats for hay. The average yield of corn is about 40 bushels an acre, although in the more favorable seasons the yield is 50 to 60 bushels. No lime, fertilizer, or manure is applied; and corn is often grown on the same land continuously for many years. Soybeans average about 2 tons of hay to the acre, and lespedeza and grass do well on it when not damaged by overflows. Oats for hay also do very well, but cotton grows rank and does not mature well. The soil produces a low quality of tobacco, and the danger of inundation makes perennial and fall-sown crops hazardous. The sandy areas are slightly less drought-resistant and probably average 5 percent less productive than the silt loam or loam areas. Yields on this soil can probably be improved by the use of a suitable crop rotation that includes a legume and by the addition of as much organic matter as is possible in the form of crop residues and green manures.

Egam silty clay loam.—Egam silty clay loam is developed under moderately good drainage on the first bottoms along the Tennessee River. It differs from Huntington silt loam chiefly in having a heavier, more compact and tough subsoil, which is medium to strongly acid.

The surface 6 to 9 inches is brown light silty clay loam. This grades into heavy silty clay loam or silty clay that has the same or slightly lighter color. This subsoil is moderately to slightly dense and compact, moderately plastic and sticky when wet, and tough and hard when dry. It contains numerous small black semi-hard pellets or iron concretions. Below a depth of about 50 inches

the subsoil grades into somewhat lighter textured, less dense, and less tough material. In many places the subsoil below a depth of about 12 inches is light to slightly yellowish brown, although a somewhat darker layer also is present in places. Mica is common throughout. The surface soil averages slightly acid and the subsoil medium to strongly acid in reaction, although this acidity varies somewhat. The organic-matter content is moderate.

Tilth conditions of this soil are not good. It requires more power to plow or work than does Huntington silt loam; and if plowed when too wet it puddles or runs together, and becomes hard and cloddy on subsequent drying. If allowed to become too dry before plowing, it can be plowed only with difficulty and breaks into cloddy pieces. It also cracks rather badly when dry. Although the soil has a high total water-holding capacity, the water held that is available to crops is not so high as in Huntington silt loam; consequently, drought injures crops sooner. In extreme drought, corn is almost a total failure on this soil.

This soil generally lies farther from the Tennessee River shore than do the Huntington soils, and it typically occupies slightly lower positions so that it is inundated by floods before those soils are. Although it lies on a flood plain, slight ridges and swales or other local undulations are common, and in some parts the slope is as steep as 10 percent. Sediments are deposited by overflow.

A small total area of this soil is mapped, all on the Tennessee River bottoms, where it is associated with the Huntington and Melvin soils. On about 0.9 of a square mile the surface layer is silt loam or loam and would be mapped as Egam silt loam if the acreage were sufficiently extensive. This variation is principally near Redden and the mouth of the Blood River, north of Pine Bluff Ferry, and east of Malory School. This lighter textured soil has somewhat better tilth and is slightly more productive than the silty clay loam. A few areas have imperfect drainage and, consequently, mottling in the lower part of the subsoil.

It is estimated that 62 percent of this soil is used for corn, 4 percent for cowpeas and soybeans, 4 percent for lespedeza, and 6 percent for forest; and 23 percent is idle open fields. Owing largely to the heavier texture, more compact and tough subsoil, poorer tilth conditions, and less favorable moisture properties, this soil is not so productive as the Huntington soils. Corn yields about 25 bushels an acre, although in favorable seasons when there is plenty of well distributed rainfall, yields may be as high as on the latter soils. Lespedeza, soybeans, and cowpeas do fairly well. Oats are frequently sown in the spring for a hay crop and ordinarily do well. Tobacco, cotton, wheat, strawberries, and perennial or biennial legumes are not adapted to this soil.

The seedbed on this soil is often insufficiently prepared. Greater horsepower or the use of tractors and plowing the soil at the proper moisture content would aid in making a better seedbed and would promote better germination and better early growth of crops. The use of a rotation that includes a legume and the plowing under of a green-manure crop, preferably a legume, would aid in improving the tilth and the other physical conditions of this soil, as well as its productive capacity. It is probably advisable to apply a light application of lime where sweetclover is to be grown.

IMPERFECTLY DRAINED SOILS

The subgroup of imperfectly drained soils includes all of such soils of the alluvial first-bottom lands. These soils have brown or grayish-brown surface soils and gray mottled subsoils. As on the well-drained soils of the subgroup just described, corn is the best adapted crop, and the system of agriculture currently practiced consists of the raising of corn with small acreages of other crops.

Most of these soils are susceptible to the usual overflows. Crops on them are apt to be injured in wet seasons; consequently they are not quite so productive as the corresponding well-drained soils.

The Collins and Hymon series comprise this subgroup. The Collins soils are developed from alluvium mainly from loess, whereas the Hymon soils are developed from alluvium derived mainly from soils developed wholly or partly from Coastal Plain materials.

Collins silt loam.—Collins silt loam is an imperfectly drained soil developed on first bottoms, from materials washed largely from loess. It differs from Vicksburg silt loam in having gray mottling in the subsoil above 36 inches.

The surface soil consists of light-brown mellow silt loam having a slightly grayish cast. It is underlain at a depth of about 7 inches by light-brown or slightly yellowish-brown friable silt loam. Below a depth of 12 to 30 inches the subsoil is mottled gray, yellow, and rusty-brown friable silt loam. With increase in depth the color becomes a mottled light gray. The substratum consists of friable material, typically a silt loam, but in many places it is stratified and consists of loam or sandy loam. Rusty-brown and dark soft and semihard iron concretions are present throughout and are most numerous and largest in the gray-mottled part of the subsoil.

The entire soil is strongly to very strongly acid. The organic-matter content is low, but it is somewhat higher than in the soils of the uplands and terraces. In wooded areas considerable organic matter has accumulated in a thin surface layer. There are scattered gravel and quantities of sand in places, especially near stream channels where the creeks have overflowed and deposited coarser textured materials. Many scattered areas have a fine or very fine sandy loam subsoil below a depth of about 2 feet.

This soil is fairly extensive. Most of the areas are on the alluvial flood plains of the Blood River and of the rivers and creeks in the western half of the county. It is associated with Vicksburg silt loam and Waverly silt loam, and it is intermediate between these two soils in profile characteristics, drainage conditions, and crop adaptations.

The surface is practically level, and surface drainage is slow. The subsoil is friable and porous enough to allow good percolation of water, good penetration of roots, and good circulation of air. The water table fluctuates, however, from a depth of several feet to 2 feet below the surface, often causing the lower part of the subsoil to be poorly drained. Tile drains or open ditches would improve most areas of this soil to a considerable extent. It is subject to the usual overflows of the streams along which it lies, and local scouring or the deposition of sediments may be expected during these floods.

The present use and crop adaptations of this soil are similar to those of Vicksburg silt loam. Yields average about 10 percent less than on that soil. In favorable seasons yields are about the same on the two soils, but in wet seasons crops are subject to more injury and yields are reduced on Collins silt loam. The recommendations for the use of this soil are similar to those for the Vicksburg soil, with the exception that artificial drainage can be expected to improve the productivity and adaptation of the Collins soil. The feasibility of such improvement, however, rests on several factors in addition to the actual response of the soil to drainage.

Hymon loam.—Hymon loam is an imperfectly drained soil developed on first bottoms, from mixed materials washed largely from soils developed from shallow loess, Coastal Plain, or cherty limestone materials. It resembles the Shannon and Beechy soils in source of parent materials but is intermediate between them in drainage condition. It resembles Collins silt loam in drainage conditions but differs from the latter in source of parent material and in texture.

The surface soil to a depth of 6 to 9 inches is light-brown mellow loam having a slightly grayish cast. It is underlain by light-brown or slightly yellowish-brown friable loam. Below a depth of from 10 to 30 inches the subsoil is gray friable loam mottled with rusty brown and yellow. The subsoil and the substratum are stratified in places, and some of the strata are variable light-textured materials ranging from loam to gravelly sand. A few pebbles occur throughout the soil in places, and iron concretions are common in the subsoil and, in many places, over the surface.

Small mica flakes are present throughout this soil, especially along Jonathan, Beechy, Sugar Tree, Duncan, and Grindstone Creeks. The organic-matter content is low, and the reaction is strongly to very strongly acid. Tilth conditions of the surface soil are excellent.

Areas of Hymon loam occupy the alluvial flood plains of the creeks and smaller rivers in the more hilly parts of the county and are associated with areas of Shannon loam and Beechy loam. About 0.6 of a square mile has a gravelly loam surface layer and a considerable content of gravel in the subsoil. This variation is indicated on the map by gravel symbols.

The surface is flat, and surface drainage is slow. The subsoil is friable and porous enough to allow good percolation of water, easy penetration of roots, and good circulation of air. The water table, however, is intermittently rather high and often causes the subsoil to be poorly drained. The soil would be benefited by tile drains or open ditches. It is subject to the usual overflows of the streams along which it occurs. Either local scouring or the deposition of sediments may occur during these floods.

The present use, crop adaptations, and recommended practices for this soil are similar to those of Collins silt loam. Yields on it average about 5 percent less than on the Collins soil. Lower yields are common where gravel is abundant.

Hymon loam, colluvial phase.—This phase is similar to typical Hymon loam in profile characteristics and parent materials. It differs from the latter soil chiefly in occupying gently sloping alluvial fans where small streams emerge into the flood plains of larger creeks, or as narrow U-shaped bottoms along deeply en-

trenched stream beds. The areas are not inundated by the usual overflows, although some of them may be covered with water for a very short time after exceptionally heavy rains. The texture of the surface soil and the subsoil varies more than in Hymon loam.

This soil occupies relatively small areas scattered throughout the more rolling and hilly parts of the county. About 0.7 of a square mile has a gravelly loam surface soil and a subsoil containing variable quantities of gravel. This variation is shown on the map by gravel symbols. Hymon loam, colluvial phase, has a nearly level to gently sloping surface, as the gradient does not exceed 4 percent. Surface drainage is slow to good, and internal drainage is sometimes retarded by an intermittently fairly high water table. Internal drainage would be good if this water table were lowered.

As danger from flooding is slight, this soil is adapted to a wider variety of crops than is typical Hymon loam. Present use, crop adaptations, yields, and recommended management practices are similar to those for Shannon loam, colluvial phase. Strawberries and tobacco yield slightly higher than on that soil because of the better moisture relations. Hymon loam, colluvial phase, is probably the best soil in the county for strawberries, raspberries, and vegetables. It is not so well adapted to deep-rooted legumes and fruit trees as is Shannon loam, colluvial phase.

POORLY DRAINED SOILS

The subgroup of poorly drained soils includes all soils of the alluvial first bottoms that are poorly drained. The soils are gray, mottled with rusty brown and yellow, from the surface downward. As on the soils of the other two subgroups, corn is the principal crop. Small acreages of redtop, lespedeza, tobacco, soybeans, and wheat are also grown. A larger proportion of these soils is in forest and in pasture, however, than of the soils in either of the two subgroups previously described. The present timber consists predominantly of southern red, black, pin, willow, swamp white, and swamp chestnut oaks, silver and red maples, winged elm, sweetgum, river birch, sycamore, and hickory. Cypress, willow, and swamp tupelo (tupelo gum) predominate in the permanently wet areas.

Because of the poor natural drainage conditions, the growing of field crops on these soils is hazardous. In favorable seasons good yields may be produced on some of these soils, but in wet seasons, part or complete crop failures are common on them all. All these soils are greatly benefited by artificial drainage, although factors other than the response of the soil to drainage may make such improvement impracticable.

The series included in this subgroup are Waverly, Beechy, and Melvin, and the miscellaneous land type riverwash. The Waverly soils are developed from alluvium washed almost wholly from soils developed from loess. The Beechy soils are developed from mixed alluvium washed from soils derived from shallow loess, Coastal Plain, and cherty limestone materials. The Melvin soils are developed from Tennessee River alluvium. Riverwash consists of sand and gravel bars in or along the Tennessee River.

Waverly silt loam.—Waverly silt loam is a poorly drained soil developed on first bottoms, the material of which was washed largely from soils derived from loess. It differs from Collins silt loam chiefly in being naturally poorly drained and in having a gray or brownish-gray surface soil.

The surface soil consists of brownish-gray or gray mellow silt loam mottled with light brown, rusty brown, and yellow. Dry fields appear light gray with a slight brownish tint. The surface inch or two in wooded areas is slightly darkened by a slight accumulation of organic matter. At a depth of from 5 to 10 inches is light-gray friable silt loam mottled with rusty brown, yellow, and grayish brown. Below a depth of 36 inches the material is variable, generally consisting of stratified silt loam, loam, and fine sandy loam.

Numerous rusty-brown and dark soft semihard and hard iron concretions on the surface and throughout the soil mass give the soil its local name of buckshot land. It is also often called white and crawfishy land. Crawfish are present in some areas. The entire soil is strongly to very strongly acid, and the organic-matter content is low. The subsoil allows good penetration of roots.

A considerable area in the Blood River bottoms about half a mile south of New Concord is slightly heavier textured than elsewhere. The surface soil is light silty clay loam, and the subsoil is silty clay loam, moderately plastic. All this area is in woods. Waverly silt loam is associated with Collins silt loam and Beechy loam, and small areas of these soils are included with Waverly silt loam.

The aggregate area of this soil is fairly large. The bodies are chiefly on the first bottoms of the creeks and rivers in the western half of the county and on the Blood River bottoms. They are on the flat alluvial flood plains and are generally away from the creek or river channels. The usual floods of the streams cover the soil; consequently it is subject to deposition and occasionally to scouring. Surface drainage is poor. The subsoil and the substratum allow fairly good percolation of water, but the water table is intermittently rather high, which causes poor internal drainage. Most of this soil responds to artificial drainage, and a few open ditches that have been dug appear to have been beneficial. No areas are tile-drained. A few areas are swampy, permanently wet or nearly so, and these are indicated on the map by swamp symbols.

It is estimated that 50 percent of this soil is used for corn, 4 percent for lespedeza, 3 percent for redtop, 2 percent for soybeans and cowpeas, 2 percent for tobacco, 2 percent for wheat, and 20 percent for forest; and 15 percent is in idle open fields, including pasture. The use of this land is limited by poor drainage and susceptibility to overflow. Crops succeed nearly as well on it in dry years as on Collins silt loam, but they commonly fail in very wet years. According to farmers, crops fail because of excessive moisture once in every 4 or 5 years. Corn, redtop, lespedeza, cowpeas, soybeans, sorgo, and moisture-loving grasses are among the better adapted crops. If the land is properly fertilized and managed, certain pasture crops appear to be particularly well suited except to the wettest areas. The moisture relationships characteristic of this soil prolong the growing season for the common pasture grasses well beyond that to be expected on the well-drained soils of the uplands. Tobacco, cotton, wheat, strawberries, and deep-rooted legumes are poorly adapted to it because of

excess water. Hay crops are often injured by deposition of sediment on them during floods, and tobacco tends to be coarse and low in quality. Those areas that are swampy, permanently wet, or nearly so are not at all suited to tilled crops and therefore are used only for pasture or forest.

Corn yields about 22 bushels an acre, wheat 3 bushels, tobacco 600 pounds, lespedeza 0.8 ton, redtop 1 ton, and soybeans 1.2 tons, under the usual farm practices.

Proper drainage will improve the productivity and adaptation of much of this soil, but such improvement may not always be feasible. The use of lime, phosphate, and possibly potash as fertilizer, the addition of organic matter, and the use of a rotation that includes a legume are considered as good practices for drained areas of this soil that are to be used for crops.

Beechy loam.—Beechy loam is a poorly drained soil developed on first bottoms, the material of which is mixed alluvium washed from soils developed from loess, Coastal Plain, and cherty limestone materials. It differs from Waverly silt loam chiefly in having a coarser texture and a mixed source of parent materials. It differs from Hymon loam chiefly in color and drainage conditions.

The surface soil is brownish-gray or mottled gray, grayish-brown, and rusty-brown mellow loam. It is underlain at a depth of 6 to 10 inches by light-gray friable loam mottled with grayish-brown, rusty brown, and yellow. This material continues downward into the substratum. The subsoil and the substratum are generally stratified and variable in texture, ranging from loam to loamy sand or gravelly loam. The texture of the surface soil also varies considerably. An abundance of rusty-brown and dark soft and hard iron concretions throughout gives the soil its local name of buckshot land.

In wooded areas the surface inch is somewhat darker, owing to a moderate accumulation of organic matter. The entire soil is medium to very strongly acid. The subsoil allows good penetration of roots. Pebbles are abundant in places on the surface and in the soil, and small mica flakes occur in many areas, especially in those along Jonathan, Beechy, Sugar Tree, Duncan, and Grindstone Creeks. Crawfish are present in some of the areas. This soil is associated with Beechy loam, sanded phase; Waverly silt loam; and Hymon loam. As mapped, it includes small areas of each of these soils.

Areas of this soil occupy the flat, alluvial flood plains of the streams in the hilly areas, chiefly in the northern and eastern parts of the county. Several large areas are along Jonathan and Sugar Tree Creeks. Surface drainage is poor, and all areas are very susceptible to overflow. The subsoil and the substratum allow good internal movement of water, but the water table is intermittently quite high, often causing the subsoil to be poorly drained. Areas that are swampy, permanently wet, or nearly so, are indicated on the map by swamp symbols. Most of the areas will respond to artificial drainage; however, the feasibility of such improvement involves engineering problems. No tile drains are used, but a few areas have been drained with open ditches.

About 0.8 of a square mile has a sandy loam or loamy sand surface layer and stratified light-textured subsoil. This variation is less productive than the typical soil. A few small scattered areas

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are included that have a dark brownish-gray surface soil underlain by a light-gray mottled subsoil at a depth of 6 to 10 inches. These areas are very wet, and a comparatively large quantity of organic matter has accumulated in the surface soil. Another inclusion, covering about 0.4 of a square mile, consists of very gently sloping alluvial fans of small streams emerging into flood plains of larger streams. This variation is above the usual overflow, but it receives seepage water from adjacent hills.

The present use, crop adaptations, and recommendations for the use of this soil are similar to those for Waverly silt loam, except that a slightly smaller proportion is in corn and a larger proportion is in idle open fields. Yields average about 5 to 10 percent less than on the latter soil, owing to the lighter texture and the slightly lower inherent fertility.

Beechy loam, sanded phase.—This name designates areas of Beechy loam that have been buried by a recent overwash of sandy or sandy and gravelly material to a depth of 2 to 20 inches. The overwash consists of yellowish, brownish, or reddish loose incoherent sand, or sandy gravelly materials. In some places this material is stratified; everywhere it is variable. In a few included areas the underlying soil consists of Waverly silt loam.

This phase has been formed by the spilling of coarse-textured wash from stream channels over the adjacent soils in places where the gradient of the stream channel is reduced or checked or where the channels become filled with sand, gravel, or other materials, causing the water of the channel to spread over the adjoining land. Most of the areas either have no definite channel now or have several small channels instead of the original larger one. A few areas are included that have been formed by spilling wash over the original bottom soils from nearby severely gullied hillsides.

These areas are poorly drained. Most of them have been cleared of the original timber, but none are used for field crops at present. Most of them have grown up in brush, consisting mainly of willow, sweetgum, silver and red maples, river birch, and buttonbush. Some have a growth of cattails and water-loving sedges and grasses.

Under the present conditions of drainage, this soil is best suited to pasture or forest. Only a very small total area is mapped.

Melvin silt loam.—Melvin silt loam is a poorly drained soil developed on the first bottoms along the Tennessee River. The surface soil is brownish-gray or mottled gray, rusty-brown, and yellow friable silt loam from 4 to 6 inches thick. Under virgin conditions there is a very thin darker surface layer. The subsoil is light-gray friable loam or silt loam mottled with yellow, rusty brown, and brownish gray. It rests at a depth of a few feet on variably textured stratified material. Rusty-brown or black concretions are numerous throughout, and because of this feature this soil is called buckshot land. A moderate quantity of fine mica flakes is distributed throughout this soil, and crawfish activity is evident in many areas. The reaction ranges from medium to strongly acid, and the organic-matter content is low.

Melvin silt loam occupies flat, low, long, narrow sloughs and abandoned creek and river channels running through or adjacent to the low ridges or swells of the terraces and better drained parts of the

first bottoms along the Tennessee River. All the land is very susceptible to overflow.

The aggregate area of this soil is small. About 33 percent is occupied by forest, 42 percent is used for corn, 17 percent is idle open land, and the rest is used for lespedeza, redtop, and other crops. Crop adaptations and recommendations for this soil are similar to those for Beechy loam. Yields may average slightly higher than on the Beechy soil.

Melvin silty clay loam.—Melvin silty clay loam resembles Melvin loam in most respects except texture. The surface soil is silty clay loam rather than silt loam, and the subsoil ranges from silty clay loam to clay. Practically all of this soil is on the main flood plain of the Tennessee River and occupies low, long, rather narrow sloughs, swales, or old river channels. Many of the areas lie farther away from the river and between areas of Egam silty clay loam and the steep terrace or bench escarpments. The soil is usually more poorly drained than Melvin loam. Otherwise, drainage and overflow conditions and moisture relationships of this soil are similar to those of the silt loam. Some of the wetter areas have a darker surface than is typical, owing to the accumulation of organic matter. Tilth conditions of the surface soil are not good, and in this respect the soil resembles Egam silty clay loam.

This is an inextensive soil. Approximately 67 percent of it is in forest, and 18 percent is idle open fields or pasture land. Practically all of the cultivated land is used for corn. As with most of the other poorly drained soils of the bottoms, the yields depend greatly on the season. Corn may yield about 35 bushels an acre in a favorable season. However, a good season for corn occurs only once in 3 to 5 years. This soil is one of the highest in inherent fertility in the county. Nevertheless, considering its conditions of poor drainage, overflow, and tilth, it can probably be used best for permanent pasture. If satisfactorily drained, it could be a fairly good soil for corn, soybeans, cowpeas, redtop, oats for hay, and lespedeza. The feasibility of such improvement, however, will depend on several factors besides the improved productivity.

Riverwash.—Riverwash represents deposits of loose sandy or gravelly material. The areas are located in the main channel of the Tennessee River at the ends of the islands. They are only a few feet above normal river stage and are inundated by slight rises of the river. Except for willows and cottonwoods, little vegetation grows on them. The areas are practically worthless for agricultural purposes, even for forest.

PRODUCTIVITY RATINGS AND PHYSICAL LAND CLASSIFICATION

In table 6 the soils of Calloway County are listed alphabetically and estimated average acre yields of the principal crops are given for each soil.

The estimates in table 6 are based primarily on observations and interviews with farmers, the county agricultural agent, members of the staff of Kentucky Agricultural Experiment Station and of the staff of the College of Agriculture, and others who have had

experience in the agriculture of the county. Information from experimental fields in this and nearby counties was available. Because of a lack of specific data by soil types, the yields are presented only as estimates. This is especially true of the figure for the hay crops and pasture. It is also realized that the estimates may not apply directly to specific tracts of land for any particular year, as the soils as shown on the map may vary slightly from place to place, management practices differ somewhat from those indicated, and climatic conditions fluctuate from year to year. The soils of Calloway County differ widely in productivity, and the methods of management vary considerably. For this reason, average yields to be expected under three different kinds of treatment are given.

Column A gives the average yields to be expected under a minimum of management that does not include the use of fertilizers, lime, or other amendments or soil-improvement practices. These yields were largely arrived at inductively, as the soils are rarely handled in this way, except some on the first bottoms.

Column B gives the estimated yields commonly obtained under average conditions and the prevailing or dominant present practices of management. These practices do not include the use of lime for any crop or the use of commercial fertilizers except for tobacco and wheat. Tobacco land is nearly always fertilized, usually with a 3–8–6 or a 4–8–4 mixture at the rate of 100 to 250 pounds to the acre. An application of 20-percent superphosphate is commonly used on wheat at the rate of 100 pounds to the acre. The amount of manure added to the land is small, and most of it is used for tobacco. Crops are rotated, but the rotations are not in full accord with soil requirements. Most of the cultivated soils of the uplands and terraces are used for an intertilled crop (mainly corn and tobacco) for 2 years and then used for hay or pasture or left idle for 2 or 3 years. The hay and pasture crops consist mostly of lespedeza with or without redtop. When grown, wheat generally follows tobacco or corn. Mechanical devices or other special means for the control of surface water and soil erosion are not commonly used, and little effort has been made to provide adequate drainage on the poorly and imperfectly drained soils. The dominant present practices on the bottom lands are similar to those on the uplands, except that corn is usually grown for more years in succession and, on some of the soils, is grown continuously for many years. The prevailing practices on some of the soils of the bottom lands are the same as those described for column A.

The above-described practices prevail at present. Improved practices of soil management, however, are adopted on many farms. It is estimated that lime has been used on 5 to 10 percent of the cropland and that about 10 percent of the cornland and 35 percent of the land in cotton and strawberries is fertilized, usually with superphosphate. Only about 50 to 65 percent of the wheatland is fertilized. The use of cover crops and terraces is becoming more common.

Column C gives the average yields that may be expected under what is considered to be the best practicable management. These practices

TABLE 6.—*Estimated average acre yields of the principal crops on the soils of Calloway County, Ky.*[1]

Soil	Corn			Tobacco (western fire-cured)			Wheat			Cotton (seed)			Lespedeza hay			Redtop hay			Soybean hay			Strawberries			Pasture			Principal crop, type of farming, or present land use
	A	B	C	A[2]	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	
	Bu.	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Lb.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*24-quart crates*	*24-quart crates*	*24-quart crates*	*Cow-acre-days*[3]	*Cow-acre-days*[3]	*Cow-acre-days*[3]	
Atwood fine sandy loam																									5	10	20	Forest, idle.
Beechy loam	16	20	35	300	[4] 525	700	1	[4] 4	10				0.7	0.7	1.4	0.9	0.9	1.3	1.0	1.1	1.6	10	[4] 20	55	45	45	75	Corn, hay, pasture, forest.
Beechy loam, sanded phase			20												1.0			1.0			1.2				35	35	60	Idle, pasture.
Bodine cherty loam																												Forest.
Bodine loam																									5	10	30	Forest, idle.
Bodine loam, smooth phase	12	15	30	475	725	875	3	8	14	300	350	750	.6	.6	1.1	.5	.5	.8	.7	.8	1.3	25	35	60	30	35	60	Forest, idle, general farming.
Brandon gravelly loam		3	7						6	100	[4] 100	200													5	5	15	Idle, forest.
Brandon gravelly loam, smooth phase	4	5	10						8	150	[4] 150	300													5	5	20	Forest.
Brandon gravelly loam, steep phase																												Forest, idle.
Brandon silt loam	4	7	18	50	[4] 300	475	1	4	9	100	[4] 200	400	.1	.2	.7	.1	.2	.4				5	[4] 15	30	5	10	30	Idle, forest, pasture.
Brandon silt loam, smooth phase	12	15	30	400	700	850	4	9	15	350	400	800	.6	.6	1.1	.5	.5	.8	.7	.8	1.3	30	38	65	30	30	55	Idle, general farming, forest.
Brandon silt loam, slope phase	6	12	24	200	550	700	2	6	12	175	300	700	.3	.4	.9	.1	.2	.6	.3	.6	1.0	20	28	50	15	20	45	Do.
Brandon silt loam, steep phase																									5	5	20	Forest, idle.
Calhoun silt loam	10	14	30	475	825	1,000	3	6	14				.8	.8	1.4	.8	.8	1.1	.9	1.0	1.6	35	40	70	40	40	65	Corn, hay, tobacco, forest.
Calloway silt loam	11	15	30	500	850	1,000	3	7	14				.8	.8	1.4	.8	.8	1.1	.9	1.0	1.6	35	40	70	40	40	65	Do.
Collins silt loam	32	34	45	550	750	875	4	[4] 8	13	350	[4] 400	800	1.0	1.0	1.6	1.0	1.0	1.3	1.5	1.5	2.0	55	[4] 55	85	60	60	90	Corn.
Egam silty clay loam	25	25	40										.9	.9	1.4	.8	.8	1.0	1.5	1.5	1.7				55	55	80	Do.
Ginat silt loam	11	15	30	400	725	875	3	6	14				.8	.8	1.3	.6	.6	1.0	.9	1.0	1.6	35	40	70	40	40	65	Pasture, forest, corn, hay.
Grenada silt loam	15	18	35	500	[5] 850	[5] 1,000	4	9	15	275	[4] 350	800	.7	.7	1.3	.5	.5	.9	.8	.9	1.5	35	40	70	35	35	60	Corn, hay, tobacco, idle.
Grenada silt loam, level phase	17	20	38	600	[5] 950	[5] 1,050	5	10	16	300	[4] 385	800	.8	.8	1.4	.6	.0	1.0	.9	1.0	1.6	40	45	75	40	40	65	Corn, tobacco, hay.
Grenada silt loam, slope phase	8	14	27	300	625	750	2	7	12	200	300	700	.4	.5	1.0	.2	.3	.6	.4	.7	1.1	25	32	55	20	25	50	Idle, general farming, pasture.
Henry silt loam	7	10	20	350	700	900	1	[4] 4	10				.5	.6	1.0	.4	.5	.9	.6	.8	1.3	20	30	60	20	25	50	Forest, hay, corn, idle.
Huntington silt loam	40	40	55										1.4	1.4	1.7	1.2	1.2	1.3	2.0	2.0	2.2				70	70	100	Corn.
Hymon loam	30	32	45	525	725	850	4	[4] 7	12	350	[4] 400	800	1.0	1.0	1.6	1.0	1.0	1.3	1.4	1.4	1.8	50	[4] 50	85	60	60	90	Do.
Hymon loam, colluvial phase	31	33	50	700	875	1,000	8	13	19	550	600	1,100	1.1	1.1	1.7	1.1	1.1	1.3	1.5	1.5	2.0	70	75	115	65	65	90	Corn, hay.
Lexington loam	5	9	20				1	5	10	150	[4] 250	500	.2	.3	.8	.1	.2	.5				10	[4] 20	35	10	15	40	Idle, forest, pasture.
Lexington loam, smooth phase	11	15	30	450	700	850	3	8	14	350	400	800	.5	.6	1.0	.4	.4	.7	.6	.7	1.2	25	32	55	20	25	50	Idle, general farming, forest.
Lexington loam, steep phase																									5	10	20	Forest, idle.
Lexington silt loam	5	9	20	100	[4] 375	550	1	5	10	150	[4] 250	500	.2	.3	8	.1	.2	.5				10	[4] 20	35	10	15	40	Idle, forest, pasture.
Lexington silt loam, smooth phase	18	21	40	550	825	1,000	6	12	18	400	480	1,100	.8	.8	1.5	.6	.6	1.0	1.0	1.1	1.7	40	45	75	40	40	65	General farming, idle.
Lexington silt loam, slope phase	8	14	27	275	600	725	3	8	13	225	325	725	.4	.5	1.0	.2	.3	.6	.4	.7	1.1	25	32	55	20	25	50	Idle, general farming, forest.
Melvin silt loam	18	22	40										.7	.8	1.5	.8	.9	1.3	1.1	1.2	1.7				50	50	80	Forest, corn, pasture.
Melvin silty clay loam	10	15	35										.5	.6	1.2	.7	.8	1.2	.9	1.1	1.5				40	40	70	Do.
Memphis silt loam	19	22	42	550	825	1,000	6	12	18	400	480	1,100	.8	.8	1.5	.6	.6	1.0	1.0	1.1	1.7	45	50	80	40	40	65	General farming, idle.
Olivier silt loam	17	20	38	600	[5] 950	1,050	5	10	16	300	385	800	.8	.8	1.4	.6	.6	1.0	.9	1.0	1.6	40	45	75	40	40	65	Corn, tobacco, hay.
Olivier silt loam, slope phase	15	18	35	500	[5] 850	[5] 1,000	4	9	15	275	[4] 350	800	.7	.7	1.3	.5	.5	.9	.8	.9	1.5	35	40	70	35	35	60	Corn, hay, tobacco, idle.
Providence silt loam	7	13	26	300	625	750	2	7	12	200	300	700	.4	.5	1.0	.2	.3	.6	.4	.7	1.1	25	32	55	20	25	50	Idle, general farming, pasture.
Riverwash																												Forest, idle.
Rough gullied land (Brandon soil material)																												Idle.
Sciotoville very fine sandy loam	24	26	40				10	14	20	700	750	1,200	.9	.9	1.5	.7	.7	1.1	1.1	1.2	1.8	55	60	85	45	45	70	Corn, wheat, cotton, hay.
Sciotoville silt loam	24	26	40	650	850	1,000	10	14	20	600	650	1,100	.9	.9	1.5	.7	.7	1.1	1.1	1.2	1.8	55	60	85	45	45	70	Corn, wheat, hay.
Sciotoville silt loam, slope phase	18	21	36	550	750	900	8	11	17	400	500	975	.8	.8	1.4	.6	.6	1.0	1.0	1.1	1.7	35	45	75	40	40	65	Corn, wheat, hay, idle.
Shannon cherty loam	19	20	30	550	700	825	5	9	15	400	450	800	.6	.6	1.1	.7	.7	.9	.9	1.0	1.3	40	45	65	40	40	60	Corn, hay, idle.
Shannon loam	33	35	45	575	775	875	6	10	15	450	500	950	1.0	1.0	1.6	1.0	1.0	1.3	1.4	1.4	1.8	55	[4] 55	85	60	60	85	Corn.
Shannon loam, colluvial phase	32	34	45	675	850	1,000	8	13	19	650	700	1,300	1.0	1.0	1.6	1.0	1.0	1.3	1.4	1.4	1.8	60	65	90	60	60	85	Corn, hay.
Vicksburg silt loam	36	38	50	600	800	900	6	10	15	450	500	950	1.0	1.0	1.6	1.0	1.0	1.3	1.5	1.5	2.0	60	[4] 60	90	65	65	90	Corn.
Waverly silt loam	18	22	40	400	600	775	2	[4] 5	11				.8	.8	1.5	.9	.9	1.3	1.1	1.2	1.7	15	[4] 25	60	50	50	80	Corn, hay, pasture, forest.
Wheeling silt loam	28	31	44	600	[4] 800	950	11	15	21	650	750	1,300	1.0	1.0	1.7	.8	.8	1.2	1.3	1.4	2.0	60	65	90	50	55	80	Corn, wheat, cotton, hay.

[1] The estimates are based on estimates of local farmers, members of the staff of the Kentucky Agricultural Experiment Station, members of the staff of the College of Agriculture, the county agent, and others who have had experience in the local agriculture, and on observations during the progress of the survey. The yields in columns A are to be expected under a minimum of management that does not include the use of fertilizer, lime, or other amendments, or any special soil-improvement practices. The yields in columns B are those commonly obtained under the dominant present practices of management. The yields in columns C may be expected under the best practicable management. Refer to the text for further explanation. Where no yield is given the crop is not commonly grown on the soil.

[2] The grade of western fire-cured tobacco grown on these soils without the use of fertilizer or manure is generally poorer than when grown with the use of fertilizer and manure.

[3] The term "cow-acre-days" is used to express the carrying capacity or grazing value of pasture land. It represents the number of days that 1 animal unit can be supported on 1 acre without injury to the pasture, or the product of the number of animal units to the acre multiplied by the number of days of grazing. The animal unit is a means of measuring the feed requirements of livestock. It is the equivalent of a mature cow, steer, or horse, or 5 hogs, or 7 sheep or goats. For example, a soil that would provide grazing for 1 cow or 1 animal unit to the acre for 100 days, or for 2 cows or 2 animal units for 50 days, would rate 100 cow-acre-days; and a soil that would provide grazing for 1 cow or 1 animal unit to 4 acres for 100 days would rate 25 cow-acre-days. These figures are largely comparative for the various soils because of insufficient data.

[4] These crops are infrequently grown on these soils.

[5] The grade of western fire-cured tobacco grown on these soils is usually superior to the average of the county.

TABLE 7.—*Productivity ratings and physical land classification of the soils in Calloway County, Ky.*

Soil [1]	Crop productivity index [2] for— Corn (100=50 bu.)			Tobacco (western fire-cured) (100=1,000 lbs.)			Wheat (100=25 bu.)			Cotton (seed) (100=1,200 lbs.)			Lespedeza hay (100=1.5 tons)			Redtop hay (100=1.5 tons)			Soybean hay (100=2.5 tons)			Strawberries (100=100 24-qt. crates)			Pasture (100=100 cow-acre-days [4])			Workability	Conservability [5]	Physical land classification [6]
	A	B	C	A [3]	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C			
Huntington silt loam	80	80	110										95	95	115	80	80	87	80	80	90				70	70	100	Very good	Very easy	First class.
Vicksburg silt loam	70	75	100	60	80	90	25	40	60	40	40	80	65	65	105	67	67	87	60	60	80	60	[7] 60	90	65	65	90	do	do	
Hymon loam, colluvial phase	60	65	100	70	88	100	30	50	75	45	50	90	75	75	115	73	73	87	60	60	80	70	75	115	65	65	90	do	Easy	
Shannon loam, colluvial phase	65	70	90	68	85	100	30	50	75	55	60	110	65	65	105	67	67	87	55	55	75	60	65	90	60	60	85	do	do	
Shannon loam	65	70	90	58	78	88	25	40	60	40	40	80	65	65	105	67	67	87	55	55	75	55	[7] 55	85	60	60	85	do	Very easy	
Wheeling silt loam	55	60	90	60	[7] 80	95	45	60	85	55	65	110	65	65	115	53	53	80	50	55	80	60	65	90	50	55	80	do	Easy	
Collins silt loam	65	70	90	55	75	88	15	30	50	30	35	65	65	65	105	67	67	87	60	60	80	55	[7] 55	85	60	60	90	do	Very easy	
Hymon loam	60	65	90	53	73	85	15	30	50	30	35	65	65	65	105	67	67	87	55	55	75	50	[7] 50	85	60	60	90	do	do	
Grenada silt loam, level phase	35	40	75	60	[8] 95	[8] 105	20	40	65	25	30	65	55	55	95	40	40	67	35	40	65	40	45	75	40	40	65	Very good	Easy	Second class.
Olivier silt loam	35	40	75	60	[8] 95	[8] 105	20	40	65	25	30	65	55	55	95	40	40	67	35	40	65	40	45	75	40	40	65	do	do	
Sciotoville very fine sandy loam	45	50	80				40	55	80	60	65	100	60	60	100	47	47	73	45	50	75	55	60	85	45	45	70	do	do	
Sciotoville silt loam	45	50	80	65	85	100	40	55	80	50	55	90	60	60	100	47	47	73	45	50	75	55	60	85	45	45	70	do	do	
Memphis silt loam	40	45	85	55	83	100	25	50	70	35	40	90	55	55	100	40	40	67	40	45	70	45	50	80	40	40	65	Good	Moderately easy	
Lexington silt loam, smooth phase	35	40	80	55	83	100	25	50	70	35	40	90	55	55	100	40	40	67	40	45	70	40	45	75	40	40	65	do	do	
Egam silty clay loam	50	50	80										60	60	90	53	53	67	60	60	70				55	55	80	Medium, poor tilth	Very easy	
Grenada silt loam	30	35	70	50	[8] 85	[8] 100	15	35	60	25	30	65	45	45	85	33	33	60	30	35	60	35	40	70	35	35	60	Good	Moderately easy	
Olivier silt loam, slope phase	30	35	70	50	[8] 85	[8] 100	15	35	60	25	30	65	45	45	85	33	33	60	30	35	60	35	40	70	35	35	60	do	do	
Sciotoville silt loam, slope phase	35	40	70	55	75	90	30	45	70	35	40	80	55	55	95	40	40	67	40	45	70	35	45	75	40	40	65	Good to medium	do	
Calloway silt loam	20	30	60	50	85	100	10	30	55				55	55	95	53	53	73	35	40	65	35	40	70	40	40	65	Good	Easy	
Shannon cherty loam	40	40	60	55	70	83	20	35	60	35	35	65	40	40	75	47	47	60	35	40	50	40	45	65	40	40	60	Medium; much chert	Easy	Third class.
Calhoun silt loam	20	30	60	48	83	100	10	25	55				55	55	95	53	53	73	35	40	65	35	40	70	40	40	65	Good	do	
Brandon silt loam, smooth phase	25	30	60	40	70	85	15	35	60	30	35	65	40	40	75	33	33	53	30	30	50	30	38	65	30	30	55	do	Moderately easy	
Waverly silt loam	35	45	80	40	60	78	10	20	45				55	55	100	60	60	87	45	50	70	15	[7] 25	60	50	50	80	Medium	Very easy	
Melvin silt loam	35	45	80										50	55	100	53	60	87	45	50	70				50	50	80	do	do	
Beechy loam	30	40	70	30	[7] 53	70	5	15	40				50	50	95	60	60	87	40	45	65	10	[7] 20	55	45	45	75	do	do	
Bodine loam, smooth phase	25	30	60	48	73	88	10	30	55	25	30	60	40	40	75	33	33	53	30	30	50	25	35	60	30	35	60	Good to medium	Moderately easy	
Lexington loam, smooth phase	20	30	60	45	70	85	10	30	55	30	35	65	35	40	65	27	27	47	25	30	50	25	32	55	20	25	50	do	do	
Ginat silt loam	20	30	60	40	73	88	10	25	55				55	55	85	40	40	67	35	40	65	35	40	70	40	40	65	Good	Easy	
Grenada silt loam, slope phase	15	30	55	30	63	75	10	30	50	15	25	60	25	35	65	13	20	40	15	30	45	25	32	55	20	25	50	Medium	Moderately difficult	
Providence silt loam	15	25	50	30	63	75	10	30	50	15	25	60	25	35	65	13	20	40	15	30	45	25	32	55	20	25	50	do	do	
Lexington silt loam, slope phase	15	30	55	28	60	73	10	30	50	20	25	60	25	35	65	13	20	40	15	30	45	25	32	55	20	25	50	do	do	
Brandon silt loam, slope phase	10	25	50	20	55	70	10	25	50	15	25	60	20	25	60	7	13	40	10	25	40	20	28	50	15	20	45	do	do	
Henry silt loam	15	20	40	35	70	90	5	15	40				35	40	65	27	33	60	25	30	50	20	30	60	20	25	50	Good	Easy	
Melvin silty clay loam	20	30	70										35	40	80	47	53	80	35	45	60				40	40	70	Poor; poor tilth	Easy	Fourth class.
Beechy loam, sanded phase			40												65			67			50				35	35	60	Poor	do	
Lexington silt loam	10	20	40	10	[7] 38	55	5	20	40	10	20	40	15	20	55	7	13	33				10	[7] 20	35	10	15	40	Poor; hilly	Difficult	
Lexington loam	10	20	40				5	20	40	10	20	40	15	20	55	7	13	33				10	[7] 20	35	10	15	40	do	do	
Brandon silt loam	10	15	35	5	[7] 30	48	5	15	35	10	15	35	10	15	45	7	13	27				5	[7] 15	30	5	10	30	do	do	
Bodine loam																									5	10	30	Very poor; steep	Very difficult	Fifth class.
Brandon gravelly loam, smooth phase	10	10	20						30	10	10	25													5	5	20	Poor; gravelly	Moderately difficult	
Lexington loam, steep phase																									5	10	20	Very poor; steep	Very difficult	
Atwood fine sandy loam																									5	10	20	do	do	
Brandon silt loam, steep phase																									5	5	20	do	do	
Brandon gravelly loam		5	15						25	10	10	15													5	5	15	Very poor; hilly, gravelly	do	
Bodine cherty loam																												Very poor; steep, cherty	Difficult	
Brandon gravelly loam, steep phase																												Very poor; steep, gravelly	Very difficult	
Rough gullied land (Brandon soil material)																												Very poor	do	
Riverwash																												Poor	do	

[1] The soils are listed in the approximate order of their general productivity of the crops commonly grown on them under the dominant current practices and their suitability for agricultural use. Where no index is given, the crop is not grown on this soil.

[2] The soils of Calloway County are given indexes that indicate the estimated average production of each crop in percentage of the standard of reference. The standard represents the approximate average yield obtained without the use of amendments on the more extensive and better soil types of the regions of the United States in which the crop is most widely grown. The indexes in column A give the average yields to be expected under a minimum of management, not including fertilizer, lime, or other amendments and special soil-improvement practices. These yields were arrived at largely inductively, as the soils are rarely handled in this way except some of those on the bottoms. The indexes in column B represent yields commonly obtained under average conditions and the dominant present practices of management. The indexes in column C represent yields that may be expected under the best practicable practices of management. Little of the land is managed in this way, and many of the yields are estimates arrived at inductively. (Refer to the text for further explanation.)

[3] The grade of western fire-cured tobacco grown on these soils without the use of fertilizer or manure is generally poorer than when grown with the use of fertilizer and manure.

[4] See footnote 3, table 6.

[5] Terms refer to the relative ease or difficulty of conserving the soil if tilled.

[6] This is a general grouping of the soils according to their relative physical adaptation for agricultural use. See definitions on page 70.

[7] These crops are infrequently grown on these soils.

[8] The grade of western fire-cured tobacco grown on these soils is usually superior to the average of the county.

include the use of lime and commercial fertilizers when needed, proper handling and the return of manure and crop residues, careful selection and rotation of crops (including the use of legumes and cover crops), adequate drainage, use of mechanical devices or other means for water control when necessary, and proper tillage methods carried on toward the end of making the greatest use of the soil commensurate with proper conservation and improvement of the soil. Further details on these best practices for each of the soils are given in the sections on Soils and Land Use and Soil Management. Only a little of the land is being managed in this way now, and the yields given are mainly estimates. Although accurate data are not sufficient to support these yields adequately, the relative response of each soil to management practices is brought out by comparing these yields with those in columns A and B.

Yields only for the unprotected conditions from flooding have been given for the soils of the flood plains, as no areas are definitely protected by dikes or levees. These floods usually occur in the winter and early spring, and their chief detriment is to winter crops.

In order to compare directly the yields obtained in Calloway County with those obtained in other parts of the country, yield figures have been converted in table 7 into indexes based on standard yields. In some instances minor differences are shown in productivity ratings that are not reflected in the rounded figures of yields in table 6. The soils are listed in the approximate order of their general productivity for the crops commonly grown under the prevailing farming practices. The order is modified in some degree to show the comparative suitability of the soils for use as influenced by their workability and the problems they offer to their conservation. No attempt is made to group the soils best suited to particular crops, and the differences in the quality of the crops are not given full consideration.

The rating compares the productivity of each of the soils for each crop to a standard of 100. This standard represents the approximate average yield obtained without the use of fertilizer and other amendments on the more extensive and better soils of the United States where the crop is most widely grown. An index of 50 indicates that the soil is about half as productive for the specified crop as the soil with the standard index. The standard yield for each crop shown in table 7 is given at the head of each respective column. Soils given amendments, such as commercial fertilizers and lime, or special practices, such as irrigation, and unusually productive soils may have productivity indexes of more than 100 for some crops.

Factors influencing the productivity of the land are mainly climate, soil (including drainage and relief), and management. No one of these factors operates separately from the others, although some one may dominate. Crop yields over a long period of years furnish the best available summation of these factors contributing to productivity, and they are used whenever available. Productivity tables cannot present the relative roles that separate soil areas play in the agriculture of the county, because of the variable associations in which they occur. The tables give a characterization to the productivity of individual soil types and phases. They cannot picture the total

quantitative production of crops by soil areas without the additional knowledge of the acreage of the individual soil types devoted to each of the specified crops. Economic considerations play no part in determining the productivity rating; therefore the ratings cannot be interpreted directly into land values, except in a very general way. Distance to market, relative prices of farm products, and other factors influence the value of land.

The soils of Calloway County differ widely in physical characteristics and consequently in capabilities for use and requirements for management. Such differences are the results of a number of internal and external soil features, such as texture, structure, consistence, amount and character of organic matter, chemical character (including reaction), moisture conditions, soil depth, erosion, stoniness, and slope or lay of the land. These physical soil characteristics determine the productivity,[7] workability,[8] and conservability [9] of each soil type and phase. These three conditions in turn determine the degree to which each soil is adapted physically to the production of useful plants common to the region. The soil types and phases have been arranged in five groups according to their degree of physical adaptation and are referred to as First-class soils, Second-class soils, Third-class soils, Fourth-class soils, and Fifth-class soils. These class designations are given in the column "Physical land classification" in table 7 and are shown in the legend on the soil map.

First-, Second-, and Third-class soils in general are used for the production of crops requiring tillage and are considered physically adapted to this use under most conditions. Only a small proportion of the Fourth-class soils and practically none of the Fifth-class soils under average conditions are used for the production of crops, and they are not considered as adapted physically to such use. Although the First-, Second-, and Third-class soils are generally thought of as physically adapted to these crops, the First-class soils are very well adapted, whereas the Third-class soils are poorly adapted and the Second-class soils are intermediate in this respect. Fourth-class soils in general are poorly adapted to crops requiring tillage but are sufficiently productive to justify their use for pasture under most conditions. They are characterized by poor workability, difficult conservability, or both. Fifth-class soils in general are poorly adapted both to crops requiring tillage and to pasture; consequently their general physical adaptation is considered to be limited to forest. Although the Fourth-class soils have at least a fair productivity, those of the Fifth-class have a low productivity in addition to poor workability, serious problem of conservation, or both.

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[7] "Productivity" as used here refers to the capacity of the soil to produce crops under the prevailing farming practices. In appraising the soils for general productivity, all important crops are considered and the importance of each is weighed by its acreage and value per acre. The soil may be productive of a crop, at least for a time and under certain conditions, but not be well adapted because of poor workability, or because of associated problems of conservation, or both.

[8] "Workability" as used here refers to the ease of tillage, harvesting, and other field operations. The following characteristics affect workability: Texture, structure, consistence, organic-matter content, stoniness, and slope or lay of the land.

[9] "Conservability" as used here refers to the relative ease of maintaining or improving the productivity and workability of the soil, including control of water. The degree to which the soil responds to management practices is reflected in the problem of conservation.

GENERALIZED LAND MAP

Figure 2 is a generalized map of Calloway County showing the distribution of soils according to five land types.

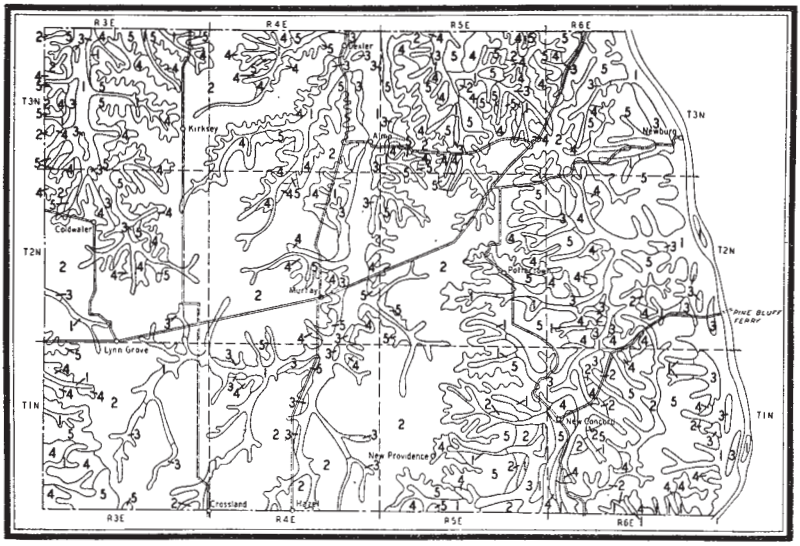

FIGURE 2.—Generalized map of Calloway County, Ky.: Land type 1, predominantly medium- to well-drained soils of the terraces and bottom lands (Collins, Hymon, Shannon, Sciotoville, Olivier, and Vicksburg soils); land type 2, predominantly imperfectly to comparatively well-drained soils of the nearly level to undulating uplands (Grenada and Calloway soils); land type 3, predominantly poorly drained soils of the stream terraces and bottom lands (Waverly, Beechy, Calhoun, and Melvin soils); land type 4, soils of strongly rolling to hilly areas (Brandon and Lexington soils); land type 5, soils of hilly, steep, and broken areas (Brandon, Lexington, and Bodine soils).

Land type 1 consists predominantly of medium- to well-drained soils of the stream terraces and bottom lands. Practically all of the acreage is physically adapted to field crops and a great part of it is comprised of First- and Second-class soils.[10] It is estimated that about 18 percent of the county is included in this land type. Soils of the Collins, Hymon, Shannon, Sciotoville, Olivier, and Vicksburg series predominate.

Land type 2 consists predominantly of nearly level and undulating imperfectly to comparatively well-drained soils of the uplands. Probably 95 percent of the acreage is physically adapted to field crops, and most of it comprises Second- and Third-class soils. It is estimated that about 50 percent of the county is included in this land type. Soils of the Grenada and Calloway series predominate.

Land type 3 consists predominantly of poorly drained soils of the stream terraces and bottom lands. It comprises largely Third-class soils, and practically all of the remaining acreage is of Fourth-class soils. The productivity of practically all of the acreage could be raised by proper artificial drainage. It is estimated that about 6

[10] See definitions in the section on Productivity Ratings and Physical Land Classification.

percent of the county is included in this land type. Soils of the Waverly, Beechy, Calhoun, and Melvin series predominate.

Land types 4 and 5 occupy the rougher parts of the county and differ chiefly in that the latter is even rougher than the former.

Land type 4 consists of strongly rolling to hilly areas, which include smoother but narrow ridge tops and narrow strips of bottom land. Most of the strongly rolling to hilly areas consist of Fourth-class soils, the narrow ridges and bottom lands consist of First-, Second-, and Third-class soils, and a small area of the rougher parts is Fifth-class soils. Only a small part of the Fourth-class soils is used for field crops, and their best physical adaptation under good management is thought to be for permanent pasture. Approximately 6 percent of the county is occupied by soils of this land type. Rolling and hilly soils of the Brandon and Lexington series predominate.

Land type 5 consists of hilly, steep, and broken areas, which include narrow ridge tops and narrow strips of bottom land. Fifth-class soils predominate, although the included narrow ridge tops and bottom lands are occupied by First-, Second-, and Third-class soils. Very little of the Fifth-class soils is used or thought suitable for either field crops or pasture. About 20 percent of the county is occupied by this land type. The hilly and steep soils of the Brandon, Lexington, and Bodine series predominate.

LAND USE AND SOIL MANAGEMENT

Proper use of the soils is a basic problem to the agriculture of the county. Although other factors enter in, the physical capabilities of the soils largely determine their suitable uses. Past use of the land in the county has been guided with considerable regard for the physical character of the soils. This was inevitable. Nevertheless, ill-adjusted use of the land has been too frequent.

One of the most obvious results of this ill adjustment is the 8,000 acres of rough gullied land in the county. Areas mapped as rough gullied land (Brandon soil material) occupy 2,496 acres, and the rest are too small to allow their delineation on the map. The condition of this eroded land has resulted from improper use and management of the soils.

USE OF LAND BY CLASSES

In the section Productivity Ratings and Physical Land Classification the soils were assigned to five classes according to their physical suitability for use. As stated therein, the soils of the first three classes, under average conditions, are considered as physically adapted to crops requiring tillage. All the brown soils of the smoother uplands and stream terraces, the gray soils of the uplands and stream terraces, and the soils of the alluvial first bottoms—with the exception of Beechy loam, sanded phase; Melvin silty clay loam; and riverwash—belong to the First, Second, and Third classes. These two soils and this land type and all the soils of the rougher uplands are members either of the Fourth or of the Fifth class. Of these, Beechy loam, sanded phase; Melvin silty clay loam; Lexington silt loam; Lexington loam; and Brandon silt loam are Fourth-class soils, and all others are Fifth-class soils. According to this classification, 309.7 square miles of the county are classed as First-, Second-, and Third-class soils,

36.4 square miles as Fourth-class soils, and 65.9 square miles as Fifth-class soils.

During the progress of the field work, the cover of the land, or its use at that particular time, was mapped and calculated for the five soil classes on approximately 17,568 acres. Several areas considered as representative of the different land conditions and types of farming of the county were selected for these calculations. Of these 17,568 acres, 13,957 acres, or 79.5 percent, was classified as First-, Second-, and Third-class soils; 1,161 acres, or 6.6 percent, as Fourth-class soils; and 2,450 acres, or 13.9 percent, as Fifth-class soils. At the time of mapping, 8,047 acres, or 45.8 percent, was being used for crops, either harvested or pastured, or for farmsteads; 5,144 acres, or 29.3 percent, was idle open land; and 4,377 acres, or 24.9 percent, was in woods. Of the acreage of First-, Second-, and Third-class soils, 56.2 percent was used for crops or farmsteads, 30.5 percent was idle open land, and 13.3 percent was in woods. Of the acreage of Fourth-class soils, 8.5 percent was used for crops or farmsteads, 31.5 percent was idle open land, and 60 percent was in woods. Of the acreage of Fifth-class soils, 4.2 percent was used for crops or farmsteads, 21.4 percent was idle open land, and 74.4 percent was in woods. Of the 3,611 acres of Fourth- and Fifth-class soils, about 30 percent has been cleared and cultivated for at least a short time, although only about 5 percent is being used for crops now.

Some of the significant interpretations of the above data are the following: First, a considerable acreage of cleared land has been reduced to an idle state. Second, the proportion of the cleared area of the Fifth-class soils now lying idle is greater than that of the Fourth-class soils, and this proportion of the Fourth-class soils is much greater than that of the First-, Second-, and Third-class soils. Third, it is significant that 74.4 percent of the acreage of the Fifth-class soils and 60 percent of the acreage of the Fourth-class soils is in forest; whereas but 13.3 percent of the acreage of the First-, Second-, and Third-class soils is in forest. Fourth, it is significant, on the other hand, that 56.2 percent of the acreage of the First-, Second-, and Third-class soils is used for field crops and farmsteads; whereas but 8.5 percent of the acreage of the Fourth-class soils and but 4.2 percent of the acreage of the Fifth-class soils are so used.

The agricultural prosperity of the area very probably can be increased by more efficient use of the idle land. A considerable part of the idle acreage of First-, Second-, and Third-class soils can be reclaimed for general-farm purposes with reasonable effort. Most of the idle acreage of First-, Second-, Third-, and Fourth-class soils that is not needed for field crops is physically suited for grass if properly fertilized and managed. Such use should provide more diversity to the agriculture. The planting of suitable species of trees on the idle acreage of Fifth-class soils is thought to be good use.

TYPES OF FARMING

Although the type of farming practiced in Calloway County has been the result of interaction of several physical, biological, economic, and social forces, it appears that the soil and other physical features of the land have been dominant in determining the present system of farming as practiced in the different parts of the county. The

Purchase Region of Kentucky has been designated as a tobacco-general farming area (*6*). Although the tobacco type of farming dominates, it is not so highly specialized as in other tobacco-growing areas of the State, and there are other types of farming.

As a whole, Calloway County can be classed as a tobacco-general farming area; but, largely because of the soil and land conditions, the systems of agriculture practiced in different parts of the county vary to some extent.

The tobacco-corn type of farming, combined with other minor enterprises, is decidedly the dominant system in the level and undulating uplands. Here, the smooth lay of the land, the low susceptibility to erosion, and the prevalence of soils particularly suited to tobacco favor this type of farming. This is the most prosperous part of the county. Plate 6, *A*, shows the utilization of a typical square mile in these smoother uplands. Fields are rectangular in shape and medium in size.

It is estimated that 15 percent of the land in farms in this area is in corn, 5 percent in tobacco, 2 percent in wheat, 11 percent in lespedeza, 2.5 percent in redtop or other permanent pasture mixtures, and 9 percent in woods; the rest is in other minor crops, idle land, and farmsteads. Practically all of the corn is used on the farms. Tobacco is the main cash crop and contributes a larger proportion of the total farm income than elsewhere. Other income is derived largely from dairying, the raising of hogs and poultry, the growing of wheat, and, on some farms, the growing of strawberries and sweetpotatoes. This system of agriculture is fairly intensive; farms are small, averaging between 50 and 60 acres; and tenancy is prevalent.

In the more hilly or rougher upland areas of the county, and especially in the breaks of the Tennessee River, a self-sufficing type of agriculture is dominant. Here, much of the land consists of steep hillsides on which many of the soils are very low in fertility, low in water-holding capacity, and very susceptible to erosion when unprotected. The only land suitable for cultivated crops is on the ridges and in the bottoms. Plate 6, *B*, shows the utilization of a typical square mile of this hilly area.

Fields are irregular and small. Of the land in farms, it is estimated that 10 percent is in corn, 1.5 percent in tobacco, 0.8 percent in cotton, 1 percent in wheat, 4.5 percent in lespedeza, 2 percent in redtop and other permanent pasture mixtures, and 40 percent in woods; the rest is in idle open fields, farmsteads, and minor crops. Practically all of the corn is utilized on the farm for supplying home needs and for feeding a few hogs, two or three dairy cows, and a small flock of chickens. Although tobacco probably represents the main cash income, the yields are small and the grade is generally low. A small quantity of cotton is raised. Much of the sloping land not in woods is badly eroded, as it has been allowed to lie idle and no measures have been taken to stop the erosion. Except on the bottoms, yields of crops are low and pastures are poor. Farms are larger than elsewhere, probably averaging 110 acres in size, but improvements are poor and many of the buildings are insubstantial.

The production of corn dominates the farming on the soils of the first bottoms. As a whole, these soils have the highest fertility of any in the county; they are level or nearly level, and runoff pre-

sents a small or no problem. Most of the land, however, is subject to the usual floods. Plate 6, *C*, shows the utilization of a typical square mile on the Clarks River bottom.

Fields are relatively large and more or less rectangular. It is estimated that 52 percent of the bottom land of the county is in corn, 4 percent in tobacco, 3 percent in lespedeza, and 14 percent in woods; the rest is in minor crops and idle land. Yields of corn are relatively good, and much of it is sold off the farm. The growing of tobacco, cotton, and wheat is hazardous. Some hogs are raised and sold, but few cows are kept. Farm homes and buildings are generally on adjacent stream terraces or hills.

Combined cotton and general farming prevails on the soils of the terraces along the Tennessee River. Here, cotton has taken the place of tobacco as the main cash crop in recent years. This change is largely due to the lower grade of tobacco produced, the lack of suitable tobacco barns, and the better adaptability of some of these soils to the production of cotton. Corn is the principal crop in acreage, and yields are fairly good. Next to cotton, hogs are the principal source of income.

PLANT NUTRIENTS

The Kentucky Agricultural Experiment Station has made chemical analyses of the important soils in order to obtain information about their supply of plant nutrients. The results of these analyses are given in table 8. The data of this table indicate the reaction of the soil and the total amount of nitrogen, phosphorus, potassium, and calcium. The total amount of these nutrients is only one factor in determining the soil productivity, but knowledge of this is of considerable value, particularly in planning long-time soil-management programs. The pH values are expressions of acidity or alkalinity, a value of 7 being the neutral point. The lower the pH value, the more acid is the soil and the more likely is the need for lime.

TABLE 8.—*Chemical composition of the surface soil of the more important soils of Calloway County, Ky.*[1]

[In pounds per 2,000,000 pounds of dry soil]

Field sample No.	Soil type or phase	Approximate location	Depth	Total nitrogen	Total phosphorus[2]	Total potassium	Calcium carbonate required to neutralize soil acidity[3]	pH[4]	Gravel rejected
			Inches	*Pounds*	*Pounds*	*Pounds*	*Pounds*		
[5]8	Grenada silt loam, level phase.	3.2 miles northeast of Crossland.	0–7	1,920	1,040	24,000	1,500	4.6	
			7–18	1,100	1,120	25,600	2,860	4.6	
23	do	3.2 miles south of Lynn Grove.	0–7	1,480	860	24,200	420	4.8	
			7–18	1,000	840	25,800	2,040	4.6	
42	do	0.8 mile east of Steelyville School.	0–7	1,220	840	20,800	220	5.4	
			7–18	800	620	24,200	3,140	4.8	
54	do	0.2 mile east of Kirksey.	0–7	1,860	1,400	24,200	100	5.5	
			7–18	960	920	26,400	1,240	5.0	
65	do	1.6 miles west of Murray State Teachers College.	0–7	1,700	700	24,400	1,240	4.7	
			7–18	900	680	26,800	4,540	4.6	
45	do	0.7 mile northeast of Outland School.	0–7	1,300	860	23,000	80	5.8	
			7–18	820	580	27,000	4,220	4.6	

See footnotes at end of table.

TABLE 8.—*Chemical composition of the surface soil of the more important soils of Calloway County, Ky.*—Continued

[In pounds per 2,000,000 pounds of dry soil]

Field sample No.	Soil type or phase	Approximate location	Depth	Total nitrogen	Total phosphorus[2]	Total potassium	Calcium carbonate required to neutralize soil acidity[3]	pH[4]	Gravel rejected
			Inches	*Pounds*	*Pounds*	*Pounds*	*Pounds*		*Percent*
1	Calloway silt loam	1 mile east of Green Plains Church.	0–7	1,480	740	17,800	1,240	4.6	
			7–18	900	620	19,000	3,280	4.4	
[5] 9	do	2.5 miles northwest of Hazel.	0–7	1,560	1,020	19,400	3,240	4.5	
			7–18	1,020	1,220	20,400	4,860	4.4	
55	do	0.2 mile southeast of Kirksey.	0–7	2,140	1,100	21,600	280	5.4	
			7–18	760	1,040	24,400	3,680	4.6	
[5] 2	Henry silt loam	1 mile east of Green Plains Church.	0–7	980	440	19,000	3,040	4.5	
			7–18	780	320	22,400	7,100	4.5	
7	do	1.4 miles south of South Howard School.	0–7	1,460	780	20,600	220	5.1	
			7–18	700	740	21,400	4,860	4.6	
[5] 22	do	1.2 miles south of Lynn Grove.	0–7	1,120	400	21,000	3,500	4.4	
			7–18	640	320	22,200	7,920	4.4	
[5] 24	Memphis silt loam	0.2 mile southwest of Protemus.	0–7	1,480	520	31,200	900	4.6	
			7–18	980	620	33,600	1,100	4.8	
[5] 43	Providence silt loam.	0.5 mile northeast of New Providence.	0–7	1,360	680	24,000	2,720	4.6	
			7–18	1,000	840	25,800	5,100	4.5	
[5] 25	Lexington silt loam	1 mile west of Protemus.	0–7	1,040	400	25,200	1,220	4.8	
			7–18	740	500	28,400	1,580	4.6	
[5] 27	do	0.3 mile southwest of Mt. Pleasant Church.	0–7	1,080	640	28,200	720	4.8	
			7–18	880	760	31,400	2,280	4.6	
[5] 32	Lexington loam	0.8 mile south of McCuiston School.	0–7	760	420	18,400	1,320	4.8	
			7–18	580	400	20,200	2,560	4.6	
[5] 37	Brandon silt loam	0.5 mile northwest of Liberty Church.	0–7	1,360	600	28,400	2,540	4.6	
			7–18	1,180	820	29,000	3,220	4.6	0.8
[5] 44	do	0.2 mile northeast of New Providence.	0–7	1,260	460	27,000	1,360	4.7	1.8
			7–18	900	800	26,200	2,560	4.6	28.9
[5] 18	Brandon gravelly loam.	2.8 miles west of New Concord.	0–7	1,200	540	20,800	960	4.6	52.8
			7–18	820	520	23,000	1,180	4.6	45.2
[5] 47	do	0.5 mile east of Faxon	0–7	800	300	17,600	720	4.9	46.6
			7–18	600	340	19,800	1,000	4.7	24.0
[5] 59	do	1.2 miles northwest of Pottertown.	0–7	1,400	580	25,800	1,400	4.8	16.9
			7–18	960	560	24,000	3,220	4.6	54.2
[5] 4	Atwood fine sandy loam.	0.7 mile west of Macedonia School.	0–7	640	540	12.800	140	4.8	.5
			7–18	720	600	16,800	720	4.6	.5
[5] 49	Bodine loam	0.9 mile southwest of Newburg.	0–7	1,220	640	34,200	3,820	4.7	.5
			7–18	1,240	680	32,400	2,420	4.6	.2
[5] 39	Bodine cherty loam	1.8 miles southwest of Redden.	0–7	1,660	540	26,000	1,080	4.6	67.5
			7–18	800	700	27,600	2,560	4.4	60.1
[5] 63	do	0.2 mile northeast of Brandon.	0–7	960	380	17,200	1,240	4.6	42.4
			7–18	800	480	19,400	2,860	4.6	49.4
16	Olivier silt loam	2.7 miles southwest of New Concord.	0–7	1,560	800	27.400	140	5.7	
			7–18	900	760	28,400	1,240	4.9	
52	do	3 miles southwest of Almo.	0–7	1,700	1,160	21,200	1,040	4.9	
			7–18	1,020	900	25,000	5,000	4.6	
[5] 6	Calhoun silt loam	3 miles southwest of Almo.	0–7	1,760	980	20,800	3,220	4.6	
			7–18	920	940	22,600	3,460	4.6	
40	Hymon loam	1.5 miles southeast of Hico.	0–7	1,500	600	22,200	900	4.6	
			7–18	1,380	680	21,000	1,720	4.6	
21	Waverly silt loam	0.7 mile northwest of New Concord.	0–7	2,020	800	27,600	900	4.6	
			7–18	1,120	760	25,600	1,400	4.6	
[5] 28	do	0.7 mile northwest of Providence Church.	0–7	2,840	760	24,200	2,560	4.6	
			7–18	820	580	22,600	2,420	4.7	
51	do	0.3 mile northwest of Bethel Church.	0–7	1,560	1,020	21,400	1,740	4.6	
			7–18	760	840	21,800	4,040	4.6	
61	Beechy loam	0.5 mile southeast of Pottertown.	0–7	1,140	820	20,200	100	5.4	.2
			7–18	940	540	20,200	280	5.4	.4
64	do	0.8 mile southeast of Poplar Springs Church.	0–7	1,380	540	15,600	180	5.4	
			7–18	1,340	620	16,200	460	4.9	
19	Huntington silt loam.	1 mile northeast of Hickory Grove Church.	0–7	2,580	1,840	31,600	40	5.5	
			7–18	2,580	1,580	32,600	80	5.7	
36	Egam silty clay loam.	1.2 miles northwest of Pine Bluff Ferry.	0–7	2,480	1,540	32,400	80	5.5	
			7–18	1,120	620	27,200	100	5.9	
13	do	1 mile south of Pine Bluff Ferry.	0–7	2,760	2,640	34,400	100	6.2	
			7–18	3,020	2,600	36,800	40	6.3	

See footnotes at end of table.

TABLE 8.—*Chemical composition of the surface soil of the more important soils of Calloway County, Ky.*—Continued

[In pounds per 2,000,000 pounds of dry soil]

Field sample No.	Soil type or phase	Approximate location	Depth	Total nitrogen	Total phosphorus[2]	Total potassium	Calcium carbonate required to neutralize soil acidity[3]	pH[4]	Gravel rejected
			Inches	*Pounds*	*Pounds*	*Pounds*	*Pounds*		
29	Melvin silt loam	0.25 mile south of Newburg.	0–7	2,160	1,660	32,400	80	5.4	
			7–18	1,940	1,580	33,200	80	5.6	
31	Melvin silty clay loam.	0.1 mile southeast of Redden.	0–7	3,320	2,100	38,200	860	4.7	
			7–18	3,160	2,260	39,000	1,720	4.8	
15	Calhoun silt loam	2.7 miles southwest of New Concord.	0–7	1,500	1,100	26,000	1,360	4.6	
			7–18	740	960	28,000	2,220	4.6	
14	Wheeling silt loam	1.2 miles northeast of Malory School.	0–7	1,440	1,360	28,800	80	5.5	
			7–18	1,120	1,540	33,800	360	4.8	
48	Sciotoville silt loam	0.1 mile west of Newburg.	0–7	1,580	1,240	27,200	80	5.8	
			7–18	1,060	1,140	32,200	420	5.0	
33	Sciotoville very fine sandy loam.	0.7 mile southeast of Redden.	0–7	1,900	2,060	27,000	80	6.2	
			7–18	900	1,000	32,600	1,040	4.8	
[5] 35	Ginat silt loam	1.7 miles northwest of Pine Bluff Ferry.	0–7	2,020	1,400	30,600	3,500	4.5	
			7–18	1,400	1,660	32,000	4,540	4.4	
58	Shannon loam	0.4 mile northwest of Pottertown.	0–7	1,140	620	19,000	80	5.8	
			7–18	820	680	19,000	100	5.5	
53	Vicksburg silt loam	1.1 miles southeast of Hickory Grove Church.	0–7	1,540	740	25,000	140	5.3	
			7–18	1,360	800	27,600	140	5.4	
26	do	0.7 mile south of Protemus.	0–7	1,580	780	27,200	100	5.6	
			7–18	1,620	700	27,600	100	5.6	
41	Collins silt loam	1 mile southwest of Gibbs Store.	0–7	1,860	800	24,000	1,320	4.6	
			7–18	840	760	23,400	2,540	4.7	
56	do	1.7 miles north of Goshen Church.	0–7	1,340	980	20,600	820	4.8	
			7–18	920	580	22,200	1,460	4.7	

[1] Analyses by O. M. Shedd, chemist, Kentucky Agricultural Experiment Station, except as indicated in footnote 2.
[2] Total phosphorus in samples Nos. 1–7 determined by S. D. Averitt, chemist, Kentucky Agricultural Experiment Station.
[3] Calcium carbonate required to neutralize soil acidity was determined by the Hopkins method.
[4] pH values were determined colorimetrically except in certain samples where the glass electrode was used to check the colorimetric reading.
[5] Woods.

The results of these analyses indicate that most of the soils contain from 1,000 to 2,000 pounds of nitrogen, 500 to 1,100 pounds of phosphorus, and 20,000 to 25,000 pounds of potassium in 2,000,000 pounds per acre of dry surface soil (approximately the weight of an acre plow layer). The soils of the rougher uplands, in general, are the lowest in plant nutrients, especially in nitrogen and phosphorus; and the soils of the Tennessee River bottoms are the highest. These analyses can be compared with that of Maury silt loam, one of the better soils of the inner bluegrass section of Kentucky, which contains an average of about 3,000 pounds of nitrogen, 4,500 pounds of phosphorus, and 25,000 pounds of potassium in 2,000,000 pounds of dry surface soil. The nitrogen content and the phosphorus content of most of the soils are relatively low for the production of good yields of crops, especially on the soils of the uplands and small stream terraces. The potassium content of most of the soils is probably sufficient to support, under a good system of soil management, good yields of general field crops except tobacco, cotton, and alfalfa. The results indicate that all the soils are strongly to very strongly acid with the exception of the better drained soils of the Tennessee River bottoms and terraces, which are only medium to slightly acid.

ROTATIONS, FERTILIZERS, AND LIME

It is important that the kind of rotation and the crops to be grown be chosen to suit the capabilities of the particular soils. A 4-year rotation of corn, wheat, and 2 years of a grass-legume mixture is used to some extent and seems to be a suitable rotation for the brown soils of the smoother uplands and stream terraces, the gray soils of the uplands and stream terraces, and the colluvial phases of the soils of the alluvial bottoms. Among the desirable features of this rotation are: (1) It includes a cultivated crop, (2) plowing is necessary only once in 4 years, (3) a growing crop occupies the land most of the time, (4) legumes included for 2 years increase the supply of nitrogen, and (5) the grass better preserves or utilizes this added nitrogen (*15*). If desired, tobacco can be substituted for corn on the Grenada and Olivier soils; cotton for corn on the Wheeling, Sciotoville, Memphis, Lexington, and Brandon soils; sorgo for corn on the Henry, Calloway, Calhoun, and Ginat soils; or sweetpotatoes for corn on the Memphis and Lexington soils. Rye or barley can be substituted for wheat. Grass-legume mixtures of adapted red clover, Korean lespedeza, alfalfa, orchard grass, and timothy are suitable for the well-drained soils after they have been limed properly. A suitable grass-legume mixture for the gray or less well-drained soils of the uplands and stream terraces is lespedeza, alsike clover, and redtop.

A good tobacco rotation for the Grenada and Olivier soils appears to be tobacco followed by a winter cover crop of rye and crimson clover, tobacco the second year, and wheat the third, followed by 3 years of a legume-grass mixture. A 1-year rotation of wheat or barley seeded to Korean lespedeza appears to be suited to Grenada silt loam, slope phase; Providence silt loam; Lexington silt loam, slope phase; Lexington loam, smooth phase; Brandon silt loam, slope phase; and Bodine loam, smooth phase. The lespedeza should reseed itself, and the small grain can be sown after the land is disked.

A 2-year rotation of corn and barley is suited to Vicksburg silt loam, Shannon loam, Huntington silt loam, Collins silt loam, and Hymon loam. An early-maturing variety of hybrid corn can be grown and the corn cut for fodder or silage. Sweetclover can be sown in the barley in the spring and plowed under the next spring about 2 weeks before planting the corn. These soils are periodically overflowed, and any winter crop on them is likely to be flooded one or more times. When the barley is killed by overflows, spring oats can be sown and the sweetclover sown in it; or soybeans can be planted, followed by a small grain cover crop. This rotation can be used on areas of Waverly silt loam, Beechy loam, and Melvin silt loam that have been properly drained. Another rotation adapted to the imperfectly and well-drained soils that are periodically overflowed is a 3-year rotation of corn, corn, and soybeans. The seeding of a winter cover crop in the fall is considered a good practice.

Grenada silt loam, and Grenada silt loam, level phase, are the two most important and most extensive of the soils well suited to crops. They are very similar except in relief. Yields of crops on these soils under average management are only fair, except those of tobacco, for which large quantities of fertilizer are ordinarily used. Experience and experiments indicate that the present productivity of these soils can be greatly increased.

The Mayfield Soil Experiment Field of the Kentucky Agricultural Experiment Station was established in 1913 near Mayfield in Graves County, which adjoins Calloway County on the west. The soils on the experiment field are principally Grenada silt loam and Grenada silt loam, level phase. A 4-year rotation of corn (followed by a small grain cover crop), soybeans, wheat, and red clover has been used on four series of plots on the field. Ground limestone was used on the series for corn at the rate of 2 tons an acre for two rounds of the rotation. These applications amounted to a total of 4.6 tons an acre between 1913 and 1920, and none has been used since. An application of 800 pounds to the acre of 16-percent superphosphate was made for each rotation for the first two rounds, and after that the rate was reduced to 400 pounds. Rock phosphate was used at double the rate of superphosphate, which made these applications approximately equal in cost. Muriate of potash was applied at an average rate of 220 pounds an acre for each rotation. All the fertilizers were applied on the cornland in the full amount for the rotation until 1924–26, when the applications were changed to the wheatland. They were applied on the broken ground and disked into the soil until the change was made to the wheatland, except that the rock phosphate was usually applied before breaking. Manure was applied to all plots preceding corn at the rate of 1 ton for each ton of crops removed, except for wheat for grain (*16*). The crop responses to limestone and fertilizers in this 4-year rotation are given in table 9.

TABLE 9.—*Acre yields of crops in response to limestone and fertilizers in the 4-year rotation on the Mayfield Soil Experiment Field in Graves County adjoining Calloway County, Ky.*[1]

Treatment	Corn [2]	Soybean hay [3]	Wheat [4]	Red clover [5]
	Bushels	*Pounds*	*Bushels*	*Pounds*
Manure only	35.8	2,685	8.8	1,291
Increases in yields with the following treatments, in addition to manure:				
Ground limestone	9.7	639	4.4	1,659
Superphosphate	1.8	268	2.8	247
Rock phosphate	7.4	538	5.0	1,366
Muriate of potash	−.8	−143	.8	−241
Ground limestone+superphosphate	10.6	955	10.3	2,539
Ground limestone+rock phosphate	11.5	946	9.6	2,400
Ground limestone+superphosphate+muriate of potash	13.9	1,034	13.1	2,925
Ground limestone+rock phosphate+muriate of potash	9.9	787	7.3	2,627

[1] Data from Kentucky Agricultural Experiment Station. Yields given for treatment with manure only are averages of 16 plots (4 plots in each of 4 series); the other yields are averages of 4 plots (1 plot in each of 4 series).
[2] Average of 22 crops.
[3] Average of 16 crops.
[4] Average of 21 crops.
[5] Average of 18 crops.

A 6-year rotation of tobacco (followed by a small-grain cover crop), tobacco, wheat, and clover and grass for 3 years was started in 1929 on another group of 3 series of plots on the Mayfield Soil Experiment Field. Manure was applied to all plots for tobacco at the rate of 5 or 6 tons an acre. A total of 6 tons of ground limestone to the acre was applied between 1913 and 1919, and none has been used since. Superphosphate was applied at the rate of 300 pounds an acre for the tobacco. Sulfate of potash was applied at the rate of 100 pounds

an acre for the tobacco. Nitrate of soda was applied at the rate of 200 pounds an acre for tobacco and 100 pounds as a top dressing on wheat in the spring. The acre yields of crops in this 6-year rotation from the various treatments are given in table 10.

TABLE 10.—*Acre yields of crops under various treatments in the tobacco rotation on the Mayfield Soil Experiment Field in Graves County adjoining Calloway County, Ky.*[1]

Treatment	Tobacco [2]	Wheat [3]	First-year hay [3]	Second-year hay [3]
	Pounds	*Bushels*	*Pounds*	*Pounds*
None	1,109	15.4	1,384	2,392
Superphosphate	1,271	19.4	2,274	2,884
Ground limestone+superphosphate	1,339	27.0	3,456	3,596
Ground limestone+superphosphate+sulfate of potash	1,273	25.7	4,258	3,996
Ground limestone+superphosphate+nitrate of soda	1,297	32.5	3,830	2,196
Ground limestone+superphosphate+sulfate of potash +nitrate of soda	1,460	32.1	4,198	3,808

[1] Data from Kentucky Agricultural Experiment Station.
[2] Average of 7 crops.
[3] Average of 3 crops.

The results in tables 9 and 10 indicate that limestone is very effective on these soils in increasing the yields of all crops, with the possible exception of tobacco. According to these data, superphosphate on unlimed soils was not very effective in the 4-year rotation, whereas rock phosphate was more effective than superphosphate on unlimed soils. Both of the phosphates were very effective on limed soils, except for corn. The use of potash was not consistently effective, although it produced some increases in yields when used with limestone and superphosphate in the 4-year rotation and when used in a complete fertilizer for tobacco. However, what appears to be a marked deficiency of potash has appeared recently in corn crops on plots that have received the limestone-superphosphate treatment but no manure.

In 1934, experiments comparing crop response to various phosphates on limed and unlimed land were started by the Kentucky Agricultural Experiment Station in cooperation with the Tennessee Valley Authority on the farm of L. L. Gupton, 7 miles southwest of Murray. These plots are located mainly on Grenada silt loam, level phase. On a 3-year rotation of corn, wheat, and lespedeza the results to date show very marked increase in yields of the three crops from the use of a combination of ground limestone and superphosphate, whereas either treatment used alone has been considerably less effective.

It appears that the application of lime is an important measure in the improvement of the Grenada soils. About 2 tons an acre seems to give good results. Probably the best time to apply it is before the corn crop or after the tobacco crop. The legumes, especially alfalfa, sweetclover, and red clover, respond particularly well to this treatment. Yields of most other crops are improved either directly or indirectly through increased yields of legumes.

The above-suggested liming practices are thought to be fairly applicable to most of the other soils of the county, with the following exceptions: The Henry, Calloway, Calhoun, and Ginat soils probably need somewhat larger applications; the Wheeling, Sciotoville, Vicksburg,

Shannon, and Melvin soils probably need smaller applications; and it is doubtful whether lime would benefit the Huntington and Egam soils.

An application of 300 to 400 pounds of 20-percent superphosphate, or its equivalent, seems to give good results on limed Grenada soils. It is often drilled or broadcast on the plowed land and disked in before wheat or other small grains are sown. The foregoing experimental data indicate that rock phosphate is effective both on the limed and on the unlimed soils and that it may have an advantage over the superphosphate where the soil is unlimed. Where rock phosphate is used, from 800 to 1,000 pounds to the acre should be applied and disked in before plowing for wheat. These quantities will probably be sufficient for a 4-year rotation unless tobacco or cotton is grown. Accurate information on responses from phosphate fertilization on the other soils of the county is inadequate.

Tobacco responds well to liberal fertilization. A good grade of leaf is produced on soils in a high state of productivity and following 2 or more years of a good grass and legume crop. A very good grade of western fire-cured tobacco is produced on the Grenada and Olivier soils, and this type of tobacco probably should be confined largely to these soils. From 100 to 150 pounds to the acre of a 6–16–12 fertilizer, or its equivalent, might be expected to give good results where the soil is in a productive state. On less productive soils this may be supplemented by a broadcast application of 200 pounds of 20-percent superphosphate and 50 to 75 pounds of muriate or sulfate of potash to the acre. If the land is fertilized as above indicated and tobacco fails to make satisfactory growth in favorable weather, an application of 100 to 150 pounds of nitrate of soda or sulfate of ammonia often is made as a side dressing when the plants are 8 to 10 inches high (*17*). The Calloway, Calhoun, and Henry soils should probably receive a larger quantity of potash for tobacco.

Cotton also responds well to liberal fertilization. From 300 to 500 pounds to the acre of a 3–10–8 or 3–10–10 fertilizer appears to be a suitable application for cotton on the brown soils of the uplands and stream terraces and the colluvial soils of the Shannon and Hymon series. A side dressing of 75 to 100 pounds of a soluble nitrogen fertilizer when the cotton is thinned may also be profitable on these soils (*16*). Applications of one-half of these amounts, however, should be very effective on the Wheeling and Sciotoville soils.

Alfalfa is a heavy feeder on potash. Unless the soil is heavily manured or the alfalfa pastured, it will probably prove profitable to apply about 200 pounds of a soluble potash fertilizer in addition to about 500 pounds of 20-percent superphosphate, or its equivalent, at the time of seeding. Another application of potash after 2 or 3 years might prove effective (*16*).

IMPROVEMENT OF PASTURE

Improvement of pasture offers an opportunity to increase the productivity and diversity of agriculture on many farms. A good pasture supplemented by the necessary concentrates is commonly considered an efficient and economical system of feeding, and pasture is among the most satisfactory uses to which agricultural land can be put with a view to conservation. All the soils, except those of the

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Fifth class, are physically capable of producing good permanent pastures when properly managed. Lexington silt loam, Lexington loam, and Brandon silt loam, all Fourth-class soils, are excessively drained, and because of this their productivity for pasture is severely limited by adverse moisture conditions during the drier periods. It is probable that contour furrows, ridges, or terraces would serve as a partial corrective for excessive runoff, especially while the grass is becoming established. Lime and phosphate are also probably of considerable value in establishing and maintaining pastures of good quality.

The permanent pasture should include a mixture of grasses and legumes. A satisfactory mixture for the above-mentioned Brandon and Lexington soils, where they have received lime and phosphate, consists of Kobe lespedeza, alfalfa, sweetclover, hop clover, yellow trefoil, orchard grass, redtop, and Canada bluegrass. Where they have not received lime and phosphate, a mixture of Kobe lespedeza, *Lespedeza sericea*, hop clover, yellow trefoil, orchard grass, redtop, and Canada bluegrass might be satisfactory. Kudzu should prove a valuable plant for the gullied spots. Beechy loam, sanded phase, and Melvin silty clay loam are poorly drained soils in the bottoms, and the use of lime or phosphate is not recommended for them unless they are artificially drained. A good permanent pasture mixture for them under natural drainage conditions might be reed canary grass, redtop, and Kobe lespedeza.

WATER CONTROL ON THE LAND

The discussion of water control on the land in this section is restricted to measures to control runoff and to artificial drainage, as neither irrigation nor the control of flooding by such devices as dikes is significant in the present agriculture of the county. Control of runoff and artificial drainage, however, are important to the agriculture, as a great acreage of land is affected by one or the other. About one-third of the total acreage presents problems of control of runoff, and about one-fifth presents problems of artificial drainage. The soils requiring attention to runoff are chiefly in the uplands; those requiring attention to drainage are mainly on the stream bottoms and in nearly flat areas on stream terraces.

CONTROL OF RUNOFF

The term "control of runoff" is used here only in relation to runoff on the fields, pastures, and forests. Previous failure to control runoff has resulted directly from a failure to adjust the use and management of the soils to their physical limitations. A great number of factors influence land use and soil management. Under past conditions, adjustment (considered in a broader sense) of land use and soil management to the physical limitations of the soils could not be expected. Readjustments to bring about such harmony must be gradual. Control of runoff should be effected through improvement or readjustment in land use and soil management and indirectly through a great number of other factors that touch every phase of the many-sided agricultural problems of the county.

The agricultural significance of controlling runoff is far-reaching not only because of the large acreage involved but also because of its

many beneficial effects. Among the desirable effects brought about by the control of runoff are, first, a more equitable supply of moisture for growing crops; second, improved tillage conditions, particularly in periods of low rainfall; third, better conditions for biological activity; fourth, improved conditions for the formation of humus; and, fifth, control of erosion. All these in turn facilitate further conservation and control of water on the land.

Although accelerated erosion is only one of the results of the failure to control runoff, it will serve as a measure of the extent to which runoff has not been controlled in Calloway County. Control of runoff and control of erosion are not identical measures. Control of erosion is only one and not necessarily the most important result of control of runoff. Accelerated erosion is here discussed, therefore, purely as a measure of the degree to which control of runoff has failed in the past.

Much of the land in Calloway County suitable for cultivation has been cleared for many years. Susceptible to erosion because of the mean annual rainfall of about 52 inches and the prevailingly undulating to hilly relief in the uplands, about one-third of the total area has become seriously eroded. About one-fifth of the total acreage has lost so much of the surface soil that the original subsoil material lies within reach of the ordinary tillage implements. Between 7,000 and 8,000 acres has undergone so much erosion that reclamation for the production of crops is impracticable except through very slow processes. Inasmuch as perfect adjustment between the use and management of the soils and their physical limitations has not been effected in the past, practically all of the sloping land that has been cultivated has lost a part of the soil material.

Only a few terraces had been constructed in the county prior to 1935. A tractor-pulled terracing machine was obtained about that time, and since then fields on many farms have been terraced. The terraces constructed have been of the broad-base type (*18*), and experience indicates that they are probably successful on such soils as Grenada silt loam where the gradient ranges from 2.0 to 10 percent. It needs to be emphasized that terraces are not everywhere equally practicable or even practicable at all. The difficulty of constructing and maintaining them must be considered before their practicability can be measured. The fertility and permeability of the soil, especially of the reworked strips for the terraces; the gradient; the complexity of the surface contour; the feasibility of providing satisfactory outlets; and the likelihood of the terraces filling and breaking are some of the factors that determine the practicability of terracing. Extremely gravelly areas of the Brandon soils, for example, probably are not suited to terracing, because of the difficulty of constructing and maintaining the terraces; and areas of Grenada soils in which the subsoil is exceptionally heavy textured may cause difficulties because of the slow permeability and low fertility of the exposed subsoil material.

Accelerated erosion is evidence of failure to control runoff on many of the important agricultural soils of the uplands, including Grenada silt loam and Lexington silt loam, smooth phase. It is significant that these soils, for the most part, are characterized by relatively favorable productivity and workability; consequently they were among the first to be put into use for the production of intertilled crops, a use that does not lend itself to measures for the control of runoff.

A large part of the acreage of the less productive soils, particularly of those associated with rugged lay of the land, has remained in forest, and here the natural vegetation has controlled runoff to a considerable extent.

Uncontrolled runoff results directly from ill-suited land use, ill-suited soil management, and ill-adjusted farm management, and indirectly from a more general maladjustment of agriculture. The remedy is to be sought, therefore, through readjustments of these causal factors. Since the land on which most of the uncontrolled runoff occurs is operated by individual farmers in small units, adjustments effecting correction of the causal factors on these individual farms must be made through and by each individual farm operator. The approach must be from his viewpoint and adjusted to the limitations and requirements of both the farm and the farm operator. In the last analysis, the problem of controlling runoff becomes a part of the whole problem of management on each individual farm. Each farm offers an individual problem, obviously a highly complex one.

The farmer who attempts to control runoff by adjustments in the use and management of his land is confronted with a number of problems that directly or indirectly limit his farm-management program. Among these are the size and type of farm; the physical character of his land, including the soil pattern of the farm; the surrounding social and economic conditions, such as transportation, market, church, and school facilities; the immediate cash demand on the farm income for such items as taxes, indebtedness, and support of family; the relation between prices of farm products and those of other commodities; the farm operator's facilities and resources for operating purposes, including buildings, farm equipment, seed, kind and number of livestock, cash, and credit; the farm operator's ability, aptitude, versatility, and preferences; community cooperation, labor, farm machinery, drainage, water disposal, marketing, and buying, and farm tenure and labor conditions.

The farmer as an individual has full or part control over some of these problems; over others he has little or no control except as a member of cooperating groups of farmers. A full solution, then, requires individual-community-State-National action embracing all the problems and influences affecting agriculture. Since the matter of runoff control is interrelated with the use and management of soils, the reader is referred to the section on Soils and to Land Use and Soil Management.

DRAINAGE

The soils of Calloway County are grouped into three drainage classes: (1) Well-drained, (2) imperfectly drained, and (3) poorly drained. The latter two groups will be considered in this discussion.

The poorly drained group includes those soils that have inadequate drainage for the production of most crops. The water table during a great part of the year is at or near the surface in some of these soils, and the production of many of the adapted crops is somewhat hazardous. The soils of this group are Henry silt loam; Ginat silt loam; Waverly silt loam; Beechy loam; Beechy loam, sanded phase; Melvin silt loam; and Melvin silty clay loam; aggregating 20,672 acres.

The imperfectly drained group includes those soils on which crop yields are limited by inadequate drainage but that are nevertheless adapted to several of the crops common to the region. Certain crops, such as alfalfa, cannot be grown successfully; yields of most of the adapted crops are somewhat limited and, during wet years, hazardous; and proper artificial drainage almost invariably increases the productivity of these soils. Calloway silt loam, Calhoun silt loam, Collins silt loam, and Hymon loam comprise this group, and their aggregate area is 38,144 acres.

So far artificial drainage has not been provided on a large acreage. Ditches have been constructed on a small acreage of poorly drained soils, and, where properly built and maintained, they have been beneficial. Very little tile drainage has been installed.

The agricultural use to which inadequately drained soils can be successfully put depends greatly on the improvement in drainage that can be effected by artificial means.

The imperfectly drained soils are suitable for hay and pasture, provided moderately water-tolerant plants are selected. Lespedeza, alsike clover, redtop, Bermuda grass, and bluegrass are among the more satisfactory hay and pasture crops for these soils under their natural drainage conditions. Corn and other crops equally tolerant of moist conditions can be grown with some degree of success, but experience indicates that corn is sometimes injured. Artificial drainage can be expected to give a much wider adaptation and the danger of injury to the more sensitive crops will be reduced.

The poorly drained soils in their natural condition are adapted to fewer uses than the imperfectly drained soils, as no plants except those that are very tolerant to wet conditions can be grown successfully. Corn, sorgo, cowpeas, soybeans, and certain water-tolerant pasture and hay crops can be grown with varying degrees of success. If these soils were drained by artificial means, it is apparent that their adaptation would be greatly broadened and their general productivity greatly enhanced. Those soils of this group that are on bottom lands and therefore subject to flooding will have this danger minimized, but flooding will not be entirely eliminated.

The feasibility of artificial drainage depends on a number of factors. An important one is the character of the soil. Some soils, for example, are more easily drained than others, and some have a higher natural state of fertility than others. Thus, the Collins and Hymon soils in general are among the more easily drained, because they are naturally better drained than the poorly drained soils and because they have a more permeable subsoil than such soils as those of the Henry series. On the basis of natural fertility, the Melvin soils are to be preferred to those of the Henry and Ginat series.

It is also necessary to know the engineering aspects in order to determine the feasibility of draining these soils. As no adequate studies have been made in regard to the engineering phase of this problem, no complete discussion of this part of the problem is attempted.

Another important aspect of the drainage problem is the effect that the improvement of drainage in one area might have upon areas farther downstream. Frequently, improvement in drainage upstream results in injury to areas downstream.

Another point worth noting is that improved drainage reduces flooding. Deposition of material during floods is one of the chief ways in which soils of the bottom lands maintain their fertility. If the flooding is greatly diminished, it is quite likely that the natural fertility of the soils will decrease and heavier fertilization will be required.

Assuming that drainage is feasible from both the agricultural and the engineering points of view, the advisability of artificial drainage rests with the individual farmers who make their living from the land. It involves changes and adjustments in the use and management of the land; and, as brought out in the subsection on Control of Runoff, the adjustments that a farmer can make in the use and management of his land are limited by a number of factors, many of which are beyond his immediate control.

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of forces of weathering and development acting on the materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and has existed since accumulation, (3) the plant and animal life in and on the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of development have acted on the material. The climate, and its influence on soil and plants, depends not only on temperature, rainfall, and humidity but also on the physical characteristics of the soil or soil material and on the relief, which, in turn, strongly influences drainage, aeration, runoff, erosion, and exposure to sun and wind.

Calloway County is in the Mississippi embayment, a northward extension of the Coastal Plain. The geological materials deposited during or after the formation of this embayment consist of unconsolidated sands, gravels, and clays of Cretaceous or later age and of a covering of loess or loesslike material over them (*13*). These deposits rest on Mammoth Cave limestone of Mississippian period, which comes close enough to the surface to influence the soils only in the hilly part of the county bordering the Tennessee River terraces. During the long period in which this limestone formation has been subjected to the weathering processes, the limestone has been leached to a depth of several feet, leaving a mass of highly resistant chert fragments. No calcareous material was found in any of it, except in a few limestone outcrops at the base of steep hills. These cherty materials have influenced the soils of about 18.5 square miles.

Nearly all of the soils of the uplands have been developed either wholly or partly from weathered loess or loesslike material. Originally this material probably covered the entire uplands, but in some areas, especially on steep slopes, most of it has been removed by geologic erosion. It ranges in depth from 2 feet or less on the ridges in the hilly eastern part of the county to about 10 feet in some places of the nearly level western part. Where it is shallow, the upper horizons of the soils have developed from it and the lower horizons have developed from Coastal Plain sandy and gravelly or cherty limestone materials. This loess has evidently been blown from the Mississippi River bottoms, as it increases in depth as this river is approached.

Although probably originally calcareous in this county, it is all leached and is acid (*14*).

The unconsolidated Coastal Plain sandy and gravelly materials outcrop or come near enough to the surface to influence the soils on most of the steep slopes throughout the county, except on the cherty ones and on many of the ridges and lesser slopes in the most dissected parts. These sandy and gravelly materials immediately underlie the loessial material in many places. They consist of brown, red, or orange stratified or cross-bedded ferruginous gravel and sand, largely gravel. Lenses or layers of ferruginous cemented sandstone or conglomerate rocks are numerous. Other lower lying sand formations outcrop in some localities, influencing the soils on the steeper slopes. The Porters Creek clay consists of clay and sand, but the clay outcrops enough to influence the soil only in a few spots. All these Coastal Plain materials are leached and acid. Some of them contain mica.

The Tennessee River alluvium has been derived largely from materials washed from limestone areas, although there has been a mixture of materials from other sources. It is the least acid of any of the parent materials.

The rather mild, temperate, humid, continental climate, the annual precipitation of about 52 inches, fairly well distributed throughout the year, and the relatively infrequent freezing weather allow moderately rapid and fairly continuous leaching and other soil processes. All the soils of the uplands are medium or more strongly acid throughout the solum, except in the dark, thin surface horizons in some of the virgin soils.

Originally all this county was probably covered with a heavy growth of an oak-hickory forest. At the time of the coming of the white men some of the more level parts were described as barrens and were largely treeless. This condition appears to have been due to the burning of the forests by the Indians (*3*). No true prairie soils have developed in the county. Because of this forest cover and a mild, humid climate, the soils are light in color and low in organic matter and nitrogen. These environmental conditions are not conducive to a large accumulation of organic matter in the soils. In virgin conditions the surface half inch is generally dark and contains a considerable amount of partly decayed organic matter consisting mainly of oak and hickory leaves and twigs.

The stage of development attained by the soils ranges from youthful to mature. Most of the soils in the first bottoms are young, and soil-forming processes have not acted on them long enough to form noticeable horizons of eluviation and illuviation. Most of the soils in the more level and undulating uplands, however, are very well developed. They have already developed their characteristic properties and are in equilibrium with their environment or nearly so. They have distinct horizons of eluviation and illuviation, but the number of horizons depends somewhat on environmental features such as relief and drainage conditions. The soils of the steeper slopes are not well developed, have a thinner solum, and have less well developed horizons because of heavy runoff and excessive geologic erosion. The soils of the terraces are well developed and resemble closely those of the undulating uplands.

Calloway County is near the northern edge of the region of Red and Yellow Podzolic soils and near the southern edge of the region of Gray-Brown Podzolic soils (*8*). It appears that podzolization processes have been dominant in the development of the soils of the county, although laterization processes have probably influenced them to some extent. Most of the soils of the uplands and terraces have developed either under conditions of imperfect or poor drainage or on steeply sloping or hilly land where geologic erosion has been great. Only a few can be regarded as zonal or normal soils, which owe their most important characteristics to the effects of the climatic and biological factors acting over a long period of time on well-drained but not excessively drained parent materials of mixed mineralogical composition.

Memphis silt loam probably best represents the zonal or normal soil developed from loessial materials, although less than 1 square mile occurs in the county. This soil is probably transitional between Yellow Podzolic and Gray-Brown Podzolic soils. It is well drained and is developed in hilly sections on undulating relief where the slope ranges from 1 to 10 percent.

Following is a description of a profile of Memphis silt loam, as observed in an excavation in a forested ridge top having a slope of about 2 percent and located one-sixth of a mile southwest of Protemus:

(1) A covering of undecayed leaves and twigs, largely from oak.
(2) 0 to 0.5 inch, (moist) dark grayish-brown mellow silt loam containing much partly decayed organic matter, mainly leaves of oaks.
(3) 0.5 to 0.6 inch, (moist) light-gray mellow silt loam.
(4) 0.6 to 5.5 inches, (moist) light grayish-brown mellow silt loam. It contains faint gray splotches or coatings and specks and a few small black soft concretions. There are some worm holes and casts and numerous fibrous roots.
(5) 5.5 to 9 inches, (moist) light-brown or slightly grayish-brown mellow silt loam that breaks into slightly firmer fine crumbs than those in the horizon above. It contains a few gray coatings, a few small rusty-brown splotches, and a few small black soft concretions. A few worm holes and casts, many roots, and considerable funguslike growth in cracks are present.
(6) 9 to 15 inches, (moist) bright yellowish-brown friable heavy silt loam that breaks indistinctly into rounded or subangular nutlike aggregates. These, in turn, break with a slight pressure and have a few black stains on their surfaces. The material is more yellowish when crushed. There are a few worm holes and casts and root channels or other channels, many medium-sized roots, and a few dark small soft concretions.
(7) 15 to 28 inches, (dry) yellowish-brown, moderately compact, moderately dense, heavy silty clay loam that breaks into subangular nutlike aggregates from ¼ to ½ inch in diameter. These aggregates can be crushed between the fingers with much pressure. They are coated with bright yellowish brown with a slightly reddish cast, have considerable black staining, and are more yellow when crushed. A few root channels or other channels and small and medium-sized roots are present.
(8) 28 to 67 inches, (dry) dull yellowish-brown silty clay loam, less heavy, compact, and dense than the horizon above. It breaks indistinctly into subangular nutlike aggregates about ½ inch in diameter. The aggregates in this horizon are less hard than those in the horizon above and are coated with bright yellowish brown with a slightly reddish cast and a little black staining. A few root or other channels and a few black small soft concretions are present. There is a little gray coating on aggregates and around root channels.
(9) 67 to 72 inches, (dry) reddish-brown light clay loam, more friable than the horizon above. It contains some gray mottlings and some medium-sized sand grains. The material probably is Coastal Plain material.

As tested in the field, the surface dark layer is slightly acid and the rest of the soil is medium acid. If the original loess were calcareous, the calcium carbonate has been removed by leaching. Also, all the deeper layers down to the Coastal Plain material appear to have been changed by illuviation, as their texture is heavier than that of the typical silty loess of deep deposits. This soil has developed under a cover of deciduous forests, mostly species of oak and hickory. Except in the thin, dark surface layer, the organic-matter content is low. The surface layers of cultivated fields are light brown or grayish brown.

The other well-drained soils of the undulating uplands are the smooth and slope phases of Lexington silt loam; Lexington loam, smooth phase; the smooth and slope phases of Brandon silt loam; and Brandon gravelly loam, smooth phase. All these soils have been developed where the covering of loessial material is less than about 3½ feet. The upper horizons of their profiles have developed from loessial material or a mixture of loessial and Coastal Plain materials, whereas the lower horizons have developed from unconsolidated Coastal Plain sandy or gravelly materials. All have been formed under environmental conditions similar to those under which Memphis silt loam has been formed; however, the Brandon soils have less well developed profiles, owing evidently to the gravelly nature of part of the parent material (pl. 7, *A*).

The Coastal Plain materials in the Lexington soils are sandy, whereas those in the Brandon soils are gravelly, the gravel consisting principally of rounded fragments of chert. The Lexington soils are very similar to Memphis silt loam in age and stage of development. The upper horizons of the members of the Lexington series are similar to the corresponding horizons of the Memphis soils. The Lexington soils differ from the Memphis soils chiefly in the lower part of the profile. The lower horizons of the Lexington soils consist of clay loam or sandy clay, mainly from Coastal Plain materials, whereas the lower horizons of the Memphis soils are silty clay loam of loesslike materials. The Brandon soils are not quite so well developed as the Memphis soils, because of the gravelly material from which the lower part of the Brandon soils have developed. Brandon gravelly loam, smooth phase, has only a thin loessial mantle, and this soil is not so well developed as Brandon silt loam.

The Lexington and Brandon soils that have a smoother surface are better developed than those that have a strongly rolling or steep relief. The stronger relief and greater surface runoff have caused less vigorous growth of plants and have inhibited soil-forming processes, with the result that these soils have a somewhat thinner solum and a slightly less heavy and well-developed B horizon. Atwood fine sandy loam has formed almost wholly from sandy Coastal Plain materials, but it has a rolling to hilly relief and is not very well developed.

Wheeling silt loam on the terraces of the Tennessee River has developed from old alluvium deposited mainly by that river. It is very similar in main profile characteristics, age, and stage of development to Memphis silt loam.

About 42 percent of the soils of the county have mature or immature profiles and have developed under imperfect to poor drainage conditions. These are classed as intrazonal soils. All these soils

have gray or gray mottled lower subsoils that are more or less compact, dense, and slowly permeable to water. The soils developed under imperfect drainage have grayish-brown surface soils, yellowish-brown friable upper subsoil layers, and slightly to very compact, dense, gray mottled lower subsoil layers. The Grenada, Providence, Olivier, and Sciotoville soils have this kind of a profile. About 33 percent of the county is occupied by the Grenada soils, which are mature soils developed from loess on nearly level, undulating, or gently rolling relief.

Following is a description of a profile of Grenada silt loam, level phase, (pl. 7, *B*) as observed in an excavation in a forest 3.2 miles northeast of Crossland and 1.5 miles north of Smotherman School:

(1) A rather thick covering of undecayed leaves and twigs from deciduous trees, largely oak and hickory.

(2) 0 to 0.5 inch, (moist) dark grayish-brown mellow silt loam, containing a large quantity of partly decayed leaves and twigs, largely from oak and hickory.

(3) 0.5 to 0.6 inch, (moist) light-gray mellow silt loam.

(4) 0.6 to 3 inches, (moist) grayish-brown mellow silt loam. The upper part is stained slightly darker with organic matter. There are a very few gray mottlings, small rusty-brown splotches, and scattered black hard to semihard concretions about ⅛ inch in diameter. Fibrous and medium-sized roots, worm holes, and casts are numerous. The material contains much whitish funguslike growth.

(5) 3 to 8 inches, (moist) light-brown or slightly grayish brown mellow silt loam having a soft fine-crumb structure. It contains a few small, soft, black concretions, a few worm holes and casts, and numerous fibrous and larger roots.

(6) 8 to 13 inches, (moist) bright yellowish-brown very friable silt loam having a soft-crumb structure. It becomes more yellow when rubbed. A few black and rusty-brown small soft concretions and a few worm holes and casts are present. Roots are less numerous than in the horizon above.

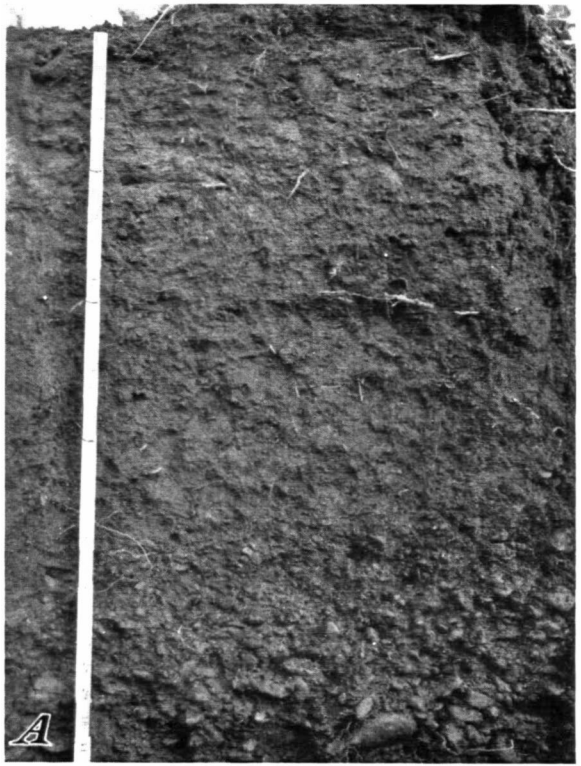
(7) 13 to 17 inches, (moist) brownish-yellow friable silt loam having faint gray coatings around some root channels and a few rusty-brown splotches. It becomes more yellow when rubbed. The structure is intermediate between crumb and soft rounded nutlike. There are a few rusty-brown and black semihard concretions ranging from very small to ¼ inch in diameter, a few roots, and a few worm holes or other channels.

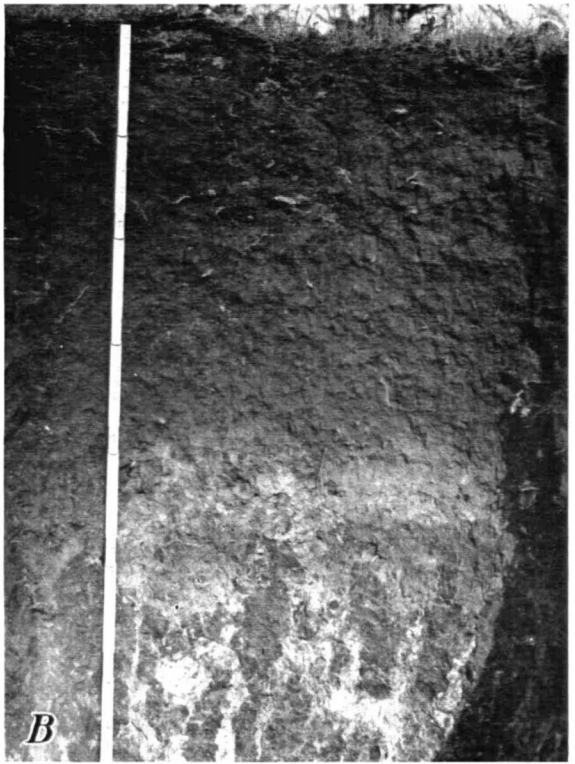
(8) 17 to 22 inches, (moist) pale brownish-yellow friable silt loam with some gray mottling and coating and a little rusty brown. It becomes more yellow when rubbed. The structure is similar to that of the horizon above, except that the aggregates are slightly larger and firmer. There are many rusty-brown, small, soft and a few semihard concretions and a few roots.

(9) 22 to 26 inches, (dry) gray, pale-yellow, brownish-gray, and rusty-brown heavy silt loam that is slightly compact but rather friable. It breaks into medium-sized, firm, rounded nutlike aggregates that are coated with some whitish gray. It contains numerous rusty-brown soft concretions, a few semihard pellets, and a few roots.

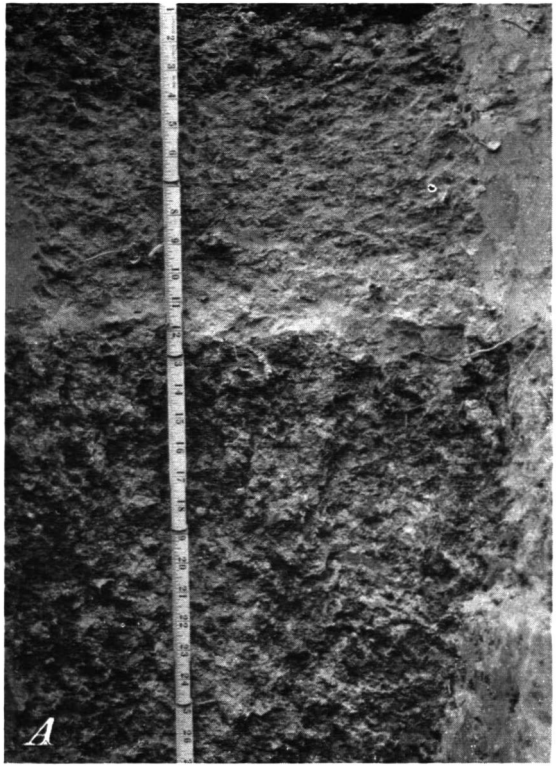
(10) 26 to 28 inches, (dry) gray, brownish-gray, and rusty-brown silty clay loam. It breaks into medium-sized rounded to subangular firm nutlike aggregates that are thickly coated with very light gray or almost white floury silt.

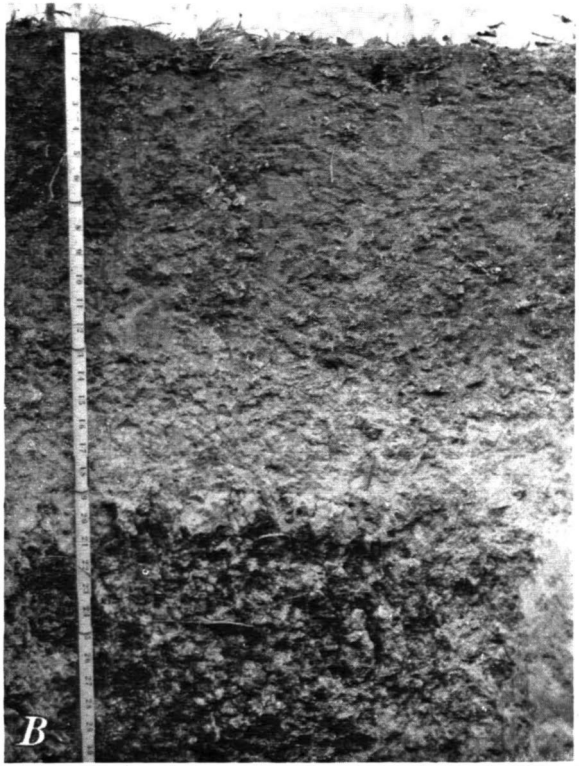
(11) 28 to 39 inches, (dry) mottled gray, rusty-brown, and yellow very compact dense tough silty clay that is plastic and sticky when wet. The material breaks into large subangular hard nutlike aggregates. The aggregates are coated with a medium-gray glossy very fine or colloidal material and with some very light gray or almost white silty material. The inside part of the aggregates contains more yellow and rusty brown. Only a few small roots are present in this horizon.





A, Profile of Brandon silt loam about 2 miles southeast of Hico. The materials consist of a mantle of loesslike silt underlain by a deposit of gravel. *B*, Profile of Grenada silt loam, level phase, showing the brown and yellowish-brown friable upper layers, extending to a depth of about 22 inches and the light-gray layer directly above the gray mottled claypan or compact layer at a depth of about 28 inches.





A, Profile of Henry silt loam. The surface layer is grayer and the depth to the claypan is less than in Calloway silt loam. *B*, Profile of Calloway silt loam. This soil profile, as compared with the level phase of Grenada silt loam (pl. 7, *B*), has a lighter colored thinner surface layer, a thicker light-gray layer, and a slighter depth to the claypan. (These pictures were taken in Graves County, but they represent these soils as developed in Calloway County.)

(12) 39 to 50 inches, (dry) brownish-gray, gray, yellow, and rusty-brown moderately or very compact dense tough silty clay. It breaks into large hard subangular nutlike aggregates that are coated with some very light gray or almost white material. Very few roots and a few rusty brown concretions are present.

(13) 50 to 93 inches +, (dry) pale brownish-yellow slightly to moderately compact light silty clay loam containing a little gray and rusty brown. This material is hard and largely massive in structure. There is some very light gray or almost white coating in cracks. A few roots or other channels are present.

The slope of the soil just described is about 1.5 percent. The vegetative cover consisted almost wholly of species of oak and hickory. Except in the thin, dark surface layer, the organic-matter content is low. As tested in the field, horizon 2 is medium acid, horizons 4 to 10, inclusive, are very strongly acid, and horizons 11 and 12 are strongly acid. It is probable that the original loess was calcareous. The gray compact lower subsoil layer is moderately or nearly impermeable to water.

The profile of Grenada silt loam, the most extensive soil in the county, is similar to the above-described profile of Grenada silt loam, level phase, except that in the former the depth to the gray compact lower subsoil layer averages very slightly less and this compact layer averages very slightly thinner and less compact. Grenada silt loam has a gently undulating relief, whereas the level phase has a nearly level surface. Grenada silt loam, slope phase, occurs on gently rolling relief and has profile characteristics similar to those of the typical soil, except that it has a very slightly brighter color in the upper part of the subsoil and is slightly shallower to the compact lower subsoil horizon, and this horizon is thinner and less compact and more permeable. The Grenada soils resemble the Memphis in their upper horizons except for their more yellow color. They have developed under imperfect drainage, at least a part of the time. Although the water table is not high now, it may have been originally.

Providence silt loam has characteristics similar to those of Grenada silt loam, slope phase, except that the lower part of its profile consists of Coastal Plain gravelly or sandy materials. The Bodine soils are evidently developed from a shallow covering of loessial material over highly weathered cherty limestone materials. The loam and cherty loam soils occupy a steep relief and have young to immature profiles, which are similar in color to that of Grenada silt loam. The lower gray mottled horizon is evidently due to impeded internal drainage. Slight cementation of chert fragments in the lower part of the solum is not uncommon, and this is thought to interfere with internal drainage.

The Olivier soils are similar in profile characteristics to the Grenada soils. They occupy stream terraces, however, and are developed very largely from old alluvium of loessial origin. The Sciotoville soils are also similar to the Grenada in main profile characteristics, but they are not quite so well developed. They occur on terraces and are developed mainly from old Tennessee River alluvium.

The Grenada, Providence, Olivier, and Sciotoville soils are considered as belonging to the Planosol group of intrazonal soils, although most of them do not occupy flat areas.

The well-developed soils on nearly level and depressed areas of poor or very poor drainage are those of the Henry (pl. 8, *A*), Calhoun,

Calloway, and Ginat series. They have gray or gray mottled profiles and very compact, dense, nearly impermeable claypans. Because of their flat surface, normal erosion is very slow or lacking; and they are more acid and leached to a greater extent than the normal soils. These soils belong to the Planosol group of intrazonal soils.

Following is a description of a profile of Henry silt loam, as observed in an excavation in a forest 1¼ miles south of Lynn Grove.

(1) A very thin covering of undecayed leaves, largely from oaks.
(2) 0 to 2 inches, (moist) medium-gray very mellow silt loam showing many light-gray and a few rusty-brown specks. It is mainly structureless and contains some black, small, semihard concretions and numerous fibrous roots.
(3) 2 to 6 inches, (moist) light-gray very mellow silt loam that is splotched with yellow and some rusty brown and is slightly platy in structure. It contains numerous fibrous and medium-sized roots, a few worm holes and casts, and a very few small, soft, black concretions.
(4) 6 to 10 inches, (moist) light-gray very mellow silt loam, splotched with very light gray or almost white and to a less extent with pale yellow. This material is slightly platy in structure. It contains numerous fibrous and medium-sized roots and a few worm holes and casts but no noticeable concretions.
(5) 10 to 12 inches, (moist) very light gray or almost white very smooth mellow silt loam. It contains a few roots and channels but no noticeable concretions.
(6) 12 to 26 inches, (slightly moist to dry) medium-gray very compact dense tough silty clay, splotched with grayish brown. This material is sticky and plastic when wet. It breaks into large subangular nutlike aggregates that cannot be crushed with the fingers. The aggregates have a glossy coating and contain a considerable amount of very light gray or almost white silty materials in the upper part of the horizon.
(7) 26 to 35 inches, (dry) medium-gray, with a brownish tint, very compact silty clay, not so tough, dense, or plastic as the horizon above. It breaks into hard subangular nutlike aggregates about ½ inch in diameter that have some very light gray or almost white coatings.
(8) 35 to 50 inches, (dry) brownish-gray very compact silty clay loam, slightly splotched with yellow and whitish gray. It is not so tough and dense as the material above. It has a hard massive structure and contains few roots.
(9) 50 to 58 inches +, (dry) light-gray compact hard moderately dense silty clay loam that has a massive structure and a few splotches of yellow and rust brown. It contains very few root or other channels.

As tested in the field, horizons 2, 7, 8, and 9 are strongly acid, and horizons 3, 4, 5, and 6 are very strongly acid. The vegetation consists almost entirely of species of oak and hickory, and the horizons above the compact subsoil seem to be thoroughly leached. The parent material was predominantly of the silty or loessial beds.

Henry silt loam occurs typically on flat or depressed areas that have practically no slope and are poorly drained. Calloway silt loam occurs typically on nearly level to depressed areas that have a slope ranging from 0 to 2 percent. It is intermediate in drainage and profile development (pl. 8, *B*) between Henry silt loam and Grenada silt loam, level phase. Its profile is largely gray but thoroughly mottled. Also, it differs from the Henry soil in having a greater depth to the heavy compact subsoil horizon.

The Calhoun and Ginat soils are on terraces and resemble Calloway silt loam in profile characteristics. The first is formed mainly from loessial materials and the second from old alluvium of the Tennessee River.

Practically all of the soils of the first bottoms are young, and no definite horizons of eluviation and illuviation have developed. Many

of them still receive deposits during floods. Some of the better drained ones have brownish-yellow subsoils. They vary in drainage conditions and in character of materials. The Egam soils of the Tennessee River bottoms seem to have developed a slight profile. They have a heavy-textured, tough, rather compact subsoil, most of these qualities probably being due to the accidents of deposition; but in some places a color profile and slight structural development are evident. These soils of the first bottoms belong to the alluvial group of azonal soils.

Mechanical analyses of several soils are given in table 11.

TABLE 11.—*Mechanical analyses of samples of several soils in Calloway County, Ky.*

Soil type and sample No.	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
Ginat silt loam:	*Inches*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
391736	0 - 1½	0.9	1.4	1.2	4.5	7.4	63.6	21.0
391737	1½-10	2.5	2.3	1.1	3.5	5.7	62.0	22.9
391738	10 -21	2.4	2.9	1.2	3.2	5.3	60.3	24.7
391739	21 -30	5.4	5.1	1.7	3.5	4.9	52.7	26.7
391740	30 -41	2.6	2.6	1.2	2.6	3.6	46.9	40.5
391741	41 -49	1.0	1.8	1.1	2.7	3.7	44.2	45.5
391742	49 -60	.4	1.9	1.3	3.3	5.1	52.1	35.9
391743	60 -80	.7	1.6	1.0	2.9	5.6	53.6	34.6
391744	80 -88+	.1	.5	.8	4.6	10.7	52.0	31.3
Calloway silt loam:								
391753	0 - ½	.2	1.6	1.0	1.9	1.5	82.0	11.8
391754	½- 6	.7	1.1	.7	1.4	1.6	77.4	17.1
391755	6 -15	.4	.9	.6	.9	.8	77.4	19.0
391756	15 -23	.4	.8	.5	.9	1.1	77.5	18.8
391757	23 -25	.2	.7	.5	.7	.9	68.2	28.8
391758	25 -31	.1	.6	.5	.7	.9	57.6	39.6
391759	31 -45	.2	.3	.4	.7	1.2	71.4	25.8
391760	45 -68+	.4	.6	1.0	1.7	1.3	75.3	19.7
Henry silt loam:								
391761	0 - 2	.5	.4	.6	1.2	1.2	87.5	8.6
391762	2 - 6	.0	.2	.5	1.1	1.0	86.7	10.5
391763	6 -10	.1	.2	.5	.9	.7	89.2	8.4
391764	10 -12	.1	.2	.4	.9	.9	89.6	7.9
391765	12 -26	.0	.1	.2	.4	.5	63.0	35.8
391766	26 -35	.0	.1	.2	.4	.5	70.6	28.2
391767	35 -50	.0	.1	.3	.7	.7	76.5	21.7
391768	50 -58+	.0	.5	1.2	2.7	1.7	70.3	23.6
renada silt loam:								
391769	0 - ½	.7	1.3	.9	1.0	.7	81.0	14.4
391770	½- 3	.4	1.1	.9	.8	.6	81.8	14.4
391771	3 - 8	.2	1.1	.8	.9	.7	79.9	16.4
391772	8 -13	.2	1.0	.8	.8	.7	76.5	20.0
391773	13 -17	.2	1.0	.7	.8	.9	74.7	21.7
391774	17 -22	.1	.7	.7	.8	.8	73.8	23.1
391775	22 -26	.1	.6	.6	.8	.9	71.1	25.9
391776	26 -28	.1	.9	6	.8	.8	64.9	31.9
391777	28 -39	.0	.4	.5	.9	.7	59.2	38.3
391778	39 -50	.1	.4	.6	1.6	1.4	72.1	23.8
391779	50 -93	.4	.7	1.1	2.6	1.8	70.2	23.2
391780	93+	.3	.6	1.4	3.8	2.5	56.9	34.5
Calhoun silt loam:								
3917100[1]	0 - ½	1.1	1.5	1.1	1.3	.9	54.7	39.4
3917101	½- 4	.6	1.4	1.2	1.5	.9	67.6	26.8
3917102	4 -16	.5	1.4	1.3	1.3	1.0	89.2	5.3
3917103	16 -23	.7	2.0	1.5	1.5	1.1	77.3	15.9
3917104	23 -26	.7	1.8	1.5	1.5	.9	79.0	14.6
3917105	26 -34	.3	1.2	1.0	1.1	.8	62.6	33.0
3917106	34 -44	.1	.7	.8	1.1	1.0	69.0	27.3
3917107	44 -58+	.7	2.2	3.9	3.5	2.1	68.6	19.0
Egam silty clay loam:								
3917121	0 - 5	.2	.3	.3	1.1	1.0	66.0	31.1
3917122	5 -33	.3	.6	.3	1.1	1.7	50.4	45.6
3917123	33 -50	.1	.2	.3	1.4	3.7	53.4	40.9
3917124	50 -66	.0	.1	.1	7.3	17.4	48.2	26.9
Lexington loam:								
3917154	0 - 1	1.4	9.2	4.5	18.7	3.2	56.8	6.2
3917155	1 - 7	2.0	11.2	5.0	20.5	3.5	49.8	8.0
3917156	7 -25	2.1	12.3	5.4	22.8	3.2	36.3	17.9
3917157	25 -38	4.3	16.1	7.0	30.5	3.6	24.3	14.2
3917158	38+	5.0	16.2	9.0	32.1	2.9	9.3	25.5

[1] Sample includes much organic matter.

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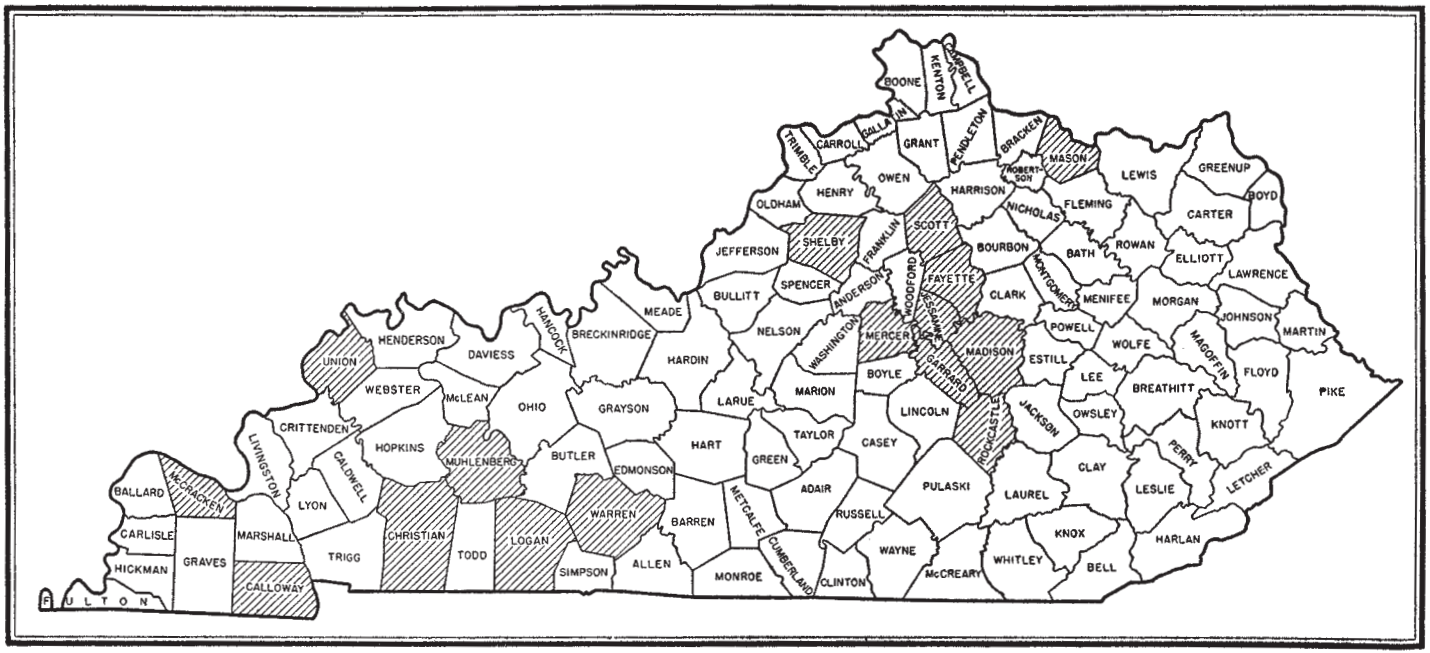

Areas surveyed in Kentucky shown by shading.

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(1) mail: U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

(3) email: program.intake@usda.gov.

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