SOIL SURVEY

Culpeper County Virginia

Series 1941, No. 3

Issued November 1952

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils, and Agricultural Engineering
In cooperation with the
VIRGINIA AGRICULTURAL EXPERIMENT STATION

How to Use THE SOIL SURVEY REPORT

FARMERS who have worked with their soils for a long time know about the soil differences on their own farms, perhaps also on the farms of their immediate neighbors. What they do not know, unless soil surveys have been made, is how nearly their soils are like those on experiment stations or on other farms either in their State or other States where farmers have gained experience with new or different farming practices or farm enterprises. They do not know whether higher yields obtained by farmers in other parts of their county and State are from soils like theirs or from soils so different that they could not hope to get yields as high, even if they followed the same practices. Knowing what kind of soil one has so that it can be compared with those on which new developments have proved successful is a means by which some of the risk and uncertainty can be taken out of trying new methods and new varieties.

SOILS OF A PARTICULAR FARM

The soil map is in the envelope inside the back cover. To find what soils are on any farm or other tract of land, the tract must first be located on the map. This is easily done by using roads, streams, villages, dwellings, and other landmarks in locating the farm boundaries.

Each kind of soil mapped within the farm or tract is marked on the map with a symbol. All the areas marked Ec are Elioak loam, eroded phase. The color with which the soil areas are shown on the map will be the same as the color in the legend.

To find out what the soil is like, turn to the section on Soil Series, Types, and Phases and find Elioak loam, eroded phase. There will be found a statement of what the soil is like, what it is mainly used for, and some of the uses to which it is suited.

How productive is Elioak loam, eroded phase? Find this soil in the left-hand column of table 5 and read the yields given opposite it under the names of different crops. This table also gives estimated yields for all the other soils mapped in the county.

What are considered good uses and management practices for Elioak loam, eroded phase? Read what is said about this soil in the section on Soil Series, Types, and Phases. Look also at the section Soils Grouped According to Their Relative Suitability for Farming. Here the soils suited to the same use and management practices are placed in classes. What is said about crops, crop rotations, liming, fertilizing, drainage, erosion control methods, and management practices for the group of soils including Elioak loam, eroded phase, will apply to that particular soil.

SOILS OF THE COUNTY AS A WHOLE

A general idea of the soils of the county is given in the introductory part of the section on The Soils of Culpeper County, which tells about the principal kinds of soils, where they are found, and how they are related to one another. At the same time study the soil map and notice how the different kinds of soils tend to be arranged in different parts of the county. These patterns are likely associated with well-recognized differences in type of farming, in land use, and in land-use problems.

A newcomer to the county, especially if he considers purchasing a farm, will want to know about the climate; the types and sizes of farms; the principal farm products and how they are marketed; the kinds and conditions of farm tenure; kinds of farm buildings, equipment, and machinery; churches, schools, roads, and railroads; the availability of telephone and electric services and water supplies; the industries of the county; and towns, villages, and population characteristics. Information about all these will be found in the section on General Nature of the Area and in the section on Agriculture.

Those interested in how the soils of the county were formed and how they are related to the great soil groups of the world should read the section on Morphology and Genesis of Soils.

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

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Series 1941, No. 3 Issued November 1952

SOIL SURVEY OF CULPEPER COUNTY, VIRGINIA

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United States Department of Agriculture in cooperation with the Virginia Agricultural Experiment Station

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CULPEPER COUNTY lies within the Piedmont physiographic province on two characteristic types of relief. The southeastern, or Triassic, part is level to undulating with a few low mountains; the rest is rolling to hilly. The county is primarily agricultural but has some other industries. As it is a great livestock section, the grain crops—corn, wheat, barley, and oats—are used chiefly for local consumption. Lespedeza, timothy, clover, alfalfa, and other hay crops occupy large acreages. Dairy farming is rapidly growing in importance because of the increasing demand for fluid milk in Washington, D. C., and other cities. To provide a basis for the best agricultural uses of the land a cooperative soil survey of Culpeper County was made in 1941 by the United States Department of Agriculture and the Virginia Agricultural Experiment Station.

GENERAL NATURE OF THE AREA

LOCATION AND EXTENT

Culpeper County, in the northeastern part of Virginia (fig. 1), has a total area of 381 square miles, or 243,840 acres, and is divided into five civil districts. Culpeper, the county seat and principal town, is approximately in the center of the county. It is about 60 miles southwest of Washington, D. C., and 70 miles northwest of Richmond. The county is roughly diamond-shaped; the longest diagonal is from northwest to southeast, and the shortest from northeast to southwest.

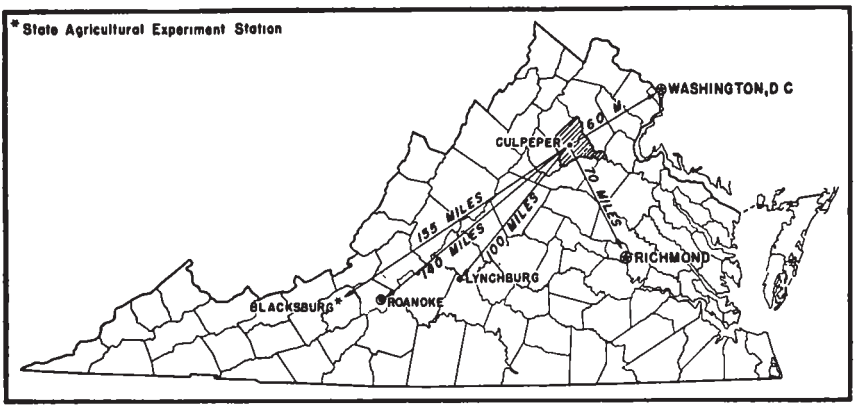

FIGURE 1.—Location of Culpeper County in Virginia.

The Rapidan River forms the southern boundary, the Rappahannock River the northeastern, Rappahannock County and the Hughes River the northwestern, and Madison County, Crooked Run, and the Robinson River the southwestern.

PHYSIOGRAPHY AND RELIEF

Culpeper County lies entirely within the Piedmont Plateau physiographic province. In general the land surface slopes gently southeastward from an average altitude of 600 feet on the west to 350 feet on the southeast. The county includes parts of the Piedmont Upland and Lowland (fig. 2); the boundary between these sections is the Catoctin Mountain border fault, which is a prominent structural feature of the area (*1*).[1] This fault separates Triassic rock in the southeastern part of the county from pre-Cambrian and Cambrian rock in the northwestern.

The Piedmont Upland is an old plain thoroughly dissected by many small streams that flow in narrow winding valleys. This stream dissection has imparted rolling to hilly relief to the upland. Occasional hills, steeper valley slopes, and narrower divides occur in the northwestern part of the upland (area A in fig. 2), which is in general more completely dissected, rougher, and steeper in relief than the southeastern part of the upland (area C in fig. 2).

The few hills, locally called mountains, that stand above the level of the upland considerably increase both the local relief and roughness of the area. One of these, Bald Mountain, located in the extreme western part of the county along the Madison-Culpeper County line, has an altitude of approximately 900 feet and is the highest point in the county.[2] This mountain is a rounded knob underlain by basic and acidic rocks. Criglers Mountain, or Muddy Run Mountain, a narrow ridge lying in a northeast-southwest direction about 2 miles north of Norman School, and Davis Mountain, 1 mile east of Norman School, are underlain by arkosic sandstone and quartzite. In the northwestern part of the county, about 3 miles north of Rixeyville, is Sheads Mountain, which is underlain by arkosic sandstone and

[1] Italic numbers in parentheses refer to Literature Cited, p. 126.
[2] Elevations from United States Geological Survey topographic sheets.

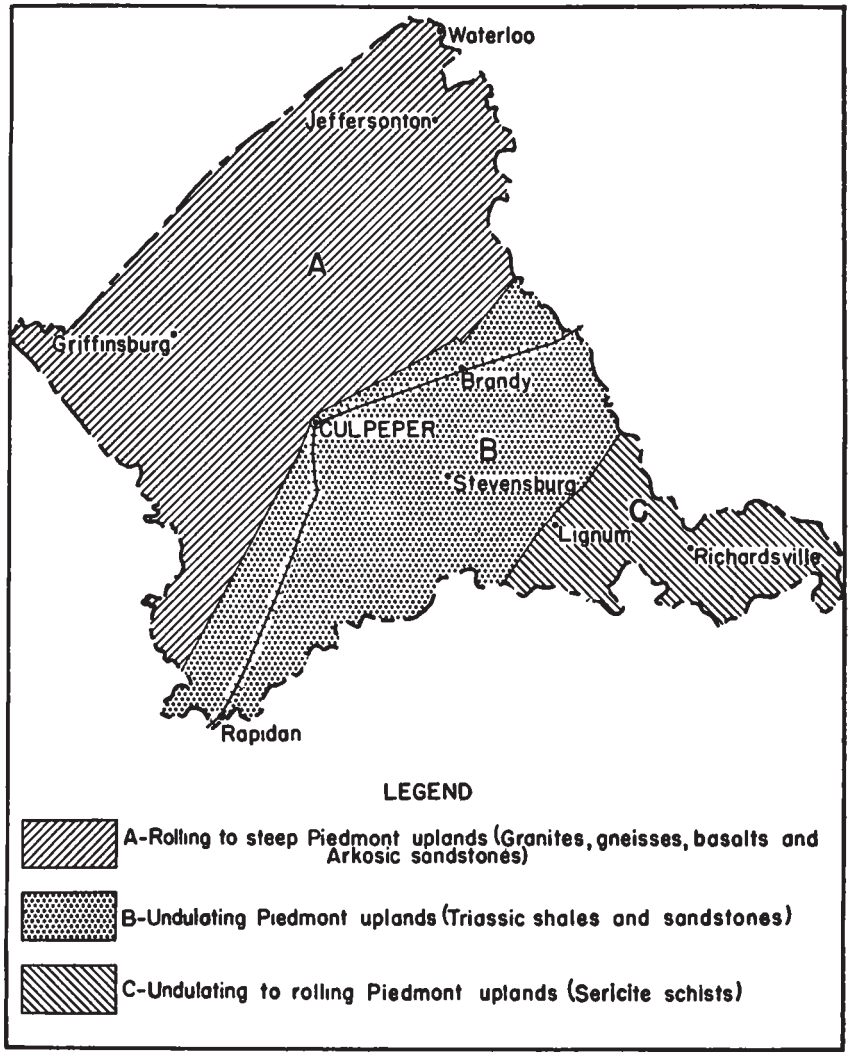

FIGURE 2.—Topographic and geologic divisions of Culpeper County, Va.

quartzite and has an altitude of approximately 540 feet. The nature and distribution of these hills indicate that they exist because they are at the headwaters of streams and not because they are composed of more resistant rocks. The general formations of this area lie in a northeast-southwest direction. The rocks consist of granite and granite gneiss in the west, and mica schists, arkosic sandstone, and greenstones in the east.

The southeastern part of the Piedmont Upland (area C in fig. 2), lying between the Rappahannock and Rapidan Rivers, is a broad, nearly level to rolling divide. This divide is a remnant of an old upland level, and many small streams that flow southward into the Rapidan River and northward into the Rappahannock River have

cut back into it and formed steep V-shaped valley slopes along the lower stream courses. The general elevation of the plateau is 300 to 400 feet above sea level. The lowest point within the county, about 150 feet above sea level, is at the junction of the Rapidan and Rappahannock Rivers. Local relief is not so great in this section as in the northwestern part of the upland. The underlying formation is Wissahickon schist [3] composed chiefly of sericite, muscovite, and chlorite schist.

The undulating Piedmont uplands or Triassic plain (area B in fig. 2), is a belt approximately 4 miles wide in the south and 9 miles wide in the north that extends across the county in a northeast-southwest direction. This belt is lower in general elevation than the surrounding Piedmont Upland, slopes gently southeastward, and in relief ranges from nearly level to rolling. This area is underlain by yellow or red shale and sandstone. Where diabase sills crop out, low ridges and hills rise 40 to 50 feet above the surrounding plain. These ridges are short and end abruptly because they are offset by cross faults. Along the northern border of the Triassic plain, the relief is more uniformly rolling because more resistant dark-colored basic rock of trap conglomerate underlies it.

Conspicuous features of the Triassic plain are small mountains rising 450 to 500 feet above it. These are Mount Pony, 3 miles southeast of Culpeper; Buzzard Mountain, 2 miles south of Mitchells; and Cedar Mountain, 1½ miles southwest of Mitchells. Mount Pony and Buzzard Mountain are composed of diabase rock; whereas Cedar Mountain is composed of trap conglomerate (*5*). The summits of these mountains are over 800 feet above sea level. In addition to these high hills a number of smaller ones exist—Stony Mountain located 1 mile northwest of Batna is composed of diabase and rises approximately 50 feet above the surrounding plain; Fleetwood Hill between Brandy and Elkwood is composed of Catoctin greenstone that was brought to the surface between two normal faults that intersect to form a V where the hill occurs (*1*).

DRAINAGE

All of the waters of Culpeper County drain into the Rappahannock River. This river and its major tributaries, the Rapidan, the Hazel, and the Thornton Rivers, rise outside of the county in the Blue Ridge Mountains but unite as one major stream before leaving the county. Drainage is well developed in the Piedmont Upland sections. The streams, except the larger ones, flow parallel to the ridges. The northern part of the county is drained by the Hazel River and its tributaries, the Thornton River and Indian, Waterford, and Muddy Runs, and by small streams such as Nigger and Beaverdam Runs that flow directly into the Rappahannock River. The southeastern part of the county is drained by many small streams that flow directly into the Rapidan or the Rappahannock Rivers.

Streams on the Triassic plain in the central part of the county have been little affected by small hills and ridges. They have developed a dendritic pattern and show little or no entrenchment since the uplift of the plain. The central part of the Triassic plain is drained by

[3] NELSON, W. A. GEOLOGICAL MAP OF VIRGINIA. Virginia Geological Survey. 1928.

Mountain Run and its tributaries, Flat and Jonas Runs, which flow eastward; the northern part is drained by Ruffans Run, which flows directly into the Rappahannock River; and the southwestern part is drained by Crooked Run, the Robertson River, and by Cedar, Summerduck, Potato, and Brook Runs and other small streams flowing directly into the Rapidan River.

WATER SUPPLY

Springs, wells, and streams provide adequate water for people and livestock. The large streams, most of which originate as springs in the Blue Ridge Mountains, maintain a steady flow except during prolonged drought. In the drought of 1930, however, surface flow ceased and these streams became only a series of disconnected ponds. The small streams, shallow wells, and branch-head springs are the first to go dry during periods of dry weather. The branch-bottom springs and deeper wells usually maintain flow during dry weather.

Good springs are common in areas underlain by granite, gneiss, schist, and slate, as in the western and northern parts of the county. These are good water-bearing rock formations because they contain many fissures, or closely spaced joints. In areas underlain by these formations shallow dug wells are common. Some of these shallow wells went dry during the drought in 1930 and 1931, but those 60 feet or deeper afforded ample water (*1*).

Few springs are in areas underlain by greenstone, and generally the wells are deepest in such places. Fissures are less abundant in the greenstone formation, and this partly accounts for the few springs and deeper wells.

Springs are rare in areas underlain by Triassic shale, as the land is level and ground water is near the surface. Because the water is at very shallow depths, most of the wells are dug, not drilled.

Springs are also rare in areas where Triassic diabase sills crop out because of low relief. The diabase contains many joints that are open in contrast to those in the soft Triassic shale. Wells, usually dug 15 to 18 feet deep, are dependable except during extreme droughts. Permanent wells may be obtained by digging to depths of 40 to 60 feet.

In areas underlain by Border conglomerate, where the relief is more rolling, drilled wells are common. The town of Culpeper has an emergency well, 676 feet deep, drilled in this rock. The present water supply, however, is obtained from Mountain Run.

CLIMATE

The climate of Culpeper County is continental. The winters, rigorous but not too severe, are characterized by frequent short cold spells; summers are hot. The mean annual precipitation is 41.27 inches. The difference between the mean summer temperature, 73.9° F., and the mean winter temperature, 35.7°, is only 38.2°. Extreme temperatures of 104° in summer and −20° in winter have been recorded.

Winters are usually sufficiently open to allow outdoor work. Although winter crops frequently receive little or no protection from a blanket of snow, crops of wheat, barley, rye, hardy winter oats,

alfalfa, and some winter vegetables as kale are grown on the well-drained soils with little danger of winterkilling.

The average frost-free period is 188 days, extending from April 16, the average date of the latest killing frost, to October 22, the average date of the earliest. This season affords ample time for growing and maturing all crops commonly grown. Frosts have occurred as late as April 30 and as early as September 26. The grazing period extends from about the middle of April to the last of October. Except in the most severe weather, most farmers allow their beef cattle to run in pastures or feed lots during the winter months. Milk cows usually remain in barns and are turned out only for short periods.

The rainfall is moderately well distributed throughout the year, although the greatest amounts come in summer and spring when rains are needed by growing crops and pasture. Nevertheless, most pastures show a marked decrease in growth during the latter part of July, August, and the early part of September. Probably the decrease is caused by the generally high temperature that prevails during this time. Spring and fall rains are usually slow and steady, but heavy downpours and thunderstorms are frequent in late summer. Prolonged wet or dry spells are not frequent, but short dry or wet spells are common during the growing season and affect most crops, particularly grains. The usual seasonal variations in crop yields are the result of these wet and dry periods. Short wet spells usually handicap farming, particularly the harvesting of small grains or the cultivating of corn. The summer and fall of 1930 and 1941 were extremely dry, and most crops and all pasture were damaged. The wettest year was 1937, when the rainfall was 57.35 inches.

Table 1, compiled from the records of the United States Weather Bureau station at Culpeper, gives the normal, monthly, seasonal, and annual temperature and precipitation.

Local variations in temperature, rainfall, and frost dates are practically nonexistent because differences in local relief are small. Small grains occasionally winterkill on heavy-textured soils and seepy spots because of heaving brought about by freezing and thawing.

The direction of the prevailing winds is southerly, and winds of high velocities are infrequent. The average hourly wind velocity is greatest in spring. Hailstorms are infrequent and generally affect only small areas.

The average annual relative humidity is about 75 percent at 8 a. m., 56 percent at noon, and 68 percent at 8 p. m. The relative humidity is greatest in the morning, least at noon, and intermediate in the evening. Humidity is greatest in fall and increasingly less in summer, winter, and spring.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Culpeper, Culpeper County, Va.*

[Elevation, 475 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total for the driest year	Total for the wettest year	Average snowfall
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	36. 2	75	−7	3. 12	2. 75	0. 61	4. 3
January	34. 7	74	−20	2. 99	2. 70	6. 42	7. 6
February	36. 3	84	−8	2. 40	1. 65	3. 00	4. 2
Winter	35. 7	84	−20	8. 51	7. 10	10. 03	16. 1
March	45. 3	89	6	2. 90	2. 45	1. 08	3. 6
April	54. 4	96	14	3. 36	2. 40	10. 07	3. 9
May	64. 1	96	31	4. 02	2. 72	4. 47	0
Spring	54. 6	96	6	10. 28	7. 57	15. 62	7. 5
June	72. 0	100	39	4. 97	2. 40	5. 81	0
July	75. 7	104	48	3. 82	. 92	3. 62	0
August	73. 9	101	48	4. 80	. 41	6. 54	0
Summer	73. 9	104	39	13. 59	3. 73	15. 97	0
September	68. 1	97	35	3. 24	1. 04	5. 11	0
October	56. 3	92	23	3. 16	. 19	7. 24	. 2
November	45. 2	80	9	2. 49	1. 34	3. 38	. 3
Fall	56. 5	97	9	8. 89	2. 57	15. 73	. 5
Year	55. 2	104	−20	41. 27	[1] 20. 97	[2] 57. 35	24. 1

[1] In 1930. [2] In 1937.

EARLY HISTORY

Warlike Indians were the earliest inhabitants of the area. They were hunters and had little time for farming. Apparently they shifted from place to place, as they left no permanent camp sites. Indian trails, mountain passes, and rivers were used by the pioneers, explorers, and early settlers in opening up the new county. John Lederer, a German physician (*1*), was the first white man to come up the Rappahannock River into Culpeper and Fauquier Counties. He arrived in 1670. The earliest settlers were English and some Scotch;[4] most of the present inhabitants are descendants of these early settlers. Some people of German descent are in all parts of the county. Their ancestors originally settled Germanna in Spotsylvania County and later moved to Madison County (*6*).

[4] Information from Mrs. Berkeley G. Calfee, historian, Culpeper, Va.

The early history of the county is an account of the activities of its leading citizens and governing body (*2*). In 1749, before he became a prominent figure, George Washington was made a surveyor of the county. As early as 1752, some of the inhabitants served in a campaign against the French and Indians. In the American Revolution Culpeper County distinguished itself through the services of the Culpeper Minute Men, a unit of 500 men recruited from Culpeper, Orange, and Fauquier Counties, and organized in 1775 at Culpeper. Many famous Civil War battles, particularly cavalry engagements, were fought within the county. The relatively smooth and open Triassic plain, which extends in a northeast-southwest direction across the county, was well adapted to troop movements and was occupied by both Federal and Confederate troops.

ORGANIZATION AND POPULATION

Culpeper County, formed from a part of Orange County in 1748, was named for Lord Thomas Culpeper, Colonial Governor of Virginia in 1680. The earliest permanent settlement within the county was made by the English at Stevensburg in 1724. The original territory of Culpeper included the present counties of Madison and Rappahannock. The town of Culpeper, originally named Fairfax in honor of the grandson of Lord Thomas Culpeper, was laid out in 1759.

The population of Culpeper County was 13,242 in 1950, a decrease of 123 since 1940. All of this population is classified as rural, inasmuch as the largest town, Culpeper, had only 2,527 people.

The distribution of population is influenced by proximity to towns and by the nature and lay of the land. The population is greatest in the vicinity of Culpeper and least in the extreme eastern part of the county near Richardsville. The least productive and most unfavorable lands are the most sparsely settled. The most productive soils, however, are not in all places the most densely populated. Most densely populated are the lands intermediate in productivity. Population on the better land may be less partly because the land costs more. Farm units are larger on the better land, where a well-adapted system of farming profitable to the operators is practiced.

Culpeper, the largest town and county seat, is a trading center and principal outlet for farm products. Elkwood, Brandy, Winston, Inlet, Mitchells, Rapidan, Catalpa, Rixeyville, Jeffersonton, Boston, Stevensburg, Lignum, and Richardsville are other population centers.

TRANSPORTATION AND MARKETS

Culpeper County has good bus, railroad, and truck transportation. The main line of the Southern Railway, running from Washington, D. C., to Atlanta, Ga., crosses the county. This roadbed—also used by the Chesapeake & Ohio Railway from Washington, D. C., to Charlottesville, Va.—serves Culpeper, Elkwood, Brandy, Winston, Inlet, and Rapidan. Some hay and livestock are shipped from each of these places to eastern markets. A livestock auction market is located along this railroad near Culpeper.

Federal highways Nos. 15 and 29, two important north-south routes, and State highways Nos. 3 and 522, all of which are hard-surfaced, cross the county. Busses operate on regular schedules. The State maintains improved dirt and gravel roads that connect all

important communities, including Catalpa, Rixeyville, Jeffersonton, Boston, Stevensburg, Lignum, and Richardsville, which are strictly farm communities not served by a railroad. The close network of roads greatly facilitates marketing of farm products. Milk is collected daily and shipped to the city markets; cattle and sheep are shipped by rail or truck to various centers; and fancy lambs go to Baltimore and Jersey City markets.

CULTURAL DEVELOPMENT AND IMPROVEMENTS

Schools have been consolidated and are maintained in principal communities. Churches are active chiefly in towns and villages, and, because families with cars tend to go to larger centers, the rural church is losing its membership. In some parts of the county the shifting of families and individuals from the farms to cities, or vice versa, tends to disrupt old established community relations.

Telephone service is available to most towns and communities and to many farms. The 1945 census reported 526 farms with telephones. Since the coming of the Rural Electrification Administration, electric lights and power are becoming available to most areas that are able to maintain a permanent rural population. In 1945, 957 farm dwellings were reported within one-quarter mile of an electric distribution line, and 353 farms obtained electricity from it.

In general, the prevailing condition of farm buildings, the extent of general farm improvement, and the modern conveniences in the rural home express the nature of the soil and physical land conditions. East, northeast, and southeast of Culpeper and west of Mitchells, where productive soils and favorable physical land conditions prevail, buildings are generally good and improvements have been made on most farms. Inasmuch as this is an important livestock section, silos are a conspicuous feature of many barns, and fences are well maintained. Elsewhere in the county, particularly in the extreme east where the soils are less productive or physical land conditions are less favorable, the buildings on each farm are fewer and not so well improved.

INDUSTRIES

Culpeper County is primarily agricultural and possesses no industries employing large numbers of workers. Several flour mills and creameries use some of the agricultural products. The nonagricultural industries consist of a small silk mill, garment factory, two small wood-working plants (one making furniture and the other making chicken coops), and a modern rope factory. Several small planing mills and semipermanent sawmills are in the county, as well as a number of portable sawmills. The town of Culpeper is the distributing center for several farm cooperatives, which do an annual business of over a million dollars.

A number of rock quarries have been opened and operated in the county. Only one quarry is now operating; it is located in trap conglomerate, which is a good road and ballast material.

As early as 1838, gold mines were being operated in Culpeper County, but they were abandoned when richer deposits were discovered in California. These old mine sites can still be seen in the eastern part of the county.

AGRICULTURE

AGRICULTURAL HISTORY

Little information is available on the early agriculture of the county. Lederer, the first white man to visit the area, reported that the Indians raised some maize; but they were essentially hunters, not farmers. The pioneers had to raise most of their food on the land; but the forests supplied game, and the streams, fish. Colonial agriculture consisted of the growing of subsistence crops—corn, oats, and wheat—for food and for feeding work animals and of tobacco for export to England as a cash crop. Tobacco is mentioned as being used in place of money in the earliest white settlements. The ownership of large numbers of slaves and the possession of large plantations made tobacco growing profitable.

After the Civil War slave labor was not available, and the farmer had to work his own land or supervise hired help. A more diversified system of farming resulted. Corn, wheat, and oats remained the principal subsistence crops, but poultry and beef cattle, hogs, and sheep fattened on the farm supplemented tobacco as sources of cash. Livestock raising became increasingly important as better markets were opened up by the construction of railroads and highways, but tobacco growing continued to decrease, and now practically none is grown. In the last decade the rapid growth of nearby cities, particularly Washington, D. C., has brought a great demand for fluid milk and an increase in dairy cattle, which now exceed beef cattle in number.

CROPS

The principal crops grown have remained essentially the same for the last 25 years or more, but as judged by acreages used for each, there have been changes in importance. The acreages of principal crops are given in table 2 for stated years.

In the last few decades acreages of corn and wheat have decreased, but there has been a corresponding increase in hay. Less corn and wheat are now grown than in 1939, but more oats, barley, and lespedeza. In 1944 lespedeza occupied a larger total acreage than any other hay crop, and it is now the most important hay crop on the less productive soils. Wheat is the principal cash crop, although it is grown chiefly for home consumption. Some hay and corn are also sold.

Corn has always occupied the largest total acreage of cropland, but since 1920 less land has been used for corn and more for hay and pasture. Corn is grown in all parts of the county—on fertile stream bottoms and on impoverished hill slopes. Most of the crop, however, is grown on the gently rolling to nearly level Bucks, Davidson, Rapidan, Lansdale, and associated soils of the Triassic plain area. This is a great livestock section, and most of the corn is fed on the farms. In 1939, corn was grown for silage on 1,407 acres and produced 15,875 tons.

A definite trend toward smaller acreages of wheat has been apparent since 1920. No doubt the Federal wheat allotment program has been responsible for some of this reduction. Most of the wheat is raised throughout the east-central part of the county on the soils of the Triassic plain and is used for home consumption or sold to local buyers who ship most of it to outside markets.

TABLE 2.—*Acreage of the principal crops and number [1] of fruit trees and grapevines in Culpeper County, Va., in stated years*

Crop	1919	1929	1939	1944
	Acres	*Acres*	*Acres*	*Acres*
Corn	23,406	19,791	16,113	15,569
Wheat	17,308	12,028	8,185	8,120
Barley	[2]	327	2,396	2,980
Oats	1,324	1,407	1,049	2,271
Rye	1,000	933	1,016	945
All hay and forage	15,942	17,423	21,805	23,149
Timothy or timothy and clover mixed	11,835	11,429	7,155	9,991
Clover alone	930	2,164	63	[2]
Alfalfa	739	925	1,110	1,727
Other tame grasses	375	387	732	[3] 849
Wild grasses cut on farms	288	289	1,353	343
Small grains cut for hay	40	31	56	5
Annual legumes saved for hay	1,735	2,198	1,107	[2]
Lespedeza	[2]	[2]	10,229	10,234
Irish potatoes	193	246	197	142
Sweetpotatoes and yams	52	26	31	13
Other vegetables	12	[4] 77	[4] 34	[2]
	Number	*Number*	*Number*	*Number*
Apples—trees	34,300	43,262	18,947	11,212
Peaches—do	4,680	8,294	8,442	3,164
Pears—do	1,579	1,223	1,392	730
Cherries—do	989	1,720	1,087	1,028
Grapevines	2,340	2,573	3,550	1,109

[1] Number of fruit trees and grapevines of bearing age given for all years except 1944. The 1944 figures are for trees of all ages.
[2] Not available.
[3] Includes sweetclover.
[4] Harvested for sale.

Hay is very important in a livestock area, and the acreage of all hay crops has increased steadily. Hay crops occupied the largest total acreage in 1944. Lespedeza, now the most important hay crop, occupies almost half of the hayland, and next in order are timothy and clover. Alfalfa, which yields over 2 tons an acre on the average, is an increasingly important hay crop. The alfalfa is grown mostly in the dairying section, where good land conditions prevail and a high state of soil fertility is maintained by using lime, superhosphate, and manure. Soybeans and cowpeas are annual legumes used as emergency hay crops on some farms where the regular hay crop has failed. Some hay is sold on local and outside markets but most of it is fed to cattle on the farm.

Some legumes and grasses are grown for seed. In 1944, 143 acres of lespedeza produced 30,972 pounds of seed. In the same year 44 acres of clover produced 33 bushels of seed.

Oats are again becoming a popular feed for poultry and livestock. Winter varieties are grown exclusively; Lee Cold Proof is now a favorite and is planted in fall. If this variety of oats freezes out, it is possible to obtain a crop by seeding the Fulghum variety in February or early in March.

Rye is used principally as a cover crop and furnishes early spring pasture on some farms. The acreage of rye has increased little since 1920.

Barley is becoming increasingly important as a feed crop. It is being substituted for wheat in the corn-wheat-hay rotations because it yields better than wheat and is by weight equivalent to corn as a feed.

Irish potatoes occupy a small total acreage, which has not changed much in the last 35 years. Potatoes are grown on practically every farm, generally for home use. Only one small commercial producer has been reported. Most of the potatoes not used on the farms are sold at local markets.

Garden vegetables are grown chiefly for home consumption, but tomatoes were raised for sale on eight farms in 1939 and on five farms in 1944. There is only one large commercial producer of tomatoes in the county. Other important truck crops are sweet corn, snap beans, and lima beans.

Some fruit is raised for home and market on most farms, but it is not an important crop. Only one commercial orchard is in the county. The number of apple trees has declined to slightly less than one-third the number reported in 1920. Peaches are second to apples in number of trees. Small quantities of pears, plums, cherries, and grapes are also grown. The growing of strawberries and raspberries is being encouraged on some small farms near White Shop, as the berries find a ready market in the nearby town of Culpeper.

PASTURE

In 1945, less than 4 percent of all farm land was in woodland pasture, 8 percent was in plowable (or rotational) pasture, and slightly more than 32 percent was in other land pastured. The pastures are distributed throughout the livestock area on Cecil, Appling, Hayesville, Halewood, Davidson, Rapidan, Bucks, Congaree, and associated soils. Rotational pastures are grazed 2 to 6 years before being plowed again.

The small percentage of pasture that has a high carrying capacity occurs on the more productive Davidson, Bucks, and Rapidan soils that have received lime, phosphate, and manure. On these soils a few farmers are growing nearly pure stands of Kentucky bluegrass and white clover. Most of the pastures, however, either do not receive this treatment or receive only light applications of amendments, and consequently they have a lower carrying capacity than the better managed areas. This is particularly true of pastures that are not in the dairying section. Many of these less well managed pastures are on the Cecil, Appling, Hayesville, and Halewood soils. On these soils the sod will consist of a low percentage of white clover, bluegrass, and such desirable plants and a high percentage of broomsedge, poverty oatgrass, and like undesirable growth.

Although bluegrass and white clover are the most desirable pasture grasses, other species that furnish nutritious grazing are crabgrass, hop clover, orchard grass, redtop, and lespedeza, both Korean and common. Some of the most undesirable pasture plants are poverty oatgrass, broomsedge, and weeds. The weeds commonly found are wild carrot, yarrow, morning-glory, narrowleaf and broadleaf plantain,

cinquefoil, cheat, sheep sorrel, goldenrod, mullein, and common thistle. In some of the poorest pastures dewberry, blackberry, smilax, young scrub pine, broomsedge, and poverty oatgrass make up most of the vegetation. A few patches of nutritious grasses usually grow in these rundown pastures where soil and moisture conditions are favorable.

On many of the rotational pastures in areas of Cecil, Appling, Hayesville, and Halewood soils, lespedeza furnishes most of the forage because it is easy to establish, reseeds itself naturally, and builds up the soil by adding nitrogen.

The most productive permanent pastures usually receive lime, phosphate, and manure. They commonly receive 150 to 300 pounds of 20-percent superphosphate every 3 years; some farmers use a complete fertilizer.

AGRICULTURAL PRACTICES

Corn, small grains, and hay are the principal crops grown in rotations. A 3-year rotation consisting of corn, small grain, and hay is most commonly used. A 4-year rotation consisting of corn, small grain, and 2 years of hay is also used by some farmers. Where alfalfa is the hay crop, the rotations are 5 or 6 years long.

Land for corn is usually plowed in February but may be plowed as early as December if weather is suitable. The seedbed is prepared by disking, harrowing, and dragging the land, and by spreading lime if lime is used. Sometime in May corn is planted and fertilizer is applied in one operation. A two-row corn planter with a fertilizer attachment is used. Corn is commonly cultivated with a two-horse riding cultivator. When the corn is ripe in fall, it is cut by hand and shocked. If it is to be used for silage, corn is cut several weeks earlier than when used for grain.

The seedbed for small grains is prepared by disking the corn stubble-land and then rolling it with a cultipacker. The disking cuts up the corn stubble. Wheat or other small grain is then planted with a wheat drill, and fertilizer is applied at the same time. Wheat is seeded about the time of the first killing frost, barley 2 weeks earlier, and winter oats about 4 weeks earlier. Small grains are usually harvested by binders in the latter part of June or early in July. Oats are cut earliest, barley next, and then wheat. The grain is usually cut and threshed later, but some small grains are harvested by combines.

Hay usually follows small grain in the rotation. Mixtures of grasses are recommended and are usually sown. Timothy is sown with the small grain in fall, whereas clover or lespedeza is sown in spring on the small grain. When the hay is in full bloom, it is cut by a mower, dried, and put in barns or stacked. Some lespedeza and clover are threshed for seed.

FERTILIZERS AND LIME

Fertilizer is commonly used on the larger farms. On some of the larger farms the fertilizer is home-mixed; on the others it is bought ready-mixed.

The general practice is to apply 200 to 400 pounds of commercial fertilizer an acre for each rotation of corn, small grain, and hay. Usually the small-grain crop in the rotation is fertilized, but in some places the corn crop is also fertilized. Corn is sometimes side-dressed

and wheat is frequently top-dressed with 100 to 150 pounds of nitrate of soda or its equivalent in place of manure. Cornland, when fertilized, commonly receives 100 pounds an acre of nitrate of soda or its equivalent, although applications may range from 100 to 200 pounds. The fertilizers most generally used are 0–14–6 [5] and 2–12–6 for corn and 0–14–6 and 0–20–0 for small grains.

Much of the cropland and some of the pastures have been limed. Liming every 3 or 4 years, with about 1 ton of lime an acre, is a common practice on good farms. Where alfalfa is grown, 3 to 5 tons of lime an acre are applied over a 5-year period. The use of lime has been encouraged through government subsidies, and supplies have been made available to most farmers.

LIVESTOCK AND LIVESTOCK PRODUCTS

In 1945, there were 21,124 cattle on farms, the largest number on record. The cattle are raised both for beef and dairy purposes. Most of the dairy farms are in the central and east-central parts of the county near Brandy, Stevensburg, Winston, Mitchells, and Culpeper; the beef cattle farms are mostly in the northern part of the county. The dairy cattle are chiefly grades of Holstein-Friesian and Guernsey breeds. Some grade Jerseys are raised on a few farms, however, and several farms have purebred Ayrshires. The beef cattle are chiefly Aberdeen Angus and Hereford breeds. Very few farmers fatten and market finished cattle; instead they ship feeder and stocker calves out by rail or truck to Maryland, Pennsylvania, and other parts of Virginia.

In 1944, 4,066,258 gallons of milk were produced. About half of this was sold as fluid milk, and the rest was used at home or sold as cream or butter. The small quantity of milk needed by Culpeper and other small towns is supplied by specialized dairies; the bulk of the fluid milk is shipped by truck to Washington or Fredericksburg. Most of the cream is sold to local creameries.

The number of swine decreased from 12,116 in 1920 to 5,999 in 1940. Between 1940 and 1945 the number then increased to 7,069 head. The changes in hog population largely express trends in the corn-hog price ratio, for surplus corn is sold as grain when the returns from such sales are greater than they would be if the crop were marketed indirectly through swine. Poland China, Hampshire, and Berkshires are popular breeds of swine. Hogs are shipped to Jersey City and Baltimore markets.

In 1945 there were 1,849 sheep in the county, slightly more than half as many as in 1920. This decrease in number of sheep is partly due to the dangers from roaming dogs. Hampshires and a few grade Shropshires are the main breeds. Spring lambs are marketed in Jersey City and Baltimore. The 10,300 pounds of wool produced in 1944 was marketed through a wool pool.

Poultry and poultry products are important sources of cash income. Chickens lead in number, but some turkeys and a few ducks and geese are kept. Poultry is produced both as a specialty and as an adjunct to other types of farming. The greater part is raised as a side line on general and livestock farms. Approximately 60 percent of the poultry and poultry products is marketed outside the county.

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

There were 237,674 chickens raised and 1,160,289 dozens of eggs produced in 1944, as compared to 178,211 chickens raised and 732,013 dozens of eggs produced in 1939. In 1944 there were 21,495 turkeys raised, an increase over the 13,834 raised in 1939.

Work animals are chiefly horses which are raised in the county; 2,696 horses and 302 mules were enumerated by the 1945 census. The average general farm has 3 horses; grade Percherons are the most common breed.

TYPES AND SIZES OF FARMS

As classified by major source of income in 1945, 627 farms were producing products mainly for home use, and 773 were producing primarily for sale. In the group producing primarily for sale there were 233 livestock farms, 211 general, 160 poultry, 108 dairy, 36 all other crop, 21 forest products, 2 fruit and nut, 1 horticultural specialty, and 1 vegetable farm. In addition, there were 19 farms not classified.

In 1945 there were 1,419 farms in the county; 44 percent of them were less than 50 acres in size, as compared with 35.9 percent in 1940. The number of all farms between 50 and 500 acres changed little between 1940 and 1945, but in this period the number of farms of over 500 acres in size increased. The greatest number of small farms are near Culpeper, whereas the largest farms or holdings are in the extreme eastern part of the county near Richardsville.

LAND USE

The number of farms decreased from 1,719 in 1920 to 1,419 in 1945, and in the same period the average size of all farms increased from 121 acres to 137.9 acres. The proportion of land in farms was 6.7 percent less in 1945 than in 1920, and in the same period improved land dropped from 70.6 percent of all farm land to 38 percent. Improved land averaged 52.4 acres per farm in 1945, as compared to 86 acres in 1920. The decrease in improved land has been accompanied by an increase in permanent pasture and woodland. In 1945, 29.8 percent of all farm land was cropland harvested, idle and fallow, or failure; 40.2 percent was cropland and other cleared land used for pasture; 27.5 percent was woodland; and about 2.5 percent was miscellaneous land.

FARM TENURE

According to the 1945 census, 90.6 percent of the farms were operated by owners, 7.7 percent by tenants, and 1.7 percent by managers. Since 1920 tenancy has been increasing and farming by managers has been decreasing.

Most of the tenants work on shares, as only 39 percent of them reported paying cash rents in 1945. The most common system is on a 50–50 basis. When the tenant furnishes the equipment, horsepower, labor, and half the seed and fertilizer, he receives half of the crop. When the tenant furnishes everything but the land, he receives two-thirds of the crop. When the tenant furnishes only the labor, he receives one-third of the crop. Lime, if any is used, is usually supplied by the landowner under all systems of tenancy.

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FARM EXPENDITURES AND EQUIPMENT

In 1945, 1,246 farms, or 88 percent of the total number, reported an expenditure of $700,311 for livestock feed. This was an increase over 1939, when 1,004 farms spent $186,423 for feed. Most of the feed is purchased cooperatively and includes principally mill feed but also some grain and hay.

Expenditures for fertilizer and lime were not reported in 1945, but in 1939, 846 farms (over 68 percent) reported using a total of 3,445 tons of fertilizer valued at $74,676. The same year, 376 farms applied 8,575 tons of lime having a total value of $26,128. The county agricultural agent estimates that 75 percent of the fertilizer used is purchased cooperatively.

A total of 744 farms, or 52.4 percent of all farms in the county, reported a cash expenditure of $502,854 for hired labor in 1945. This was an average of $676.15 for the farms reporting. In 1945 nearly a thousand farms reported the use of family labor. The most satisfactory hired labor is that engaged on a yearly basis. The laborer gets a certain amount of cash and "findings." "Findings" include a house, garden, firewood, a cow or milk, and stated quantities of meat, cornmeal, and flour. According to the county agent, about half of the hired help is white and half is Negro.

Power farming is adapted to and may be profitable on large farms possessing land that is productive and not too hilly or broken. The 1945 census lists 283 farms having 365 tractors and 311 farms having 336 trucks. Other large machinery, as wheat binders, threshing machines, combines, and corn pickers, are owned either individually or cooperatively and are used on many farms within a community. The county agent estimated that in 1940 there were 2 corn pickers, several corn binders, 5 threshers, 8 combines, a number of wheat binders, 6 pick-up hay balers, and 2 clover and lespedeza seed hullers in the county.

The better farms are equipped with modern machinery. A representative outfit on a good general farm, which is the dominant type within the county, includes two- and three-horse breaking plows, disk harrow, spike- and spring-tooth harrows, cultipacker, a two-row corn planter with fertilizer attachment, walking and riding cultivators, wheat drill, mower, hay rake, tedder, hay loader, manure spreader, and wagons. The larger livestock farms may have in addition a tractor, ensilage cutter, and silo filler; the smaller farms grow less hay and have simpler haying equipment. About half of the beef cattle shippers, one-third of the cream shippers, and all the fluid milk shippers have silos on the farms in addition to sheds and feeding barns.

SOIL SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field. The soil scientist walks over the area at intervals not more than one-quarter mile apart and bores into the soil with an auger or digs holes with a spade. Each such boring or hole shows the soil to consist of several distinctly different layers, called horizons, which collectively are known as the soil profile. Each of these layers is studied carefully for the things about it that affect plant growth.

The color of each layer is noted. The darkness of the topmost layer is usually related to its content of organic matter; streaks and spots of gray, yellow, and brown in lower layers generally indicate impeded drainage and restricted aeration. Texture, or the proportionate content of sand, silt, and clay, is determined by the "feel" and is checked by mechanical analysis in the laboratory. Texture has much to do with the quantity of moisture the soil will hold available to plants, whether plant nutrients or fertilizers will be held by the soil in forms available to plants or will be leached out, and how hard the soil may be to cultivate. Structure, or the way the soil lumps or granulates, and the proportion of pore space between particles indicate how easily plant roots can penetrate and how easily water can enter the soil. Consistence, or the tendency of the soil to crumble or to stick together, indicates how difficult it is to keep the soil open and porous under cultivation. The kinds of rock material from which the soil developed, or its parent material, affect the quantity and kind of plant nutrients the soil may have naturally. Simple tests determine the chemical reaction of the soil.[6] The depth to bedrock or to compact layers is determined. The quantity of gravelstones or rocks that may interfere with cultivation, the steepness and kind of slope, the quantity of soil lost by erosion, and other external features are observed.

On the basis of all of these characteristics, soils much alike in the kind, thickness, and arrangement of layers are mapped as one soil type. Some soil types are mapped in two or more phases. For example, if a soil type has slopes that range from 2 percent up to 14 percent, the type may be mapped in two phases—an undulating phase (2 to 7 percent slopes) and a rolling phase (7 to 14 percent slopes); or a soil that has been eroded in places may be mapped in two or more phases, an uneroded (or normal) phase, an eroded phase, and perhaps a severely eroded phase. A soil type will be broken into phases primarily because of other differences in the soil than those of kind, thickness, and arrangement of layers. The slope of a soil, the frequency of outcropping bedrock, the extent of erosion, and artificial drainage are examples of characteristics that might cause a soil type to be divided into phases.

Two or more soil types may have similar profiles, that is, the soil layers may be nearly the same, except that the texture, especially of the surface layer, will differ. As long as the other characteristics of the soil layers are similar, these soils are considered to belong in the same soil series. A soil series, therefore, consists of all of the soil types that have about the same kind, thickness, and arrangement of layers, except for texture, particularly of the surface layer, whether the number of such soil types be only one or several.

The name of a place near which a soil series is first found is chosen as the name of the series. Thus, Culpeper is the name of a series of acid, friable to moderately friable, well-drained soils with a light-brown or yellowish-gray surface layer and a reddish-brown or light-red subsoil. Culpeper soils are developed on undulating to hilly

[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. Indicator solutions are used to determine the reaction of the soil. The presence of lime is detected by use of a dilute solution of hydrochloric acid.

topography and are underlain by mixed arkosic sandstone, quartzite, and granite-gneiss materials. They are extensively distributed in the northwestern part of Culpeper County, where the series was identified and mapped for the first time.

Two types of the Culpeper series are in the county—Culpeper loam and Culpeper clay loam. These differ in the texture of the surface soil, as their names show. Culpeper loam is divided into five phases because some of it is undulating, some is rolling, some is hilly, and some is eroded. These phases are Culpeper loam, undulating phase; Culpeper loam, eroded undulating phase; Culpeper loam, rolling phase; Culpeper loam, eroded rolling phase; and Culpeper loam, eroded hilly phase. Similarly, Culpeper clay loam is divided into three phases—Culpeper clay loam, eroded undulating phase; Culpeper clay loam, eroded rolling phase; and Culpeper clay loam, eroded hilly phase. The phases of each of these two types differ from one another in productivity, workability, or conservability.

The following illustrates the grouping of the Culpeper series into types, and the types, in turn, into mapping units (phases):

Series	*Type*	*Mapping units*
Culpeper	Culpeper loam	Culpeper loam, undulating phase.
		Culpeper loam, eroded undulating phase.
		Culpeper loam, rolling phase.
		Culpeper loam, eroded rolling phase.
		Culpeper loam, eroded hilly phase.
	Culpeper clay loam	Culpeper clay loam, eroded rolling phase.
		Culpeper clay loam, eroded undulating phase.
		Culpeper clay loam, eroded hilly phase.

When two or more kinds of soil are so intricately mixed they cannot be shown separately on a map of the scale used, they are mapped together, and the areas of the mixture are called a soil complex. No complexes are mapped in Culpeper County.

Areas such as bare rocky mountainsides, coastal beach, or dune sand that have little true soil are not designated with series and type names but are given descriptive names. These areas are called miscellaneous land units. Mixed alluvium, Rough gullied land, Stony land (acidic rocks), and Stony land (basic rocks) are miscellaneous land units in Culpeper County.

The soil type, or where the soil type is subdivided, the soil phase, is the unit of mapping in soil surveys. It is the unit, or the kind of soil, that is most nearly uniform and has the narrowest range of characteristics. For this reason land use and soil management can be more definitely specified for it than they can for broader groups of soils that contain more variation. One can say, for example, that soils of the Davidson series need lime for alfalfa; but Davidson clay loam, undulating phase, has very mild slopes and, in addition to needing lime, is suited to general farm crops grown in a rotation with alfalfa or other hay. Davidson clay loam, eroded hilly phase, however, has slopes that fall from 14 to 25 feet in 100, is hard to work with heavy machinery, erodes easily, and should be used principally for permanent pasture. Both phases are included in the Davidson series, as are other types and phases, each of which has specific differences in land use and soil management.

THE SOILS OF CULPEPER COUNTY

SOILS AND THEIR RELATIONS

Culpeper County has a great variety of soils, partly because several important rock formations underlie it. These formations have contributed material from which the soils have developed. The soils have formed under hardwood forest in a moderately warm humid climate. The average annual rainfall of the county is about 41 inches; the mean annual temperature about 57° F. Under such conditions leaching by rain water saturated with carbon dioxide is active during the greater part of the year. This leaching impoverishes the soils by removing some of the plant nutrients and bases, leaving them acid throughout. As the moderately warm climate is conducive to active decomposition of forest leaves, only a thin layer of organic matter is left on the surface of virgin soils.

The combined action of the processes described in the preceding paragraph has resulted in soils low in organic matter and characterized by a comparatively light-colored (light-gray and weak-yellow to moderate-brown) surface soil and a finer textured light yellowish-brown to moderate reddish-brown subsoil. This does not mean that all the soils are alike in fertility, productivity, color, depth over bedrock, drainage, and other characteristics. Local differences in soils exist because of the types of the parent materials, the lay of the land, drainage, and age. These differences are recognized in the large number of series, types, phases, and miscellaneous land units mapped.

The main agricultural soils occur in the Triassic plain, which consists of a large belt extending in a northeast-southwest direction just east of the geographic center of the county, and of adjacent areas underlain by basic rock. The principal farming soils are the Davidson, Rapidan, and Bucks. In the eastern part of the county is a large wooded area composed of Nason, Tatum, Lignum, and Manteo soils, which are low in natural fertility and are not cultivated extensively. North and northeast of Culpeper and adjoining the Triassic plain there is a rolling and hilly farming area comprised principally of Fauquier and Lloyd soils. The western and northern parts of the county are likewise rolling to hilly areas consisting principally of Culpeper, Albemarle, Hayesville, Halewood, Hazel, Appling, Manor, and Louisburg soils. These western and northern parts of the county are in large extent too hilly or eroded for cultivated crops and better suited to grazing or forestry.

According to topographic position the soils can be grouped broadly as upland, terrace land, colluvial land, and bottom land. Such a grouping is shown in table 3, which gives the principal characteristics of the soil series in the county and brings out their relations.

TABLE 3.—*Soil series of Culpeper County, Va., arranged by geographic position, and their principal characteristics*

UPLAND

Series	Parent rock	Profile description			Drainage
		Color[1]		Subsoil consistence	
		Surface soil	Subsoil		
	Acidic rocks:				
Cecil	Granite, granite gneiss	Yellowish gray	Moderate reddish brown	Firm	Good.
Appling	do	do	Brown to reddish brown	Friable	Do.
Culpeper	Arkosic sandstone and quartzite; some granite gneiss.	do	Moderate reddish brown	Friable to firm	Do.
Albemarle	do	do	Yellowish brown	Friable	Do.
Louisburg	Granite and granite gneiss	do	Shallow, has no subsoil	Friable to loose parent material.	Good to excessive.
Halewood	do	Weak yellow	Moderate yellowish brown	Friable	Do.
Hayesville	Granite and inclusions of granodiorite.	Light yellowish brown	Strong brown to moderate reddish brown.	do	Do.
Yadkin	do	Moderate brown	Moderate to dark brown	do	Good.
Hazel	Mica schist, arkosic sandstone, and quartzite.	Brownish gray to dark yellowish brown.	Shallow, has no subsoil	Firm parent material	Good to excessive.
Elioak	Granite gneiss and mica schist.	Light yellowish brown	Brown to moderate reddish brown.	Firm	Good.
Manor	Mica schist	do	Light yellowish brown	Friable	Good to excessive.
Watt	Graphitic schist	Light olive gray	Shallow, has no subsoil	Friable to firm parent material.	Do.
Tatum	Sericite schist	Weak yellow	Strong brown to moderate reddish brown.	Firm	Good.
Nason	do	do	Strong yellowish brown	do	Moderately good.
Lignum	do	do	Dusky yellow	Friable to firm	Fair.
Manteo	do	Yellowish gray	Shallow, has no subsoil	Firm parent material	Good to excessive.
Bucks	Reddish-brown Triassic shale and mudstone (with a purplish cast).	Light brown (with a purplish cast).	Pale reddish brown (with a purplish cast).	Firm	Good.
Penn	do	Pale brown with a slight purplish cast.	Shallow, has no subsoil	Firm parent material	Good to excessive.
Wadesboro	Light-brown to reddish-brown Triassic shale and mudstones.	Yellowish gray to weak yellow	Strong brown to moderate reddish brown.	Firm	Good.
Lansdale	Light-brown and yellow Triassic shale.	Weak yellow	Light yellowish brown	Firm; slightly compact	Moderately good to fair.

Brecknock	Baked moderate-gray Triassic shale and mudstone.	Light olive gray	Light olive gray	Friable to firm	Good to fair.
Catlett	Baked dark-gray Triassic shale.	do	Shallow, has no subsoil	Firm parent material	Do.
Croton	Gray, green, yellow, and brown Triassic shale and mudstone.	Yellowish gray mottled with light yellow and light gray.	Mottled	Firm	Poor.
Stanton	do	Mottled	do	Very firm	Poor to very poor.
	Mixed acidic and basic rocks:				
Zion	Triassic shale and diabase	Dusky yellow	Yellowish gray	Firm to slightly plastic	Fair.
Kelly	do	Light brownish gray	Mottled	Tough, plastic	Fair to poor.
Wilkes	Granite gneiss mixed with any basic rock.	Weak yellow	Shallow, has no subsoil	Variable parent materials	Good to excessive.
Helena	do	Yellowish gray	Light yellowish brown	Plastic	Fair.
Lloyd	Dark-colored greenstone or diabase mixed with granite or arkose sandstone.	Moderate brown	Moderate reddish brown	Firm	Good.
Rapidan	Dark-colored trap conglomerate consisting mostly of greenstone.	Moderate reddish brown	do	do	Do.
	Basic rocks:				
Davidson	Dark-colored greenstone, diabase, or diorite.	Moderate brown	Moderate reddish brown to dark red.	Firm	Do.
Mecklenburg	do	Moderate yellowish brown	Dark yellowish brown	Firm to slightly plastic	Moderately good.
Fauquier	Dark-colored greenstone (schisty in places).	Light yellowish brown	Strong brown to moderate reddish brown.	Firm	Good.
Aldino	Light-colored greenstone	Yellowish gray	Light yellowish brown	Friable to slightly plastic	Fair.
Catoctin	do	do	Shallow, has no subsoil	Firm parent material	Excessive.
Iredell	Diabase	Light gray	Light olive to light olive brown.	Plastic	Fair to poor.
Elbert	do	Mottled	Mottled	do	Poor to very poor.

Terrace Land

Hiwassee	Old alluvial deposits from—Acidic and basic rocks	Moderate brown or dusky yellow to light brown.	Moderate reddish brown	Firm	Good.
Altavista	Acidic rocks	do	Light yellowish brown	Friable to firm	Fair.
Masada	do	Weak yellow	Light brown	do	Good.
Roanoke	do	Very pale brownish gray highly mottled with light gray.	Mottled	Plastic	Poor.

See footnote at end of table.

TABLE 3.—*Soil series of Culpeper County, Va., arranged by geographic position, and their principal characteristics*—Con.

Series	Parent rock	Profile description			Drainage
		Color [1]		Subsoil consistence	
		Surface soil	Subsoil		
COLLUVIAL LAND					
Starr	Local alluvial and colluvial deposits from—Reddish upland soils	Moderate reddish brown	Moderate reddish brown	Friable	Good to moderately good.
Seneca	Light-colored upland soils	Yellowish gray	Light yellowish brown, slightly mottled	do	Moderately good
Worsham	Local thin colluvial deposits from granite, gneiss, and schist.	Light gray (mottled)	Highly mottled	Firm to slightly plastic	Poor to very poor.
BOTTOM LAND					
Buncombe	Recent alluvial deposits chiefly from granite, gneiss, and schist.	Very pale brown	Pale brown	Loose	Excessive.
Congaree	do	Light yellowish brown	Light yellowish brown	Very friable	Good.
State	Moderately old alluvial deposits from acidic rocks	do	Moderate yellowish brown	Friable	Do.
Chewacla	Recent alluvial deposits chiefly from granite, gneiss, and schist.	do	Mottled	do	Fair.
Wehadkee	do	Light gray (mottled)	Highly mottled	Firm to slightly plastic	Poor.

[1] Soil color names used throughout the report are from U S. Dept Agr. Misc Pub. 425(4); color of soil when moist unless otherwise stated.

SOILS OF UPLANDS

The soils of the uplands are discussed in the following paragraphs in the same order as they are listed in table 3.

The Cecil and Appling soils are developed from granite and granite gneiss. Their surface soil is fine sandy loam; their subsoil, a finer but moderately brittle clay, ranges from moderate reddish brown or light red for the Cecil to brown or reddish brown for the Appling. These soils occupy favorable topography for farming and are well drained.

The Culpeper and Albemarle soils, covering a large acreage, are developed from arkosic sandstone and quartzite. They are characterized by a firm to friable subsoil and differ essentially in the color of surface soil and subsoil. They range from undulating or smooth to hilly and are well drained.

Louisburg fine sandy loam, the only member of the Louisburg series in the county, occurs on steeper slopes in association with the Culpeper, Albemarle, Cecil, and Appling soils and to some extent with Halewood loam. It is a shallow soil and has fragments of weathered gneiss or schist on the surface and throughout the subsoil. Some of the Louisburg soil on smoother slopes is adapted to grazing, but the best extensive practical use for most of it is forest.

The Halewood and Hayesville soils occur chiefly in the western part of the county in the foothills of the Blue Ridge Mountains. They are typically developed on rolling to hilly topography. Many areas of these soils that have been under clean cultivation are severely eroded and gullied. The Hayesville soils resemble the Cecil in color, whereas the Halewood soils resemble the Appling. Both differ from the Cecil and Appling soils in being less thoroughly leached and in containing more organic matter.

The Yadkin soil (Yadkin silt loam) is inextensive, occurring chiefly in the western part of the county on undulating to rolling topography. It is closely associated with Hayesville and Halewood soils. Yadkin soil has a moderate brown surface soil and subsoil.

The Hazel soils are shallow and are derived from the weathered mica schist, arkosic sandstone, and quartzite. They occur in the northern part of the county on rolling to steep topography and are associated principally with the Culpeper and Albemarle loams and to a lesser extent with the Elioak and Manor soils. Because they grow pasture grass, they are physically adapted to grazing.

The Elioak soils are derived from the weathered material of granite gneiss and mica schist. They are more friable and have a browner surface soil than uneroded Cecil soils, although their subsoil is nearly the same color. They are not extensive, occur principally in the northern part of the county in association with the Manor soils, and most typically are on rolling topography.

The Manor soils are formed from material weathered from mica schist and are very friable and micaceous. They are associated with Elioak soils. Their color is light yellowish brown throughout. The Manor soils occur in the northern part of the county on rolling to hilly topography. They are very erosive because of the shallowness and looseness of their parent material.

The Watt are shallow grayish-colored soils derived from material weathered from graphitic schist. They occur in narrow bands on rolling to hilly topography throughout areas of Culpeper and Albe-

marle loams. They are very erosive and not well adapted to cultivation.

The Tatum, Nason, Lignum, and Manteo soils are geographically associated in the southeastern part of the county. They are formed principally of material weathered from sericite schist, which is low in lime and all plant nutrients. All of these soils are highly leached, have a light-colored surface soil, and are low in productivity.

The Tatum soils resemble the Cecil and Culpeper in color. They are most extensive on undulating topography and occur to a lesser extent on rolling and hilly slopes.

The Nason soils, the most extensive of this group and resembling the Appling and Albemarle soils in color, occur mostly on undulating and gently rolling topography and to less extent on hilly slopes.

The Lignum soil (Lignum silt loam) is weak yellow and in places not so well drained or aerated as the Tatum and Nason soils. Typically this soil is level to undulating.

The Manteo soils are very shallow and have fragments of schist scattered throughout their profile. They occur principally on hilly and steep slopes and are not adapted to cultivation. They are now largely in forest, to which they are best suited. The small acreage that is less steep can be used for permanent pasture.

The Bucks, Penn, Wadesboro, Lansdale, Brecknock, Catlett, Croton, and Stanton soils formed from materials weathered from Triassic shale and mudstone.

The Bucks and Penn soils are reddish brown with a purplish cast. The Bucks soils are deeper to bedrock than the Penn and consequently less droughty. The Penn soils occur mainly on level and undulating relief but in a few areas are on rolling and hilly relief; they are more erosive than the Bucks soils because of their lower water-absorption capacity.

Associated with the Bucks, but on more rolling topography and frequently occupying the tops of ridges, is the Wadesboro soil. It resembles the Cecil soil in color and depth of profile but is derived from different parent material.

Geographically associated with the Bucks soils and occurring on level to undulating topography are the Lansdale soils. They are derived from the weathered material of light-colored shales and have a light yellowish-brown subsoil.

The Brecknock soils are derived from the weathered material of baked grayish-colored shale and mudstone. They are light olive gray throughout. These soils are associated with the Bucks, Catlett, and Penn soils and occupy undulating to rolling topography. Frequently they occur between those soils and the Iredell soils.

The Catlett soils are associated with the Brecknock soils, but differ from them in being much shallower over bedrock and having developed from the weathered material of dark-gray baked shale. They have little or no subsoil development.

The Croton and Stanton soils are the imperfectly and poorly drained soils associated with the Bucks, Penn, Lansdale, and other soils formed of weathered material from Triassic shale and mudstone. The Croton soils occupy broad flats that are nearly level to gently sloping. The Stanton soils frequently occur as depressions in areas of Croton or Lansdale soils, and are too wet for cultivation.

The soils derived from material weathered from mixed acidic and basic rocks are the Zion, Kelly, Wilkes, Helena, Lloyd, and Rapidan. These soils differ in profile characteristics, use capabilities, and management because they formed from a great variety of rocks.

The Zion and Kelly soils in this county generally occur near or at borderlines between Triassic shale and diabase. They have developed from material weathered from mixtures of these rocks. The Zion soils are undulating and geographically associated with the Iredell and Mecklenburg soils. They are less plastic and better drained than the Iredell. The Kelly soil (Kelly silt loam) occurs on level to undulating slopes and is associated with the Bucks, Penn, Lansdale, Brecknock, and Croton soils. It is somewhat poorly drained and has a heavy tough plastic subsoil.

The Wilkes soils are shallow and variable in profile characteristics because of the heterogeneous nature of their parent material. They occur in association with Cecil and Appling soils on rolling to hilly topography.

The Helena soil (Helena fine sandy loam) differs from the Wilkes in that it is deeper to bedrock and less variable in profile. It is associated with the Wilkes, Cecil, and Appling soils and has a plastic subsoil but not so plastic as that of the Iredell soils. Helena soil occurs on undulating slopes.

The Lloyd soils are intermediate between the Davidson and Cecil soils and occur in close association with them. They are developed from material weathered from mixtures of granite and dark-colored greenstone. They occupy undulating to rolling topography.

The Rapidan soils are derived from a complex of parent materials consisting mainly of dark-colored greenstone fragments and boulders cemented together by very fine pieces of greenstone that have oxidized to a purplish color, and in places they contain some sandstone and Triassic shale. They are associated with Davidson, Bucks, Penn, and Lansdale soils and occur in a narrow belt in the vicinity of Culpeper. The topography is dominantly undulating to rolling, although in some places it is hilly. In most places Rapidan soils resemble the Davidson in color, but they have a slight purplish cast, which is characteristic of the Bucks soils. The Rapidan are among the best and most productive soils in the county.

The soils derived from the weathered material of basic rocks are the Davidson, Mecklenburg, Fauquier, Aldino, Catoctin, Iredell, and Elbert. The Davidson, Rapidan, and Fauquier soils possess a reddish subsoil; Mecklenburg and Aldino soils have a yellowish-brown subsoil; and Iredell and Elbert soils have a light olive-brown to mottled plastic clay subsoil.

The Davidson soils are among the easiest to identify because they have a pronounced reddish-brown color and high productivity. They are derived from material weathered from dark-colored greenstone and diabase and occur typically on undulating to rolling topography, principally in association with the Rapidan soils and to a lesser extent with the Iredell and Bucks soils. The Davidson soils are very erodible if not properly managed.

The Mecklenburg soil (Mecklenburg silt loam) is associated with the Davidson and Iredell soils and is intermediate between them in color and consistence of the subsoil. The Mecklenburg soil is derived from the weathered products of diabase and has a moderate yellowish-

brown surface soil and a dark yellowish-brown slightly plastic subsoil. Undulating topography is most typical for this soil.

The Fauquier soils are derived from the weathered material of dark-colored greenstone, are associated with the Aldino and Catoctin soils, and adjoin areas of Davidson, Lloyd, and Cecil soils. They are lighter colored and more shallow to bedrock than the Davidson soils. They occupy undulating to hilly topography and are very erodible.

The Aldino are yellowish to yellowish-brown soils associated with the Fauquier and Catoctin. They are derived from the weathered material of light-colored greenstone. Topography is undulating to rolling.

The Catoctin soil (Catoctin silt loam) is mapped chiefly on hilly to steep slopes. It is a shallow soil associated with the Aldino and Fauquier soils. It is derived from material weathered from light-colored greenstone. The color of the weathered stone persists throughout, and there is little or no subsoil.

The Iredell soils are derived from weathered diabase material and are associated chiefly with the Elbert soil. In places they adjoin areas of Davidson, Mecklenburg, Catlett, Brecknock, and Bucks soils. Their plastic impermeable subsoil makes them easily recognized—farmers call them blackjack land or "tangle foot." Topography is level to undulating in most places, and internal drainage is very slow. Where they occur on rolling relief these soils are extremely erosive.

The Elbert soil (Elbert silt loam) is derived from weathered diabase and diorite material and is even more poorly drained than the associated Iredell soils. It occupies level to undulating topography and is wet for long periods each year. The surface soil is light gray; the subsoil is mottled plastic clay.

SOILS OF TERRACES

The soils developed on terraces belong to the Hiwassee, Altavista, Masada, and Roanoke series. They are all derived from old stream deposits consisting of soil material that washed from uplands miles upstream. These uplands include parts of the Blue Ridge Mountains. Except for the Roanoke soil, which is poorly drained, these soils are all well drained or moderately well drained.

The Hiwassee soils occupy old high terraces and are on level, undulating, rolling, and hilly topography. They resemble the Davidson and Lloyd soils in color, possessing a dusky-yellow to moderate-brown surface soil and a moderate reddish-brown subsoil.

The Altavista are light-colored soils occupying low level and undulating terraces. They possess a dusky-yellow surface soil and a light yellowish-brown subsoil.

The Masada soils occupy undulating and rolling topography and resemble Altavista soils in color but occupy old terraces of higher elevation. These terraces occur near the junction of the Rappahannock and Rapidan Rivers.

The Roanoke soil (Roanoke silt loam) occupies level land, is poorly drained, and is associated with the Altavista and Hiwassee soils. Roanoke soil has a gray surface soil and a mottled subsoil.

SOILS OF COLLUVIAL LANDS

The so-called colluvial soils might be more properly designated as soils of local alluvial deposits. The deposits consist of materials recently washed or sloughed from adjoining soils occupying slopes and have accumulated at the base of slopes or at the heads of drains. Soils of the Starr, Seneca, and Worsham series are included. They occupy level to gently sloping areas.

The Starr soil (Starr silt loam) consists of wash from the reddish upland soils—the Davidson, Fauquier, Rapidan, Bucks, Lloyd, and eroded Culpeper. It is moderately well to well drained and retains the reddish-brown color of the uplands.

The Seneca soil (Seneca silt loam) consists of wash from the light-colored upland soils—the Appling, Albemarle, and Nason. It is only moderately well drained in most places, as is indicated by its yellowish gray surface soil and yellowish-brown, slightly mottled with yellow and gray, subsoil.

The Worsham soil (Worsham silt loam) is a poorly drained associate of Cecil, Appling, Manor, Tatum, Lignum, and Nason soils. It is derived mainly from granite, gneiss, and schist but has an overwash of recent material from the adjoining uplands. The surface soil is light gray. The subsoil, commonly heavy and plastic, is light gray mottled with yellow or brown.

SOILS OF FIRST BOTTOMS

Soils of the first bottoms—members of Buncombe, Congaree, State, Chewacla, and Wehadkee series—are differentiated chiefly according to drainage, and drainage influences their color. They are all level and subject to periodic overflow.

The Buncombe soil (Buncombe loamy fine sand) is excessively drained and very pale brown throughout. This soil is not so productive of most crops as the Congaree soils.

Congaree soils are well drained, light yellowish brown, and very productive of all crops grown.

The State soil (State loam) occupies high bottoms or low terraces that are not entirely free from occasional overflow. It has a light yellowish-brown surface soil and a moderate yellowish-brown subsoil and is closely related to and associated with the Congaree soils. It is mapped only on level and undulating relief.

The Chewacla soil (Chewacla silt loam) is intermediate in drainage between the well-drained Congaree and the poorly drained Wehadkee soils. The surface soil resembles that of the Congaree soils, and the subsoil is somewhat similar to that of the Wehadkee.

The Wehadkee soil (Wehadkee silt loam) is a poorly drained soil associated with the Congaree and Chewacla soils. It is gray and mottled throughout and is being used for pasture in places.

SOIL SERIES, TYPES, AND PHASES

In the following pages the soils, identified by the same symbols as those on the soil map, are arranged alphabetically by series name and described in detail. The location and distribution of each type, phase, or miscellaneous land unit is shown on the accompanying map (cover page 3), and the acreage and proportionate extent are given in table 4.

Additional information on the agricultural relations, use suitability, present management, management requirements, estimated average crop yields, and crop adaptations of the soils are given in the section on Estimated Yields and in the section on Soils Grouped According to Their Relative Suitability for Farming. For detailed descriptions of the more important soils the reader may turn to the section on Morphology and Genesis of Soils.

TABLE 4.—*Acreage and proportionate extent of soils mapped in Culpeper County, Va.*

Soil	Acres	Percent
Albemarle fine sandy loam:		
Eroded hilly phase	454	0.2
Eroded rolling phase	587	.2
Rolling phase	2,593	1.1
Undulating phase	1,735	.7
Aldino silt loam:		
Eroded rolling phase	1,286	.5
Undulating phase	1,118	.5
Altavista loam:		
Level phase	219	.1
Undulating phase	1,071	.4
Appling fine sandy loam:		
Eroded rolling phase	348	.1
Rolling phase	1,260	.5
Undulating phase	655	.3
Brecknock silt loam	2,141	.9
Bucks silt loam:		
Eroded rolling phase	1,392	.6
Undulating phase	6,669	2.7
Buncombe loamy fine sand	489	.2
Catlett silt loam:		
Eroded rolling phase	417	.2
Undulating phase	2,483	1.0
Catoctin silt loam	1,098	.5
Cecil fine sandy loam:		
Eroded hilly phase	882	.4
Eroded rolling phase	1,497	.6
Eroded undulating phase	69	(1)
Rolling phase	1,890	.8
Undulating phase	1,035	.4
Chewacla silt loam	7,463	3.2
Congaree fine sandy loam	2,064	.8
Congaree silt loam	3,468	1.4
Croton silt loam:		
Level phase	6,622	2.7
Undulating phase	368	.2
Culpeper clay loam:		
Eroded hilly phase	1,170	.5
Eroded rolling phase	3,936	1.6
Eroded undulating phase	256	.1
Culpeper loam:		
Eroded hilly phase	1,797	.7
Eroded rolling phase	3,462	1.4
Eroded undulating phase	3,691	1.5
Rolling phase	8,035	3.4
Undulating phase	1,464	.6
Davidson clay:		
Eroded hilly phase	241	.1
Rolling phase	1,228	.5

[1] Less than 0.1 percent.

TABLE 4.—*Acreage and proportionate extent of soils mapped in Culpeper County, Va.*—Continued

Soil	Acres	Percent
Davidson clay loam:		
Eroded hilly phase	429	0.2
Hilly shallow phase	190	.1
Rolling phase	830	.3
Undulating phase	1,583	.6
Elbert silt loam	5,553	2.3
Elioak loam	6,935	2.8
Eroded phase	8,364	3.5
Fauquier silt loam:		
Eroded hilly phase	770	.3
Rolling phase	1,618	.7
Undulating phase	412	.2
Fauquier silty clay loam:		
Eroded hilly phase	3,220	1.3
Rolling phase	4,722	1.9
Halewood loam:		
Eroded hilly phase	2,508	1.0
Hilly phase	531	.2
Rolling phase	2,184	.9
Hayesville loam:		
Eroded hilly phase	2,002	.8
Rolling phase	2,333	1.0
Undulating phase	445	.2
Hazel loam:		
Hilly phase	4,332	1.8
Steep phase	731	.3
Helena fine sandy loam	274	.1
Hiwassee loam:		
Eroded hilly light-colored phase	239	.1
Eroded rolling phase	359	.1
Eroded rolling light-colored phase	1,081	.4
Undulating light-colored phase	2,124	.9
Undulating phase	523	.2
Iredell silt loam:		
Eroded undulating phase	4,921	2.0
Level phase	7,202	3.0
Undulating phase	5,797	2.4
Iredell stony silt loam	3,251	1.3
Eroded phase	1,219	.5
Kelly silt loam	1,617	.7
Lansdale silt loam:		
Level phase	1,663	.7
Undulating phase	4,618	1.9
Lignum silt loam	1,527	.6
Lloyd clay loam:		
Eroded hilly phase	246	.1
Rolling phase	695	.3
Lloyd loam:		
Eroded rolling phase	901	.4
Undulating phase	416	.2
Louisburg fine sandy loam:		
Eroded hilly phase	3,956	1.6
Rolling phase	510	.2
Manor silt loam:		
Eroded hilly phase	2,194	.9
Eroded rolling phase	3,279	1.3
Rolling phase	418	.2
Manteo shaly silt loam:		
Hilly phase	6,124	2.5
Rolling phase	850	.3

TABLE 4.—*Acreage and proportionate extent of soils mapped in Culpeper County, Va.*—Continued

Soil	Acres	Percent
Masada loam:		
Rolling phase	240	0. 1
Undulating phase	576	. 2
Mecklenburg silt loam	1, 368	. 6
Mixed alluvium	2, 477	1. 0
Nason silt loam:		
Hilly phase	699	. 3
Rolling phase	1, 829	. 8
Undulating phase	5, 776	2. 4
Penn silt loam:		
Eroded hilly phase	324	. 1
Eroded rolling phase	923	. 4
Undulating phase	3, 876	1. 6
Rapidan silty clay loam:		
Eroded hilly phase	1, 266	. 5
Eroded rolling phase	6, 644	2. 7
Undulating phase	5, 065	2. 1
Roanoke silt loam	197	. 1
Rough gullied land	155	. 1
Seneca silt loam	2, 227	. 9
Stanton silt loam	327	. 1
Starr silt loam	6, 476	2. 7
State loam	567	. 2
Stony land (acidic rocks)	1, 769	. 7
Stony land (basic rocks)	2, 682	1. 1
Tatum silt loam:		
Hilly phase	359	. 1
Rolling phase	861	. 4
Undulating phase	3, 252	1. 3
Tatum silty clay loam:		
Hilly phase	212	. 1
Rolling phase	811	. 3
Very stony land (acidic rocks)	2, 130	. 9
Very stony land (basic rocks)	844	. 3
Wadesboro silt loam:		
Eroded rolling phase	262	. 1
Undulating phase	1, 244	. 5
Watt silt loam:		
Eroded hilly phase	325	. 1
Rolling phase	353	. 1
Wehadkee silt loam	1, 730	. 7
Wilkes soils, undifferentiated	508	. 2
Worsham silt loam	1, 278	. 5
Yadkin loam	702	. 3
Zion silt loam	487	. 2
Eroded phase	670	. 3
Total	243, 840	100. 0

ALBEMARLE SERIES

The soils of the Albemarle series are similar in color to those of the Appling but differ from them in being developed over arkosic sandstone and quartzite rather than granite. They have yellowish-gray (*4*) loam surface soil and light yellowish-brown friable subsoil. Relief is undulating to hilly, the slopes ranging from 2 to 25 percent. Surface and internal drainage are moderate. In a considerable part

the soils are forested. Corn, small grain, and lespedeza are the major crops.

Albemarle fine sandy loam, undulating phase (AD).—This dominant phase of the Albemarle series is typically on undulating to gentle slopes of 2 to 7 percent. It occurs in small irregularly shaped areas in association with Culpeper loam, undulating phase, and Hazel loam, hilly phase. It has developed over and from the weathered products of arkosic sandstone, quartzite, and granite gneiss. The arkosic sandstone and quartzite materials were originally washed from granite that disintegrated in place and were partly metamorphosed later. Drainage, both surface and internal, is moderate to rapid. Natural vegetation consists of white, scarlet, red, chestnut, and black oaks, hickory, blackgum, and scrub, white, and shortleaf pines.

Representative profile:

1½ to 0 inch, leafmold and forest litter; extremely acid.
0 to 12 inches, weak-yellow very friable fine sandy loam; very strongly acid.
12 to 16 inches, yellowish-gray very friable loam containing many fine holes and worm holes; material breaks out in irregularly shaped lumps ½ to 2 inches in diameter that crush to a granular mass under slight pressure; very strongly acid.
16 to 28 inches, yellowish-brown to light yellowish-brown friable clay loam that breaks out into irregularly shaped lumps ¼ to 2 inches in diameter; very strongly acid.
28 inches +, light yellowish-brown friable clay loam material mingled with light gray, light yellow, and moderate reddish brown; contains small quartz particles ranging up to ¼ inch in diameter and many fine mica flakes; strongly acid.

In surface texture the soil ranges from a sandy loam to a loam. Included are a few areas containing occasional gullies or that have lost part of the surface soil through erosion. Also, a few areas are included that have a sandy loam surface soil and yellow subsoil.

Use and management.—Some of Albemarle fine sandy loam, undulating phase, still has forest growth of some kind; some is in idle land; and probably half or more is about equally divided between cropland and pasture. The main crops are corn and lespedeza hay. All of this soil could be used for cropland if needed.

Three-year rotations of corn, small grain, and hay (usually lespedeza) are most common. Corn is fertilized with 100 pounds an acre and small grain with 200 to 250 pounds an acre of 2–12–6 fertilizer. Wheat is sometimes top-dressed with nitrate of soda or the equivalent. Some lime and all the available manure is used. Approximate acre yields under the above system of management are 35 bushels of corn, 12 bushels of wheat, 16 bushels of barley, 16 bushels of oats, and 1½ tons of mixed hay. To increase the nitrogen and organic matter in this soil more clover should be grown and more green manure turned under. In addition, greater quantities of lime are needed. Heavier applications of a complete fertilizer for corn would give a justifiable increase in yield.

Albemarle fine sandy loam, rolling phase (AC).—This phase differs from the undulating phase in occurring on steeper relief and in having a thinner subsoil in places. The range in slope is 7 to 14 percent. Most of this phase is now in woodland that could be cleared for crops if needed. On cleared areas the same crops are grown as on the undulating phase, and yields are about the same because this soil is

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little eroded. Contour tillage and strip cropping could be used on the longer and steeper slopes to reduce runoff and conserve soil and moisture.

Albemarle fine sandy loam, eroded rolling phase (AB).—This soil is similar to the undulating phase but has steeper slopes of 7 to 14 percent, a shallower surface soil, and in some places a thinner subsoil over rock.

Use and management.—A considerable acreage is in forest and a few areas are reverting to forest, some of the soil is idle, some is still being used for crops, and a small acreage is in pasture. Wherever possible it would be better to use this soil for permanent pasture, because so much of the surface soil has already been lost. About 200 acres are included that have lost 50 to 75 percent of the original surface soil, and in this tract occasional gullies have developed. If it is necessary to crop Albemarle fine sandy loam, eroded rolling phase, a rotation of small grain and hay should be followed, if practical. Tillage should be on the contour, and strip cropping could be used on long slopes.

Albemarle fine sandy loam, eroded hilly phase (AA).—This soil differs from the undulating phase in being shallower to bedrock and in occupying slopes of 14 to 25 percent. In places a number of loose stones are on the surface and an occasional outcrop of bedrock.

Use and management.—Much of this soil is in woods. Some areas are idle, and a few are used for pasture. The best practical uses are pasture and forest. The soil should be plowed only to renew stands of grasses. The use of lime and a complete fertilizer would aid in establishing bluegrass, white clover, and other desirable pasture plants.

ALDINO SERIES

Soils of the Aldino series developed in the northeastern part of the county throughout the greenstone belt in close geographic association with Fauquier and Catoctin soils. They are underlain by and derived from light-colored and schisty greenstone (*1*). Approximately 45 percent of the land area occupied by these soils is undulating, and 55 percent is rolling. About 7 percent has been severely eroded. Aldino soils are fair for crops but their shallow profile tends to make them droughty during dry seasons.

Aldino silt loam, undulating phase (AF).—This soil has very good surface drainage and moderately slow to moderate internal drainage. Relief is undulating, ranging from 2 to 7 percent. White, post, scarlet, and red oaks, hickory, shortleaf, white, and scrub pines redcedar, and dogwood are the natural vegetation.

Representative profile:

1 to 0 inch, leafmold and forest litter; medium acid.
0 to 8 inches, yellowish-gray very friable flourlike silt loam containing many brown concretions 1/16 to 1/4 inch in diameter and small irregular-shaped fragments of greenstone; very strongly acid.
8 to 15 inches, light yellowish-brown friable to slightly plastic heavy silt loam containing many brown concretions and greenstone fragments up to 4 inches in diameter; strongly acid.
15 inches +, light yellowish-brown silty clay loam material mingled with light gray and pale yellow; contains a high percentage of light olive-gray schisty greenstone that is black on the cleavage planes, strongly acid.

A few small areas were included that have a heavy plastic subsoil; these would have been mapped as Orange silt loam if they had been large enough to be shown separately on the map. In a few areas there are solid outcrops of greenstone bedrock, and in several places numerous loose stones are on the surface. Near Lakota a few small areas of Fauquier silt loam are included with this soil.

Use and management.—A considerable acreage of Aldino silt loam, undulating phase, is in forest. When there is need of pasture or cropland this soil can be cleared and put into pasture or cultivation. At present a 3-year rotation consisting of corn, small grain, and hay seems to give the best results. Treatments are recommended of 1 ton of lime and 600 pounds of a complete fertilizer for each rotation. In addition small grain and corn could well be top-dressed or side-dressed with 150 pounds an acre of nitrate of soda or its equivalent.

Aldino silt loam, eroded rolling phase (AE).—This phase is more eroded than the undulating phase and occurs on more rolling to hilly relief. About 15 percent of the acreage has lost 75 percent or more of its surface soil, and a few shallow gullies are present in some areas. All areas are well drained. The dominant slope range is 7 to 14 percent, but some hilly areas with slopes of 14 to 20 percent are included.

Use and management.—The acreage of Aldino silt loam, eroded rolling phase, that has lost 75 percent or more of its surface soil is best suited to pasture, but applications of manure, lime, and phosphate fertilizer are needed to obtain good stands of grass. The rest of the acreage has lost between 25 and 75 percent of its surface soil. Of this less eroded land, approximately one-fourth is being cultivated, a few acres are idle, one-half is forested, and the rest is in pasture. All tillage operations should be on the contour, and a rotation consisting of small grain and hay is best.

ALTAVISTA SERIES

In the Altavista series are light-colored loam soils with a light yellowish-brown clay loam subsoil. They occur on second bottoms and terraces (pl. 1, *A*) along the larger streams. They have developed from material washed from the soils of the Piedmont Plateau and adjacent mountain regions and occur in association with the Hiwassee and Roanoke soils.

Altavista loam, undulating phase (AH).—Benches or stream terraces above the first bottoms along the larger streams are occupied by this soil. Slopes range from 2 to 7 percent. The soil is moderately well drained, although some of the lower smoother areas are subject to overflow during extremely high water.

Representative profile:

0 to 12 inches, dusky-yellow very friable mellow loam.
12 to 30 inches, light yellowish-brown to pale-yellow friable clay loam.
30 inches +, strong yellowish-brown friable clay loam to clay mottled with light gray and yellowish gray; grades into lighter textured material.

The entire profile is very strongly acid. The soil grades toward the State soil on the one extreme and toward the Roanoke soil on the other. The texture ranges from silt loam to fine sandy loam. About 10 percent of the total area of this soil has gently rolling rather than

undulating topography; less than 1 percent of the total area has been severely eroded. Several small included areas are extremely gravelly both on the surface and in the profile, there being round rocks as large as 8 inches in diameter. Where the rocks are numerous enough to interfere with agricultural practices, they are shown on the map by a gravel-and-stone symbol.

Use and management.—Altavista loam, undulating phase, originally covered by hardwoods, has been nearly all cleared. Slightly more than half the acreage is used for cultivated crops, and about one-third is in pasture. Near the junction of the Rapidan and Rappahannock Rivers east of Richardsville, however, all of the bottoms and terraces that were at one time cultivated are now idle and reverting to forest. Corn and hay are the main crops grown. Some wheat is grown, but average yields are very low because the soil is not well suited to small grains.

Rotations consisting of corn, small grain, and hay and lasting 3, 4, or 5 years are used. When longer than 3-year rotations are followed, the land is usually used for pasture the last year or two. The most commonly used fertilizer is 16-percent or 20-percent superphosphate, which is applied at the rate of 100 to 150 pounds an acre for corn and at a rate of 250 to 300 pounds for small grain. Varying quantities of lime and manure are applied to these crops with the superphosphate. Under these treatments average acre yields range from 35 to 45 bushels of corn, 15 to 18 of wheat, 20 to 24 of barley, 24 to 28 of oats. Mixed hay (clover and lespedeza) yields 1½ tons.

The soil is very strongly acid and should be limed during each rotation. The use of lime and phosphate and the feeding of livestock on the land in winter will help control broomsedge and some of the other weeds in pastures. Corn grows well, but for good yields it requires 200 to 400 pounds an acre of a complete fertilizer and a side dressing of 100 to 150 pounds of nitrate of soda or the equivalent.

Altavista loam, level phase (AG).—This soil differs from the undulating phase in occupying smoother slopes of 0 to 2 percent. Most of it is level or nearly level and not so well drained as the undulating phase. Runoff is low, and during wet weather water often stands for several days in the small depressions that are of common occurrence. Because of its slow drainage, this soil is used chiefly for pasture. It is strongly acid, and the use of lime and phosphate will aid in establishing a sod of bluegrass and white clover.

APPLING SERIES

The soils of the Appling series are developed over granite and granite gneiss. They are light brown or yellowish gray in the surface part and have a brown to reddish-brown fine moderately heavy subsoil. They are associated with the Cecil, Albemarle, and Louisburg soils, but differ essentially from Cecil in not being as red in the subsoil and from Albemarle in having a heavier subsoil and in being developed from different material. The naturally well-drained Appling soils have undulating to gently rolling or rolling relief, with a slope range of 2 to 14 percent. They are used mainly for corn, wheat, oats, barley, and pasture, but some areas remain in forest.

Appling fine sandy loam, undulating phase (AM).—This is the second most extensive soil of the Appling series in the county, and it

is located chiefly in the northwestern and northern parts. It is developed over and from the weathered products of granite and granite gneiss. Relief is undulating to gently sloping, with a gradient of 2 to 7 percent. Drainage, both surface and internal, is good. Natural vegetation consists of white, scarlet, Northern red, black and chestnut oaks, bitternut, white, and pignut hickories, and white and shortleaf pines.

Representative profile:

0 to 8 inches, yellowish-gray very friable fine sandy loam.
8 to 12 inches, light yellowish-brown heavy fine sandy loam.
12 to 30 inches, strong yellowish-brown friable clay; streaked and mingled with brown, yellow, and gray near the bottom.
30 inches +, strong yellowish-brown friable clay loam material mingled and streaked with light gray and light yellow; contains many fragments of weathered granitic material.

Variations occur in the texture of the surface soil, which ranges from a loam to a sandy loam. In a few small areas south and east of Mission Church the subsoil is yellow and slightly lighter in consistence than typical. Such areas would be separated as a soil of the Durham series if they were large enough. In many places small outcrops of granite occur.

Use and management.—A considerable part of Appling fine sandy loam, undulating phase, is in forest, a small acreage is in pasture, and the rest is about equally divided between cropland and idle land.

Three- to four-year rotations usually consist of corn, small grain, and hay. If longer than 3-year rotations are used, 1 or 2 years of pasture are included, giving a 4- or 5-year rotation. Large areas of this soil have never received lime, and the rest has had only small quantities. The most popular fertilizer is 3–12–6, which is usually applied at the rate of 200 pounds an acre for small grain or at the rate of 100 pounds for corn.

Approximate acre yields under the system of management just described are 28 bushels of corn, 14 of wheat, 20 of barley, 22 of oats, and 1 ton of lespedeza hay. These yields could be increased by using larger applications of lime and complete fertilizer. Also, this better treatment would make it possible to grow red clover. Heavier applications of a complete fertilizer are needed for corn.

Appling fine sandy loam, eroded rolling phase (AK).—Steeper relief, a subsoil shallower to bedrock, and more severe sheet and gully erosion differentiate this soil from the undulating phase. The dominant slope range is 7 to 14 percent, but several hundred acres of hilly land with 14- to 30-percent slopes are included. Sheet erosion, some of which has been severe, has removed part of the surface soil from nearly every area, and in places both shallow and deep gullies are present. A few small areas have been badly cut up by these gullies.

Use and management.—The most practical extensive use for this soil is pasture, but some of the steeper more severely eroded areas are best suited to forest. Liberal applications of lime and a complete fertilizer are required to establish a good sod of desirable grasses.

Appling fine sandy loam, rolling phase (AL).—Steeper relief and less depth to bedrock make this soil different from the undulating phase. Slopes range from 7 to 14 percent. A large part of this soil

is in forest, and the rest is about equally divided in pasture, cropland, and idle land. Areas occurring on smoother relief that are only slightly eroded can be used for crops. Strip cropping or a rotation of small grain and hay will be needed if the soil is to be conserved under cultivation. Liberal applications of lime and complete fertilizer are required to obtain good yields of small grain and hay or to establish a sod of desirable grasses.

BRECKNOCK SERIES

Soil of the Brecknock series occurs on the Triassic plain, where it is closely associated with Catlett, Lansdale, and Croton soils. It is underlain by and developed from the weathered products of medium-gray shale and mudstone of Triassic age. This mudstone has not been hardened or changed by heat from intrusions of basic material to the degree that Catlett parent material has, and it therefore weathers much more rapidly. Brecknock soil is characterized by a surface soil brownish gray when wet and light olive gray when dry. It is similar to the Catlett soil in color but differs from it in having a well-developed subsoil over the shale. Only one type—Brecknock silt loam—is mapped.

Brecknock silt loam (BA).—The fairly large areas of this soil usually occur in close geographic association with the Catlett, Lansdale, and Bucks soils. All but 5 percent, which is on level relief, occurs on gently undulating topography (2- to 7-percent slopes). Drainage, both surface and internal, is good to fair. A hardwood forest of post, red, black, and white oaks, hickory, and redcedar is representative of the natural vegetation.

Representative profile:

0 to 11 inches, light olive-gray very friable silt loam having small fragments of shale scattered over the surface and through the layer.
11 to 30 inches, light olive-gray friable to firm silty clay loam, more compact than the above layer; contains fragments of moderate yellowish-brown weathered shale that range up to ¼ inch in diameter.
30 inches +, light olive-gray friable silt loam material streaked and mingled with light gray; contains many fragments of gray shale.

Where this soil grades into the Bucks soils it is browner throughout the profile; and where it adjoins the Lansdale soils, its subsoil has a yellowish cast. Several areas with poor to intermediate drainage and a few small areas of Lansdale soils were included. In some of the smoother areas many small yellow patches give the soil a spotted appearance.

Use and management.—Nearly all of Brecknock silt loam has been cleared. A few acres are idle, approximately one-third of the total area is used for pasture, and the rest is used for crops. Because of its smooth topography, favorable depth over parent material, and good drainage, most of this soil can be used for crops. Little of the soil is now used for alfalfa, but results obtained by several farmers indicate it is adapted to that crop if enough lime is applied and other good management practices are followed.

A 4-year rotation consisting of corn, small grain, and 2 years of hay is the one most commonly used. During the rotation 1 ton of ground limestone an acre and some stable manure are generally applied. Fertilizer treatments most commonly used are 200 to 250 pounds an acre of 20-percent superphosphate for small grain and 100

pounds for corn. With the crop rotation and fertilization just described corn yields 35 bushels; wheat, 20 bushels; barley, 28 bushels; oats, 30 bushels; clover hay, 1½ tons; and alfalfa hay, 2 tons. A considerable increase in yields can be obtained by applying larger quantities of complete fertilizer.

BUCKS SERIES

The soils of the Bucks series occur in the east-central part of the county. They are deep, well developed, pale reddish-brown soils with a purplish cast that have developed from and over purplish-colored shale of Triassic age. They differ from the Penn soils in having a thick subsoil, and from the Lansdale mainly in color. Most Bucks soils are suitable for cropland, and some of all of the crops grown in the county can be grown on them. Because the soils are very strongly acid, large quantities of lime must be added before alfalfa or like crops can be grown.

Bucks silt loam, undulating phase (Bc).—This soil occupies undulating relief (2- to 7-percent slopes) but includes some nearly level areas (0- to 2-percent slopes). It is associated with the Penn, Wadesboro, Lansdale, Rapidan, and Croton soils and has developed entirely from reddish-brown shale that has a purplish cast. This shale—also called "Indian red shale"—is of Triassic age. Drainage, both internal and external, is good.

The greater part of this soil is in the triangular area between Culpeper, Stevensburg, and Elkwood. Areas range from a few acres to several hundred acres in size. Large representative tracts occur along State highway No. 3 west of Stevensburg. The natural vegetation consists of white, red, scarlet, and black oaks, hickory, redcedar, black walnut, persimmon, dogwood, redbud, and hackberry.

Representative profile:

1 to 0 inch, leafmold and forest litter.
0 to 8 inches, light-brown very friable silt loam with a slight purplish cast; upper 1½ inches slightly darker because it contains more organic matter; very strongly acid.
8 to 28 inches, pale reddish-brown firm silty clay loam having a definite purplish cast; material breaks out in irregularly shaped aggregates, ½ to 3 inches in diameter, that crush to a granular mass if considerable pressure is applied; very strongly acid.
28 inches +, pale reddish-brown compact and brittle silty clay loam with a purplish cast; contains a high proportion of purplish shale fragments of various sizes and in different stages of weathering; very strongly acid.

The subsoil varies from 14 to 32 inches thick. The surface soil is lighter colored in places, especially where it adjoins areas of Wadesboro soils or includes small areas of Wadesboro soils. Such included areas of Wadesboro soils will likely have some rounded quartz gravel 1 to 3 inches in diameter scattered on the surface.

Use and management.—One of the good agricultural soils of the county, Bucks silt loam, undulating phase, is used chiefly for cropland and pasture; a very small acreage is idle or in forest.

Hay, chiefly alfalfa and red clover, occupies a larger acreage than either corn or small grains. Alfalfa on land properly limed and fertilized produces 2 to 4 tons an acre and averages 2½ tons. Where alfalfa is manured and heavily fertilized average yields of 4 tons are expected. Clover hay yields 1 to 2½ tons, and if heavily limed and

fertilized, an average yield of 2 tons can be expected. Corn yields 25 to 60 bushels. Where the land is limed and where generally only the small grain rotation is fertilized, corn yields about 40 bushels an acre. If the corn crop is heavily fertilized, average yields of 55 bushels an acre may be expected. Wheat yields 15 to 30 bushels an acre, the average being about 22 bushels. If wheat receives heavy applications of fertilizer and a top dressing in spring, a yield of 28 bushels an acre is usually obtained (pl. 1, *B*). Barley yields 30 to 50 bushels an acre, the average being about 34 bushels. Oats yield 25 to 50 bushels an acre and average about 42 bushels.

A 3-year rotation consisting of corn, small grain, and hay is most common. Where alfalfa is grown, the rotation may be 5 to 6 years long and consist of corn, small grain, and 3 to 4 years of hay. Most of the land has been limed at some time, and much of it is being relimed at regular intervals. Sometimes the corn crop in the rotation is fertilized with 100 to 200 pounds an acre of 0–14–6 or 2–12–6. The small grains usually receive fertilizer—200 to 300 pounds an acre of 0–14–6, 2–12–6, or 20-percent superphosphate. As this is a dairying section (pl. 1, *C*), barnyard manure is available as a top dressing for wheat and for hayfields that are to be plowed for corn. Mixtures of grasses are sown with clover. Pastures receive lime and superphosphate.

In general this soil is being well farmed and managed. Heavier applications of fertilizer would produce better yields. Long slopes should be tilled on the contour and in places may be strip cropped to control losses of soil through erosion.

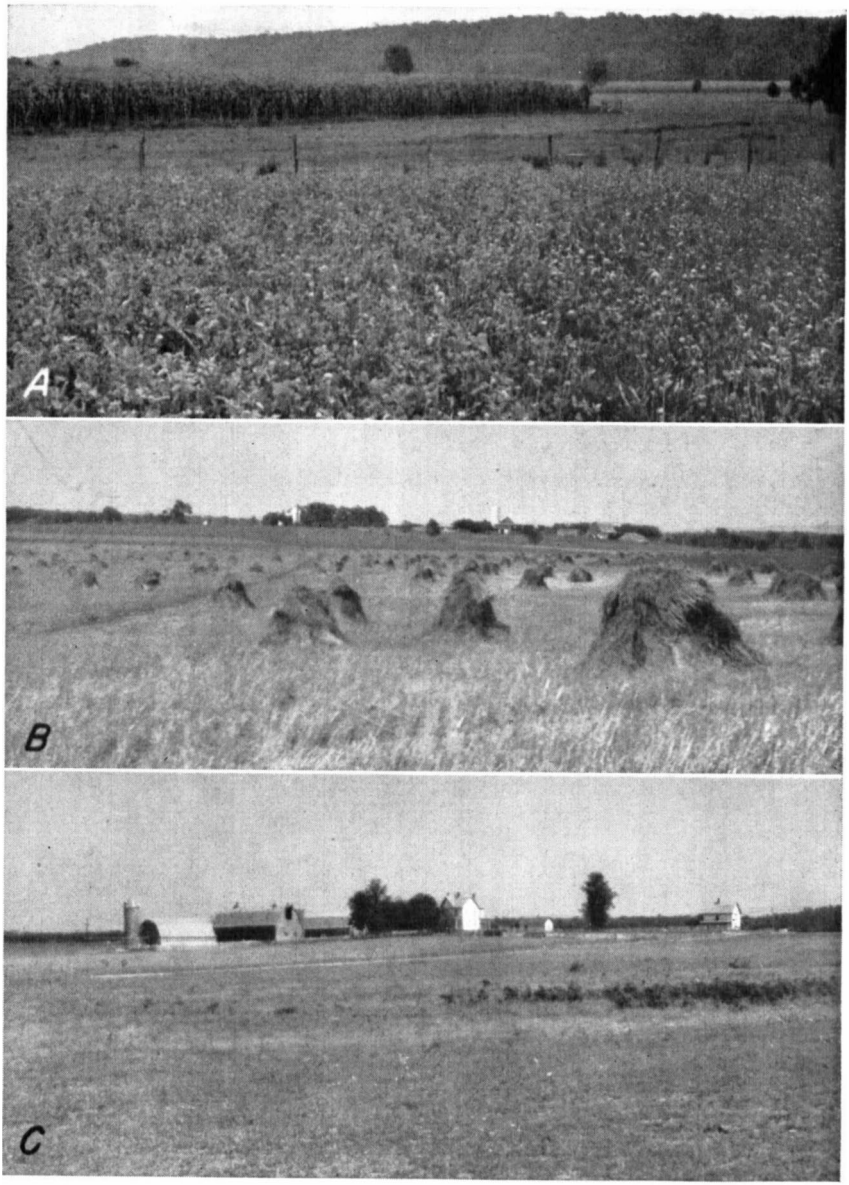
Bucks silt loam, eroded rolling phase (Bʙ).—This soil is slightly more eroded and rolling (pl. 2, *A*) than the undulating phase and has a few gullies in places. Slopes range from 7 to 14 percent.

Use and management.—Bucks silt loam, eroded rolling phase, is used and managed in about the same way as the undulating phase, but yields are slightly lower because less moisture is available on some of the more eroded or sloping areas.

More care is used in tilling this soil. Contour tillage is common and should be used on all slopes in cultivation; longer slopes also should be strip cropped. Growing less corn and more small grains in rotations would aid in reducing runoff from some areas. The more eroded areas would benefit by heavy applications of manure or by the turning under of green manures. Uncontrolled gullies, and waterways as well, can be seeded to fast-growing vegetation to protect the soil from washing. Heavy applications of lime will benefit the clover and alfalfa crops.

BUNCOMBE SERIES

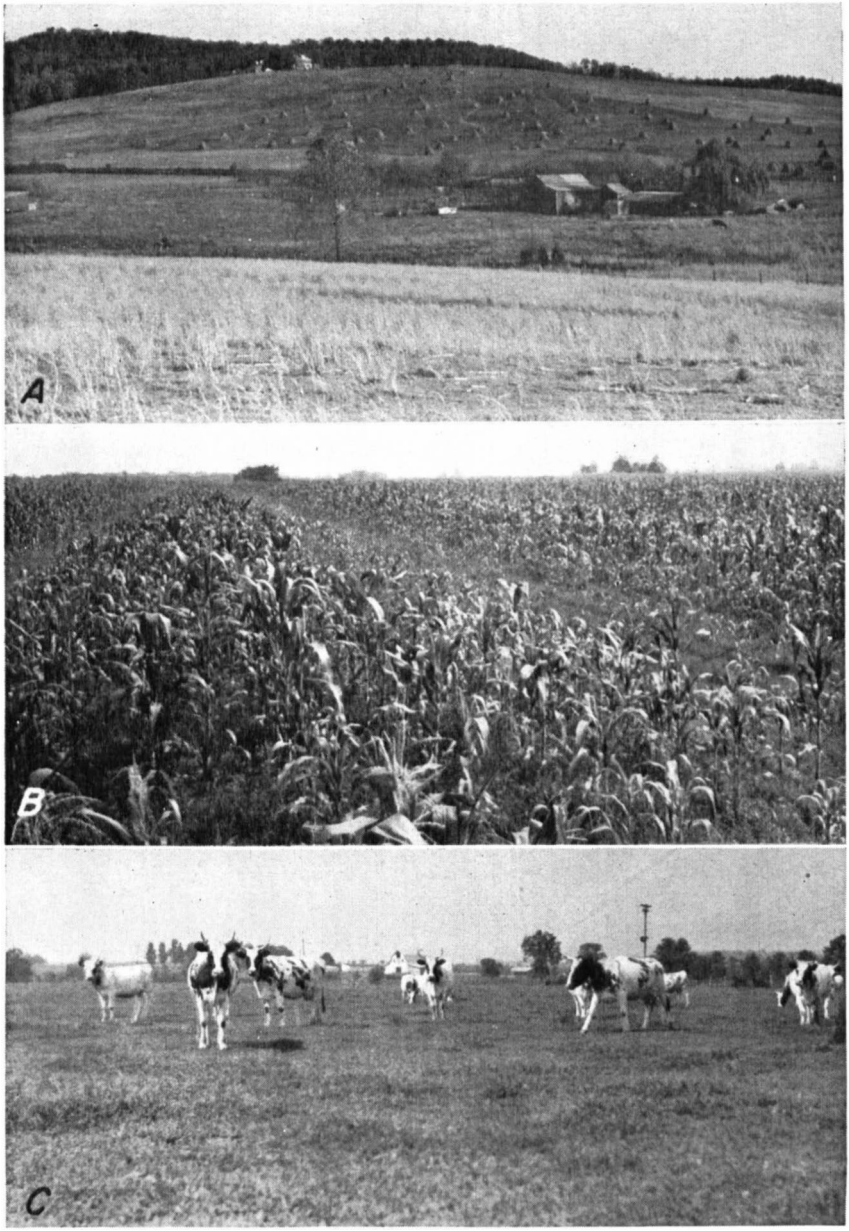
The soil of the Buncombe series—a light grayish-brown to light yellowish-brown alluvial soil consisting of loose sandy materials—occurs near the channels of the larger streams in the county. Its sandy soil materials wash from soils derived chiefly from granite, gneiss, and, to a much less extent, schist. The Buncombe soil is associated with the Congaree, Chewacla, and Wehadkee soils. It is distributed in bodies of small extent and, although its total acreage is not great, it is of some local agricultural importance.



A, Nearly level to undulating Altavista soils located just above the flood plain of the Rapidan River. Altavista soils on undulating topography are well suited to crops, but on level areas are imperfectly drained and best used for pasture.

B, Good crop of wheat on Bucks silt loam, undulating phase, that has received liberal applications of lime, manure, and commercial fertilizer.

C, A prosperous dairy farm on Bucks, Penn, and Lansdale soils, all of which are nearly level.



A, Bucks silt loam, eroded rolling phase, on a steep hillside of Mount Pony. Erosion caused by cropping Land soon becomes thin, and many shallow gullies develop.

B, Ridge cultivation of Croton silt loam, level phase, to accelerate runoff. Effects of poor drainage can be seen by comparing the larger darker colored corn on top of the ridges with that between ridges.

C, Ayrshire cattle grazing on pasture of bluegrass and crabgrass on Croton silt loam, level phase.

Buncombe loamy fine sand (Bd).—Most of the soil is mapped along the Rapidan, Rappahannock, and Hazel Rivers. It occurs in narrow strips near the banks of the stream, in sharp bends, and as an overlay of material deposited by recent high waters on Congaree fine sandy loam or silt loam.

Buncombe loamy fine sand differs from Congaree silt loam and Congaree fine sandy loam in texture, color, and porosity. It is loose and open throughout, very pale brown instead of light yellowish brown, and has very rapid internal drainage. Only a small acreage is mapped, and most of this is of recent origin; as it was deposited chiefly by the flood of 1937.

Use and management.—Nearly all of Buncombe loamy fine sand is now idle. Practices that give good results on Congaree soils usually give poor results on the Buncombe. The soil is low in plant nutrients but will respond to good management; and fair yields of corn can be obtained by using heavy applications of complete fertilizer. Under good management, this soil is particularly good for melons.

CATLETT SERIES

The soils of the Catlett series occur in the southern part of the county in relatively narrow bands scattered throughout the Triassic plain area. They are the well-drained soils found along the contact zones between the basic dikes and Triassic shales. They are underlain by and developed from a dark-gray to bluish-gray highly metamorphosed Triassic shale. About one-seventh of the total area of these soils occurs on relief steeper than 7-percent slope, and approximately 4 percent shows severe sheet or gully erosion. These soils are best adapted to pasture but require both lime and phosphate fertilizer to sustain a good stand of grass.

Catlett silt loam, undulating phase (Cb).—This soil occupies nearly level to gently undulating areas (2- to 7-percent slopes). A few nearly level areas with slopes of 0 to 2 percent are included. The soil is mapped throughout the Triassic shales part of the county. It occurs in narrow strips near the contact zone between intruded basic material and the Triassic gray shales. The parent materials are dark-gray, light-gray, and greenish Triassic shales, most of which have been metamorphosed by heat from dikes that pushed up through the shales or from the sills and sheets that spread out beneath the shales. The soil is closely associated with Brecknock silt loam and Kelly silt loam. In some places it joins the Bucks and Penn soils on one extreme and the Iredell soils on the other. Surface drainage is fair to good, depending on the slope. Internal drainage is good. The natural vegetation is redcedar, scrub pine, and post, white, and red oaks.

Representative profile:

0 to 13 inches, light olive-gray very friable silt loam that changes to a medium olive gray when wet; contains fragments of shale and mudstone and some small, rounded, brown concretions.

13 inches +, light olive-gray friable silt loam splotched with light gray; material spongelike in appearance due to many small holes and cavities; irregular-shaped to blocky pieces of dark-gray and bluish-gray shale and mudstone material constitute 40 percent or more of layer.

The variations are chiefly due to differences in parent material. In places the shale has been baked so hard by the basic intrusions that it

weathers very slowly. On some areas the soil on level topography developed from this hard shale is only 6 inches deep. Included in other places are areas too small to be shown separately on the map that run as deep as 22 inches and have developed a thin subsoil. Several areas lie on and are developed from light-gray and greenish-colored shale, which imparted a yellowish-gray color to the soil. The quantity of shale and mudstone on the surface and throughout the soil varies from place to place—in some areas the quantity is enough to interfere with cultivation. Occasionally there are outcrops of hard, baked shale.

Use and management.—Nearly all of Catlett silt loam, undulating phase, has been cleared and is now being used for pasture. A little of this soil is idle, and some of the smoother areas that run fairly deep are being used for crops.

Where this soil is cropped, a 4- or 5-year rotation of corn, small grain, hay, and 1 or 2 years of pasture is usually practiced. One ton of ground limestone an acre is used during the rotation. The wheat receives 200 pounds an acre of 16-percent superphosphate and some manure. Sometimes 100 pounds an acre of 16-percent superphosphate is used for corn, but the usual practice is to use no fertilizer for that crop. Approximate average yields under the above practices are 25 bushels of corn, 12 of wheat, 20 of barley, 22 of oats, 1 ton of clover hay, and 1½ tons of mixed hay.

As this soil is shallow and droughty, it would be better to leave corn out of the rotation and use a rotation of small grain and hay. Where little manure is available a complete fertilizer should replace the 16-percent superphosphate. Both lime and phosphate should be applied to the pastures to establish a better sod.

Catlett silt loam, eroded rolling phase (CA).—This soil differs from the undulating phase in occupying slopes of 7 to 14 percent. There are 40 acres included that have slopes exceeding 14 percent. In general this eroded rolling soil is shallower than the undulating phase and has more shale particles on the surface.

Use and management.—Nearly all of Catlett silt loam, eroded rolling phase, is being used for pasture. Only a few acres are in woods. Applications of lime and phosphate would help to establish a better stand of grass and aid in eliminating some of the broomsedge.

CATOCTIN SERIES

The soil of the Catoctin series is a shallow light yellowish-gray soil found on steeper slopes in the greenstone schist areas. On forested slopes, where the only erosion that has taken place is geologic, it is rarely more than 8 inches deep over bedrock. It generally is underlain by and developed from a pale yellowish-green rock material—boulders, cobblestones, and pebbles of greenstone imbedded in a finer matrix of similar material. Only Catoctin silt loam is mapped, and because of its shallow solum, it is best suited to pasture. The steep and eroded areas are better suited to forest.

Catoctin silt loam (CC).—This excessively drained soil occurs in the north-central part of the county and extends from Culpeper to Waterloo. It occupies small irregularly shaped areas on steeper slopes in close geographic association with Aldino and Fauquier soils. The parent greenstone is of volcanic origin. The cobblestones

and boulders in the agglomerate are rounded, and Shand (7) attributes this to their being tossed up and down in the throat of a volcano before they were finally ejected. About 75 percent of the total area is hilly and steep, but about 400 acres are included that are undulating to rolling. Approximately 10 percent of the land has been subject to only slight erosion, but 50 percent has been damaged by severe sheet or gully erosion.

White, red, scarlet, and black oaks, hickory, white, shortleaf, and scrub pines, Eastern redcedar, redbud, dogwood, and mountain-laurel compose the natural vegetation.

Representative profile:

1 to 0 inch, leafmold and forest litter; medium acid.
0 to 5 inches, yellowish-gray very friable floury silt loam containing many fragments of partly weathered schisty greenstone varying in size from ¼ to 2½ inches; strongly acid.
5 inches +, dusky-yellow stony silt loam material composed of partly weathered schisty greenstone and a small quantity of completely weathered material between the 1- to 4-inch rock fragments; few roots penetrate deeper than 9 inches owing to the high percentage of rock; strongly acid.

There is considerable variation in the depth of the soil and in the quantity and size of stone fragments it contains. In some areas outcrops of greenstone are common; in a few places the soil has a loam texture. This change in texture seems to occur where sandstone and quartzite were interbedded with the greenstone.

Use and management.—About half of Catoctin silt loam is in forest, approximately one-tenth is idle, and most of the rest is used for pasture. A few small areas, however, are being cultivated unsuccessfully. Most of this soil in Culpeper County is too shallow and droughty for pasture, and the best practical use for it is forest.

CECIL SERIES

The soils of the Cecil series occupy small acreages in the northwestern and western parts of the county. They are developed from the weathered products of granite and granite gneiss. They differ from the Appling soils in being redder in the subsoil and from the Culpeper in having a heavier subsoil and being developed from different parent material. This is about the northern extremity of the Cecil soils, and the subsoil is not so red or heavy as the Cecil subsoil farther south. Relief is undulating, rolling, and hilly, and drainage is good. Sheet erosion and some gullies have developed on steeper slopes that have been cultivated. Under good management practices Cecil soils are fair to good for agriculture where their relief is favorable.

Cecil fine sandy loam, undulating phase (CH).—This soil occupies undulating to gently sloping relief of 2 to 7 percent in the northern and northwestern parts of the county. It is naturally well drained both in the surface and the subsoil. It has developed over and from the weathered products of granite and granite gneiss, and the texture of the surface soil varies from a loam to a sandy loam. Quartz stones may be present on the surface. Natural vegetation includes white, scarlet, Northern red, chestnut, and black oaks, white, bitternut, and pignut hickories, and scrub and shortleaf pines.

Representative profile:

0 to 8 inches, yellowish-gray to light brownish-gray very friable fine sandy loam.
8 to 12 inches, light yellowish-brown friable clay loam.
12 to 32 inches, moderate reddish-brown firm heavy clay that is very hard when dry but sticky and slick when wet.
32 inches +, moderate reddish-brown friable clay material that is highly streaked and mingled with pale yellow and light gray and contains partly weathered fragments of granite.

Use and management.—Approximately one-fourth of Cecil fine sandy loam, undulating phase, is in forest, one-fourth is idle land, and the rest is about equally divided between cropland and pasture. The main crops grown are corn, wheat, barley, and lespedeza.

In general use is a 3-year rotation in which 200 pounds an acre of 2–12–6 or 4–12–4 is applied to small grain and 100 pounds is used for corn. Average yields with this fertilization are 37 bushels of corn, 14 of wheat, 24 of barley, and 1½ tons of hay. The soil is very responsive to treatment, and a considerable increase in yields of corn can be obtained by using heavier applications of a complete fertilizer. All of this land must be limed before clover can be grown successfully.

Cecil fine sandy loam, eroded undulating phase (CF).—This soil differs from Cecil fine sandy loam, undulating phase, in being more eroded. More than 25 percent of the original surface soil has been removed by accelerated erosion. In some places the surface soil has become so thin that part of the heavier subsoil is brought to the surface when the soil is plowed. In time the subsoil material is mixed with what remains of the original surface soil, and therefore the texture of the surface soil in these more severely eroded areas is a clay loam. A few shallow gullies are present in most areas.

Use and management.—The same crops are grown on Cecil fine sandy loam, eroded undulating phase, as on the undulating phase, but yields are approximately 10 percent less. Management is more difficult than on the undulating phase, and the moisture range suitable for tillage operations is not so wide on the more eroded areas that have a clay loam surface soil. Areas that have shallow gullies or that have lost most of their surface soil are best suited to hay or permanent pasture. Liberal applications of both lime and fertilizer are required to get good stands of desirable pasture grasses and high yields of hay.

Cecil fine sandy loam, eroded rolling phase (CE).—This phase differs from Cecil fine sandy loam, undulating phase, in that it occupies more rolling relief, is more eroded, and usually has a subsoil shallower to rock. Relief is sloping to hilly (7 to 14 percent). Internal and natural surface drainage are good. A number of gullied areas are included. The texture of the surface soil varies from a loam to a sandy loam where uneroded, and the texture is a clay loam in places where most of the surface soil has been removed.

Use and management.—All of Cecil fine sandy loam, eroded rolling phase, has been cleared. About half has been or is in the process of being restocked with scrub pine; the rest is used for pasture and cropland. Pastures have a very low carrying capacity, and few, if any of them, have ever received lime or phosphate fertilizer. Plant growth now consists principally of broomsedge, poverty oatgrass, dewberry briers, and a little lespedeza. The same crops are grown on this soil as on Cecil fine sandy loam, undulating phase, but yields are approxi-

mately 15 percent less. Management is more difficult because the land is more sloping. Contour tillage and strip cropping are effective, and rotations having a greater proportion of soil-conserving crops are desirable.

Cecil fine sandy loam, eroded hilly phase (CD).—The areas of this soil occur in the northern and northwestern parts of the county. The soil differs from the undulating phase of Cecil fine sandy loam in occupying steeper slopes and in having a thinner subsoil over bedrock. It has a rolling to hilly surface with some steeper slopes. The slope range is 14 to 25 percent. All areas are well to somewhat excessively drained. The texture of the uneroded surface soil varies from a loam to a sandy loam, and in places where most of the surface has eroded the texture is clay loam. Gullies, both deep and shallow, are present in many areas.

Use and management.—About one-fourth of Cecil fine sandy loam, eroded hilly phase, has never been cleared, and most of the rest is either idle or has been restocked naturally with scrub pine. A few acres are used for pasture. In fields where this soil joins other soils that are cultivated, a few acres of it are cropped, but very low yields are obtained and much accelerated erosion occurs. Under present conditions this soil is best suited to forest. It will, however, produce fair pasture when heavy applications of lime and complete fertilizer are made. The areas now being cropped would be better suited to pasture or the growing of shortleaf pine.

Cecil fine sandy loam, rolling phase (CG).—More rolling relief and a subsoil shallower to rock differentiate this phase from Cecil fine sandy loam, undulating phase. Slope ranges from 7 to 14 percent. Natural surface drainage and internal drainage are good.

Use and management.—Large areas of Cecil fine sandy loam, rolling phase, have never been cleared and many areas have reverted to forest after being abandoned years ago. Only a small acreage of this soil is being used for pasture or crops, but nearly all of it could be used, and average yields would be slightly lower than on Cecil fine sandy loam, undulating phase. Management is more difficult than on the undulating phase because the land is more sloping. Contour tillage and strip cropping are usually advisable where this soil is used as cropland.

CHEWACLA SERIES

The soil of the Chewacla series is a somewhat poorly drained one occurring in first bottoms. It consists of materials washed from the soils of the Piedmont Plateau and adjacent mountain regions and occurs dominantly on the outer edge of the wide bottoms along the larger and many of the smaller streams in the county. It has a yellowish-brown surface soil and a mottled yellow, light-gray, and brown subsoil. It is associated with Congaree and Wehadkee soils and in drainage is intermediate between them. The Chewacla surface soil is brown like that of the Congaree; the subsoil is similar to the Wehadkee subsoil.

Chewacla silt loam (CK).—Much of this soil occurs along the smaller streams in the county, and because it is frequently subject to overflow, it is somewhat poorly drained. Those areas in wide bottoms along larger streams are usually adjacent to higher uplands; their

restricted drainage is caused partly by these main streams overflowing their banks, but chiefly by surface runoff brought down from higher uplands by many intermittent streams. Relief is level, with a slight gradient in the direction of the stream flow. The slope range is 0 to 2 percent. This soil is in close geographic association with Congaree and Wehadkee soils. The natural vegetation is swamp hardwoods—willow and white oaks, sycamore, elm, red birch, red maple, boxelder, willow, smooth alder, and blue beech.

Representative profile:

0 to 11 inches, light yellowish-brown very friable silt loam becoming slightly mottled with gray at the bottom of the layer; strongly acid.
11 to 25 inches, friable heavy silt loam mottled with weak yellow and gray and to some extent with moderate yellowish brown; strongly acid.
25 inches +, friable light silt loam highly mottled with moderate yellowish brown and brownish gray; a few small water-worn rocks present; strongly acid.

Surface texture varies from silt loam to loam. Light mottling appears at depths of 3 to 8 inches. In many places, especially along the smaller streams, small areas of poorly drained soil are included. In a few small areas a thin layer of sandy material, deposited on this soil by recent overflows, gives the surface soil a fine sandy loam or sandy loam texture.

Use and management.—Nearly all of Chewacla silt loam has been cleared; pasture is the principal use, but a few areas are in forest or crops. During dry seasons it furnishes fair to good grazing, while pastures on well-drained soils may furnish little or none. Pasture is perhaps the best use for this soil. During extremely dry seasons there is great need for the kind of pasture it supports, and because it is frequently flooded, there is no certainty that a crop can be grown every year.

Not over 100 pounds of a complete fertilizer is used if this soil is cropped, and usually none is applied. Rotations are very indefinite. Corn may follow corn, a rotation of corn and wheat may be used, and sometimes a 3-year rotation of corn, wheat, and hay is followed. Average acre yields are not very high—25 bushels of corn, 10 bushels of wheat, and 1½ tons of mixed hay.

Little drainage can be done along the smaller streams, as the normal water level is only 1 to 2 feet below the surface of the soil and the drains overflow with every heavy rain. Along the Rapidan River and other larger streams, some drainage is possible because the normal water level may be 20 feet or more below the surface. Here the main problem is controlling the surface runoff from adjacent uplands. This can be done by digging ditches at the base of slopes and connecting them with the intermittent streams that carry the surface water from the uplands.

CONGAREE SERIES

The soils of the Congaree series occur throughout the county on first bottoms along the larger streams. They are derived from material washed from the soils of the Piedmont Plateau and adjacent mountain regions.

Congaree soils are easily worked and very productive, giving high yields without the use of fertilizer, but they are subject to periodic floods that are often destructive. The frequent occurrence of floods

in the past few years has caused a number of farmers to give up trying to crop Congaree soil, and they now use it entirely for pasture.

Congaree silt loam (Cm).—This soil occupies level areas along the larger streams. Near the streams it may have a very gentle slope in the direction of stream flow. It is well drained for a soil occupying first bottoms that are subject to overflow. It occurs in close association with Congaree fine sandy loam, Chewacla silt loam, and Wehadkee silt loam. Natural vegetation consists of swamp hardwoods and species that are associated with upland soils—yellow-poplar, black walnut, white and red oaks, white ash, hackberry, red birch, blue beech, elm, sycamore, and boxelder.

Representative profile:

0 to 14 inches, light yellowish-brown mellow very friable silt loam; strongly acid.
14 to 32 inches, light yellowish-brown very friable heavy silt loam containing grass roots throughout; strongly acid.
32 inches +, light yellowish-brown, splotched with yellowish gray and light brown, very friable heavy silt loam to silty clay loam material, becoming sandy in the lower depths and gravelly in places; small mica flakes and a few grass roots present in layer; strongly acid.

Surface texture varies from loam to silt loam, and the color of the surface soil ranges from light yellowish brown to moderate brown.

Use and management.—Nearly all of the Congaree silt loam has been cleared. A few acres in the extreme eastern part of the county, near the junction of the Rapidan and Rappahannock Rivers, have reverted to forest. Present use is about equally divided between cropland and pasture. Corn is the major crop, but a considerable acreage is used for hay, and a small acreage for wheat, oats, and barley. This soil is productive and yields 35 to 50 bushels of corn without fertilization. Lime is required for clover, which is usually grown with lespedeza. The most common rotation is 2 years of corn followed by 2 years of hay; the corn receives 100 to 200 pounds an acre of 2–12–6 or 3–12–6 fertilizer. Under this system of management, corn averages 45 bushels an acre, and mixed hay (clover and lespedeza) 1½ tons.

Periodic overflows at times completely destroy crops and considerably damage the soil itself. Little can be done about these floods, but by carefully selecting the fields that are to be cropped, damage from washing can be reduced. Areas most likely to be damaged by serious washing during floods are those near places where the stream channel is obstructed by islands or rock outcrops, those near sharp bends in the stream, those where a shallow channel has been caused by the presence of very resistant rocks, and those above dams. Such areas should be kept in pasture, for during flood stage the streams overflow their banks at these places with such force that serious washing results if the soil is plowed.

Congaree fine sandy loam (Cl).—This soil is differentiated from Congaree silt loam chiefly by texture. Locally it is slightly lighter colored than the silt loam because it contains less organic matter.

Use and management.—Nearly all of this soil is being used for pasture or crops, and as on Congaree silt loam, corn and hay are the main crops. In yields produced and management required this soil is similar to the silt loam. It is very easy to work and, except for the flood hazard, an excellent soil for vegetables.

CROTON SERIES

The soils of the Croton series occur throughout the Triassic plain area where relief is level to gently undulating and surface runoff is very low. They are characterized by a light-gray to yellowish-gray surface soil that contains a few mottlings in or near the surface and by a mottled subsoil which is slightly plastic when wet but hard and compact when dry. They are underlain by and developed from the weathered products of mudstones that have a purplish cast and from yellow, reddish-brown, gray, and greenish-colored shales, all of the Triassic formation. These soils are best used for pasture. Some form of artificial drainage is required to grow crops with any degree of success.

Croton silt loam, level phase (Cn).—This level to very gently sloping soil has slopes of 0 to 2 percent. It is poorly drained, with very slow surface runoff and very slow internal drainage. It occurs throughout the Triassic plain area in close association with Penn, Bucks, Lansdale, Brecknock, Catlett, Stanton, and Kelly soils, and usually at the heads of drains, at the foot of slopes, and in low spots where water stands after a rain. Willow, post, white, black, and swamp white oaks, hickory, and scrub pine are the natural vegetation.

Representative profile:

0 to 7 inches, yellowish-gray floury very friable silt loam faintly mottled with light yellow and light gray; contains many small dark-brown concretions; strongly acid.

7 to 12 inches, weak-yellow friable silty clay loam highly mottled with light gray, yellowish white, and light yellowish brown, material breaks out in irregularly shaped aggregates 1 to 4 inches in diameter that can easily be crushed to a granular mass between the fingers; strongly acid.

12 to 16 inches, highly mottled yellowish-white, pale-yellow, and strong yellowish-brown firm silty clay loam; slightly sticky when wet and hard when dry; numerous vesicular holes occur throughout, strongly acid.

16 inches +, light olive-brown firm clay mottled with light gray and pale yellow; contains many fragments of medium-gray and light brownish-gray Triassic shale; layer is sometimes plastic and very sticky when wet, and hard when dry; numerous small vesicular holes occur throughout layer; medium acid.

This soil is variable. Where it overlies the metamorphosed "Indian Red" and the dark-gray Triassic shales it is shallow (6 to 12 inches), and instead of a heavy clay layer at the lower depths many fragments of highly weathered shale occur. In some of these shallow areas the soil has a pinkish cast inherited from the red parent shales. Included with this soil are a number of small areas of soils having heavy plastic subsoil; these would have been mapped as Kelly silt loam if they had been larger and could have been delineated accurately on the map. Also included are a number of small areas of Stanton silt loam and of somewhat poorly drained colluvial material that washed from Bucks and Penn silt loams.

Use and management.—About 20 percent of Croton silt loam, level phase, is used for forest, 15 percent is idle, 30 percent is in crops, and 35 percent is in pasture. Some corn is grown, but more of the soil is used for small grains and hay.

The major problem in trying to crop this land is finding a way to carry off the surplus water. Where it has been cropped for any period of time, the soil has almost always been plowed in beds 20 feet or more wide and 2 feet or more high (pl. 2, *B*). This practice of bedding gets part of the crop above standing water and somewhat improves surface drainage. During a wet season, however, series of small ponds develop between these beds.

Yields on this soil average very low because of its wetness. Under average management, corn yields 15 bushels; wheat, 10 bushels; barley, 12 bushels; and lespedeza hay, 1 ton. The best practical use is pasture (pl. 2, *C*) or hay (lespedeza and timothy). A number of pastures that have been treated with phosphate and lime have a much higher carrying capacity than those not treated. Little can be done in the way of artificial drainage, because of the flat topography and slow internal drainage. A few areas near natural drains have been drained with some success by using open ditches, but these are exceptions.

Croton silt loam, undulating phase (Co).—Except for slopes ranging from 2 to 7 percent, this soil is similar to the undulating phase. Drainage is better as a result of more rapid runoff. Some slightly eroded areas are included in this phase. This is a better general purpose soil than the level phase; most of it is used for cropland, and yields are slightly higher.

CULPEPER SERIES

The soils of the Culpeper series are developed over arkosic sandstone. Their parent material is a mixture of that sandstone with quartzite and some granite gneiss. Furcron (*1*) in his description of the arkosic rocks in this area says:

> The arkosic beds in this area overlie greenstone, the Fauquier formation, and granite, but are derived from granite. Fragments do not show chemical weathering Disintegration, transportation, and deposition must have taken place rapidly; therefore, the deposits, although thick, probably represent but a short period of time.

Culpeper soils are closely associated with the Albemarle of like origin and also with the Cecil soils derived from granite gneiss. The Culpeper soils have a light-brown or yellowish-gray surface soil and a reddish-brown or light-red friable subsoil, which is more friable than the subsoil of the Cecil. Relief is undulating to gently rolling or hilly, with a slope range of 2 to 25 percent. Surface runoff is medium and internal drainage is good. A considerable part of these soils is in forest, dominantly hardwoods. General farming—the growing of corn, wheat, barley, oats, lespedeza and other hay crops, and pasture—is practiced on some of the smoother areas.

Culpeper loam, undulating phase (Cx).—This loam is geographically associated with the Appling, Manor, Elioak, Lloyd, and Hazel soils. It occurs in scattered areas throughout the northwestern part of the county on undulating to gently sloping relief of 2 to 7 percent. Drainage, both surface and internal, is good. The natural vegetation is a hardwood forest composed of white, scarlet, red, black, and post oaks, and hickory, with occasional shortleaf and scrub pines.

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Representative profile:

1½ to 0 inch, leafmold and forest litter; extremely acid.
0 to 8 inches, yellowish-gray very friable loam containing many brown and white quartz fragments 1 to 5 inches in diameter; top inch or two slightly darker because of organic matter; very strongly acid.
8 to 12 inches, light yellowish-brown friable clay loam that breaks into irregularly shaped lumps ½ to 2 inches in diameter; very strongly acid.
12 to 22 inches, strong-brown to moderately reddish-brown friable to firm clay that breaks out into irregularly shaped lumps 1 to 2 inches in diameter; lumps, or aggregates, difficult to crush between the fingers when soil is dry; numerous small mica flakes throughout layer; very strongly acid.
22 inches +, strong-brown friable clay material highly streaked and mingled with pale yellow and light gray; contains a few small fragments of arkosic sandstone and mica schist; strongly acid.

The texture of the uneroded surface soil varies from loam to sandy loam. Where sheet erosion is severe, a clay loam type is mapped. In a few areas Culpeper loam is closely associated with Manor and Elioak soils, and areas of these two soils too small to show on the map are included.

Use and management.—Most of Culpeper loam, undulating phase, is now in woodland. It is not cultivated, but the crops that could be grown and their expected yields would be the same as those given for Culpeper loam, eroded undulating phase.

The soil is well suited to cultivation. On farms where it occurs with steeper or more eroded soils, it would be a good practice to retire the eroded soils if they are being cultivated and clear some of this phase. Good management should be followed in order to conserve this soil.

Culpeper loam, eroded undulating phase (Cv).—This soil is similar to Culpeper loam, undulating phase, except that it has lost over 25 percent of its original surface soil through sheet erosion. Slopes range from 2 to 7 percent. Occasional shallow gullies exist in some fields, but erosion has not greatly impaired productivity. This phase has undulating to gently sloping relief favorable for farming. All areas are well drained.

Use and management.—Nearly all of Culpeper loam, eroded undulating phase, is now cleared. A few areas, however, have been lying idle for several years and now support stands of young scrub pine. The soil is used in about equal extent for crops and pasture. Corn is the main crop, followed by hay and wheat. Oats and barley make up a very small part of the total. Because it occurs on undulating topography, is easily tilled, and is fairly easy to conserve, all of this soil could be used as cropland.

A 3-year rotation of corn, small grain, and hay is most widely used. The small grain is usually wheat, but barley is sometimes substituted. The hay crop is generally a mixture of clover and lespedeza, but the two legumes are also grown separately. Small grain is usually the crop in the rotation that is fertilized. On one farm a 3-year rotation of corn, wheat, and clover received the following treatment: 1 ton of ground limestone an acre was used, no fertilizer was applied for the corn, the small grain was treated with 250 pounds an acre of 2–12–6 fertilizer, and 200 pounds an acre of 20-percent superphosphate was added in spring as a top dressing for the small grain and clover. Yields under this treatment were 35 bushels an acre of corn, 14 of wheat, and 1½ tons of lespedeza hay.

The potentialities of this soil, when well managed, are illustrated by results obtained by successful farmers. One uses a 3-year rotation of corn, small grain, and clover hay and applies 1 ton an acre of ground limestone during each rotation, 300 pounds of 0–14–6 for corn, 300 pounds of 0–14–6 for small grain, and top dresses the clover in the spring with 300 pounds of 0–14–6. Any manure that is available is also added. Average acre yields under this treatment are 20 bushels of wheat, 45 of oats, 38 of barley, 65 of corn, and 1½ tons of clover hay. A dairy farmer on this soil has built up the carrying capacity of his pasture during the last 8 years from more than 3 acres per animal unit to less than 1 acre per animal unit. During this period he has added 2 tons of ground limestone and 1,000 pounds of 20-percent superphosphate an acre, and has top-dressed the soil twice with manure.

Culpeper loam, rolling phase (Cw).—This soil occupies slopes of 7 to 14 percent and has a subsoil in some places thinner over rock, but is otherwise similar to the undulating phase.

Use and management.—Most of the rolling phase of Culpeper loam is now in forest, but it is physically suited to crops. Clean-cultivated crops, however, should be planted infrequently. Contour tillage and strip cropping are very effective in reducing erosion losses (pl. 3, *A*).

Culpeper loam, eroded rolling phase (Cu).—This is an extensive soil similar to the undulating phase, but it is slightly more eroded and in many places has a subsoil thinner over rock. Occasional gullies have formed in some areas. Slopes range from 7 to 14 percent.

Use and management.—A small percentage of Culpeper loam, eroded rolling phase, is used for general farm crops and pasture. Extensive areas that have been cleared are now idle. Some are growing up in scrub pine. The same crops are grown as on Culpeper loam, undulating phase, but yields are approximately 15 percent less.

Management is slightly more difficult than on Culpeper loam, undulating phase, because this soil is more sloping. The fertilizers used are about the same. Measures of conservation and erosion control are more necessary than on the eroded undulating phase, as that soil occupies gentler slopes. Tillage should be on the contour; rotations should be well planned and include a minimum of row crops. More organic matter should be returned to the soil.

Culpeper loam, eroded hilly phase (Ct).—This soil is similar to Culpeper loam, undulating phase, but slightly shallower to bedrock, more eroded, and steeper in relief. Slopes range from 14 to 25 percent. Occasional gullies occur throughout, and on a few areas many deep gullies have formed. There are some outcrops of arkosic sandstone.

Use and management.—Only a small acreage of Culpeper loam, eroded hilly phase, is now in cultivation. The cultivated areas are hillsides that make up part of a field and join areas of smoother cropland. A considerable acreage is either in scrub pine woods or in idle land that will in time revert to pine thickets. The rest of the acreage is now being used for pasture of very low carrying capacity. Few of these pastures have ever received lime or fertilizer. In most of them the present growth consists of broomsedge, poverty oatgrass, sheep sorrel, other weeds, and a sparse stand of lespedeza. The areas that have not been eroded make fair permanent pasture, however, if lime and a complete fertilizer like 4–12–14 is applied at the rate of 200 to

300 pounds an acre and followed by an application of 20 percent superphosphate.

The best use for this soil is forest. Abandoned areas will usually seed to scrub pine after several years, but if they do not, shortleaf pine can be planted.

Culpeper clay loam, eroded rolling phase (CR).—This is one of the extensive soils in the county. Most areas have lost 50 to 75 percent or more of the original surface soil through erosion. The original surface soil in most places was a loam. Relief is rolling to steeply rolling (7 to 14 percent).

The surface soil, 3 to 8 inches thick, is moderate yellowish-brown to strong-brown moderately friable clay loam containing practically none of its original organic matter. In cultivation some subsoil has gradually become mixed with the original surface soil as sheet erosion progressed. The subsoil consists of strong-brown to moderate reddish-brown firm silty clay or clay 10 to 18 inches in depth. The material deeper in the profile, similar to that underlying other Culpeper soils in the county, grades into the soft or hard arkosic sandstone.

Surface runoff is very high because little or none of the original surface soil remains. Where the soil is cultivated, a large part of the rainfall is lost as surface runoff. All but about 25 percent of the total acreage has some form of gully erosion in addition to sheet erosion. In many areas the gullies are deep and numerous.

Use and management.—Although more of Culpeper clay loam, eroded rolling phase, is being used for pasture than for any other purpose, a considerable acreage is still being cultivated. Some of the more severely eroded areas have reverted to forest, usually scrub pine; the rest are lying idle and in time will restock with scrub pine.

This soil is not well suited to row crops; the best use for it is hay or permanent pasture, with the more severely eroded areas in forest. Present practices have not protected the soil from erosion and other damage from runoff. Contour furrows might be practical to conserve moisture. More organic matter should be returned to increase the water-holding capacity of the surface soil. Lime and fertilizer would aid in establishing a good grass sod that would provide grazing and protect the soil. Animals should not be permitted to graze the land until the herbage is 3 or 4 inches high.

Culpeper clay loam, eroded undulating phase (Cs).—Smoother relief of 2 to 7 percent, a thicker solum, less erosion, and a higher content of organic matter differentiate this soil from the eroded rolling phase of Culpeper clay loam. Only a few shallow gullies are present.

Use and management.—Nearly all of the eroded undulating phase of Culpeper clay loam is being used for cropland or pasture. A 3-year rotation of corn, small grain, and hay is in general use. A common practice is to use 200 pounds an acre of 2–12–6 or 4–12–4 for small grain and 100 pounds for corn. One ton an acre of ground limestone is usually used in the rotation if clover is grown. Average acre yields under the above practices are 28 bushels of corn, 12 bushels of wheat, 22 bushels of barley, and 1½ tons of mixed hay (clover, lespedeza, and orchard grass).

More organic matter should be returned to this soil to make it easier to work and to increase its water-holding capacity. Rotations composed of close-growing crops are recommended to protect the soil from excessive erosion. Tillage operations on more sloping areas should always be on the contour, and strip cropping is effective on long slopes. Heavy applications of lime and fertilizer would increase crop yields under normal conditions.

Culpeper clay loam, eroded hilly phase (CP).—This soil differs from Culpeper clay loam, eroded rolling phase, in occurring on steeper slopes of 14 to 25 percent. Also, some areas with steeper slopes have a thinner subsoil over rock and have been more severely eroded. Gullies are prominent, and about 85 percent of the total acreage has been gullied to some extent.

Use and management.—Less than 50 percent of Culpeper clay loam, eroded hilly phase, is used for pasture; large areas are idle or forested with dense stands of scrub pine that seeded naturally on abandoned land. Poor management in cropping and overgrazing has resulted in severe sheet and gully erosion. Pastures now receive no fertilizer or lime, support few desirable pasture grasses, and are very low in carrying capacity.

This soil should not be plowed. The best practical use is permanent pasture, and on the more severely eroded areas, forest. Heavy applications of lime, fertilizer, and manure are required to establish a sod of desirable grasses.

DAVIDSON SERIES

Soils of the Davidson series occur throughout the central part of the county in relatively small irregularly shaped bodies on or near the tops of the ridges of basic rocks. They have developed over several different kinds of basic rock—diabase, greenstone, and, in places, trap conglomerate. Most of the soils lie upon and are deeply developed from greenstone and diabase. The soils are characterized by a reddish-brown color, the heavy subsoil being moderate reddish brown to dark red. The Davidson are productive soils that give good yields of nearly all crops grown in the county. On the steeper slopes they require careful management to prevent accelerated erosion.

The approximate percentages of Davidson soils are: Undulating, 35 percent; rolling, 45 percent; hilly, 19 percent; and steep, 1 percent. About 35 percent of the land occupied by Davidson soils has been subject to severe sheet erosion and has lost 75 percent or more of the surface soil; about 10 percent has been affected by both sheet and gully erosion.

Davidson clay loam, undulating phase (DF).—This soil occupies undulating and gently sloping topography (2- to 7-percent slopes). It usually occurs on the higher ridges of basic rocks in close geographic association with Mecklenburg, Iredell, Rapidan, and Fauquier soils. Surface drainage is medium and internal drainage is moderate. White, red, scarlet, and black oaks, black walnut, black locust, yellow-poplar, dogwood, scrub and shortleaf pines, and hickory compose the natural vegetation.

Representative profile:

0 to 14 inches, moderate-brown mellow friable clay loam having a fine granular structure and containing fine roots and worm and root holes throughout; strongly acid.

14 to 66 inches, moderate reddish-brown to dark-red firm compact clay that breaks out into irregularly shaped aggregates 1 to 6 inches in size; material sticky when wet and hard but brittle when dry; dark-brown concretions and streakings occur in the lower part; numerous roots throughout; strongly acid.

66 inches +, moderate reddish-brown firm compact clay slightly more friable than layer above; yellowish-brown and yellowish-gray fragments of highly weathered rock scattered throughout.

The surface soil, from 5 to 14 inches thick, varies in thickness according to the amount removed by accelerated erosion.

Use and management.—Nearly every acre of Davidson clay loam, undulating phase, has been cleared. Over half of it is used for general farm crops; the rest, for pasture, alfalfa, and clover hay. All of it is capable of producing excellent crops and pasture, and it should not be used for pasture where inferior soils are being cropped.

The prevailing rotation lasts 3 years, but if alfalfa is included, one lasting 5 years or longer is used. One of the most successful farmers of this soil uses a 3-year rotation except on alfalfa lots. He applies 1 ton an acre of ground limestone during this rotation and uses for barley and oats 300 pounds an acre of 20-percent superphosphate, with manure, and 100 pounds an acre muriate of potash on eroded spots. For corn he applies 150 pounds of 3–12–6 fertilizer and a small quantity of manure; for wheat, the same application as for barley and oats, and in addition a spring top dressing of 50 pounds of nitrate of soda or the equivalent. When alfalfa is seeded, from 2 to 4 tons an acre of ground limestone are applied, depending upon the acidity of the soil. Also, 100 pounds of muriate of potash and 500 pounds of 20-percent superphosphate are applied the first year. The following year 300 pounds of 20-percent superphosphate and 200 pounds of muriate of potash are added, and the third year 200 pounds of 20-percent superphosphate is applied. With the practices just described, oats yield 50 bushels; barley, 40 bushels; corn, 55 bushels; clover hay, 2 tons; and alfalfa hay, 3½ tons.

Davidson clay loam, rolling phase (De).—A slightly shallower soil, a little heavier textured and slightly redder, differentiates this phase from the undulating phase. Moisture conditions are not so favorable as on the undulating phase. Slopes range from 7 to 14 percent.

Use and management.—The crops grown on Davidson clay loam, rolling phase, are about the same as on the undulating phase. Corn yields 35 to 50 bushels an acre and averages 45 bushels. This yield is 10 to 15 percent less than that on the undulating phase. More close-growing crops are needed because surface water runs off more rapidly. Contour tillage should always be used, and strip cropping is advisable wherever practical. The water-absorption capacity can be increased and the workability improved by making heavy applications of stable manure and by plowing under green-manure crops.

Davidson clay loam, eroded hilly phase (Dc).—A thinner surface soil, slightly heavier textured and redder, is the essential difference between this soil and the undulating phase. The subsoil is thinner over bedrock than that of the undulating phase. Surface relief ranges

from 14 to 25 percent. Nearly all of this soil has lost a large part of the original surface soil through erosion.

Use and management.—Two-thirds of Davidson clay loam, eroded hilly phase, is still in forest; the other third is used mainly for pasture but a few acres are occasionally cropped. Under clean cultivation this soil is very erosive on the steep slopes, and pasture is the use to which it is best suited. If there is great need for pasture some of the areas now in forest could be cleared and seeded to grasses.

Davidson clay loam, hilly shallow phase (DD).—This phase has a much shallower surface soil and a thinner subsoil over bedrock than the undulating phase. The surface soil, to depths of 2 to 4 inches, is a moderate-brown mellow friable clay loam. The subsoil, a moderate reddish-brown or dark-red firm clay, contains a few fragments of weathered rock. It is underlain by partly weathered parent material at depths of 5 to 14 inches. The depth to bedrock depends on the degree of erosion. Slopes range dominantly from 14 to 25 percent, but as mapped, the phase includes some rolling (7- to 14-percent slopes) and some steep (25+ percent slopes) land.

Use and management.—Most of Davidson clay loam, hilly shallow phase, is used for pasture. A few acres on undulating topography are used for crops, and parts of the steeper areas are still wooded. Because of its shallowness, this soil is best used for pasture or forest. Carrying capacities of pastures already established could be increased greatly by applying lime, manure, and fertilizer.

Davidson clay, rolling phase (DB).—This severely eroded phase has lost 75 percent or more of its original surface soil. The present 3- to 8-inch surface layer is moderate reddish-brown clay, low in organic matter. It is moderately granular and friable and not so heavy or stiff as the underlying layers, because plant residues and manure have been mixed into it. The subsoil, to depths as great as 48 to 60 inches, is a moderate reddish-brown or dark-red firm clay. Next lower in the profile is moderate reddish-brown compact clay, slightly more friable than the subsoil, that contains fragments of weathered diorite, diabase, or greenstone. These fragments are yellowish brown and yellowish gray. Most of the soil is sloping to rolling (7 to 14 percent), but a few acres occur on undulating relief and are less eroded.

Use and management.—Nearly all of Davidson clay, rolling phase, is used either for cropland or pasture. All crops yield 15 to 20 percent less than on Davidson clay loam, rolling phase. Because of its eroded condition this soil is better adapted to small grain, hay, and pasture than to row crops. Organic matter should be supplied in the form of green manure or stable manure. Applications of lime and fertilizer are needed to produce a good grass sod. All tillage should be on the contour. Severely gullied areas should be protected from further destruction by seeding with fast-growing grasses or by planting trees of suitable species, usually pine.

Davidson clay, eroded hilly phase (DA).—Steeper slopes, more surface runoff, more severe erosion, and a subsoil shallower over bedrock differentiate this soil from the rolling phase. The dominant range in slope is 14 to 25 percent, but some areas with 25- to 40-percent slopes are included. Surface drainage is rapid, for rain water does not readily penetrate the clay soil.

Use and management.—Although some hay and small grain are grown on Davidson clay, eroded hilly phase, where it joins smoother areas of cropland, it is chiefly in forest and permanent pasture. Crop yields are generally low because of insufficient moisture and low fertility. Because of its steep slopes and the loss of large amounts of surface and subsoil through erosion, this soil is best used for pasture or forest. Lime, fertilizer, and manure are needed to establish and maintain a good sod.

ELBERT SERIES

The soil of the Elbert series (Elbert silt loam) occurs in close association with Iredell soils. It has level relief. In places along some of the small streams it developed from poorly drained colluvial material washed out of Iredell soils, but for the most part it developed on material weathered from diabase rock. Elbert soil, locally known as wet blackjack land, is characterized by poor surface and internal drainage, numerous mottlings throughout the profile, and a very heavy plastic subsoil.

Elbert silt loam (EA).—This soil developed from dikes and sheets of basic diabasic rock that pushed up through and flowed out over Triassic deposits. Relief is level to nearly level (0 to 2 percent) with a few slight depressions. A small acreage has relief of 2 to 4 percent. Most of this soil occurs in large areas so level that there is hardly any surface drainage. From 2 to 3 inches of water usually cover these areas during winter months. Drainage, both internal and external, is very poor. Willow, elm, and swamp white, scarlet, post, and white oaks are the natural vegetation.

Representative profile:

0 to 8 inches, highly mottled light-gray and light yellowish-brown friable silt loam.
8 to 32 inches, highly mottled strong yellowish-brown and light-gray heavy plastic clay containing a few black concretions; lower part of layer slightly more plastic but not so highly mottled as the upper.
32 inches +, moderate olive-brown heavy plastic clay containing some highly weathered fragments of diabase rock.

Where Elbert silt loam occurs near small streams flowing through areas of Iredell soils, it has some colluvial material on the surface. A few included stony areas are indicated on the map by stone symbols.

Use and management.—Except for the few narrow strips along the small streams flowing through areas of Iredell soils, none of Elbert silt loam has been cleared. It is too poorly drained to grow any of the desirable grasses and therefore it is now used only for forest. The small areas of poorly drained colluvial material are exceptions and will produce fair pasture.

ELIOAK SERIES

Soils of the Elioak series differ from the Cecil soils chiefly in having a browner surface soil and a higher content of mica throughout their profile. The subsoil is moderate reddish-brown firm clay loam or silty clay loam. Parent materials are mainly granite gneiss and mica schist. Elioak soils occur mainly in small irregular-shaped bodies scattered throughout the northwest part of the county. They occur in close geographic association with Cecil, Manor, and Hazel soils.

Relief ranges from undulating and rolling to hilly. More than half the acreage is used for pasture.

Elioak loam (EB).—This soil occurs on dominantly rolling and undulating slopes of 7 to 14 percent and is therefore well drained. In fact, on some of the steeper eroded areas, drainage is excessive. The natural vegetation is white, scarlet, red, and black oaks, hickory, scrub pine, beech, blackgum, chestnut sprouts, and mountain-laurel.

Representative profile:

1 to 0 inch, thin layer of leafmold and forest litter.
0 to 7 inches, light yellowish-brown mellow very friable loam containing a few fine mica flakes; angular quartz fragments from ½ to 3 inches in diameter scattered throughout.
7 to 22 inches, strong-brown to moderate reddish-brown firm clay loam to clay that breaks out in irregularly shaped lumps ½ to 3 inches in diameter; lumps can be crushed to ¼-inch aggregates under slight pressure; brown and white quartz fragments ½ to 3 inches in diameter scattered throughout; mica occurs in quantity sufficient to impart a greasy feel to the material.
22 inches +, light-brown friable heavy silt loam to loam composed of highly micaceous material; fragments of light-colored partly weathered mica schist at about 30 inches.

A few acres that have been influenced by basic rock are darker colored. The depth of the soil over partly weathered schist varies from 20 to 30 inches. The texture of the surface soil ranges from a silt loam to a very fine sandy loam. A few shallow gullies occur in some areas.

Use and management.—Some areas of Elioak loam are still wooded, about half is in pasture, and a third is used for crops. Contour tillage and strip cropping are very effective in controlling erosion on the steeper slopes.

A 3-year rotation of corn, small grain, and hay is most widely used. The small grain is usually wheat, but barley is sometimes substituted. The hay is usually a mixture of clover and lespedeza, although either of the two legumes are grown separately. Small grain is usually the crop in the rotation that receives fertilizer. The average yields obtained in a 3-year rotation are affected by the fertilization practiced. If 1 ton an acre of ground limestone and 300 pounds an acre of complete fertilizer are used, corn yields about 35 bushels; wheat, 18 bushels; barley, 24 bushels; oats, 32 bushels; clover hay, 1¼ tons; and mixed hay, 1½ tons. Lime is required to grow clover, and the carrying capacity of pasture can be increased by applying lime and phosphate.

Elioak loam, eroded phase (EC).—This phase differs from Elioak loam in having shallower surface soil and usually a thinner subsoil. Seventy-five percent or more of the original surface soil has been removed by accelerated erosion, and there are gullies in some fields. Approximately 25 percent of the soil occurs on relief steeper than that of Elioak loam; the slope range is from 2 to 25 percent. In many places the surface texture is a clay loam rather than a loam.

Use and management.—Because it is severely eroded and difficult to conserve, Elioak loam, eroded phase, is best suited to and largely used for pasture. A few acres are used for crops, and a small part is wooded. Heavy applications of lime, fertilizer, and manure, if available, are needed to obtain good pastures of high carrying capacity.

FAUQUIER SERIES

The soils of the Fauquier series developed from greenstone and occupy a continuous area in the northeastern part of the county. Their surface soil is light yellowish brown; their subsoil—strong brown to reddish brown—is lighter colored than Davidson subsoil but deeper and darker colored than that of either of its close associates, the Aldino and Catoctin soils. The solum of the Fauquier soils is shallower over rock than that of the Davidson. Relief ranges from undulating and rolling to hilly, and in some places there are steep areas. Sheet erosion has been active in cultivated areas, particularly on the steeper slopes. Locally shallow gullies have formed, and rock outcrops are frequent. Fauquier soils are erosive in nature and in large percentage have been severely eroded. They are therefore best used for hay and permanent pasture.

Fauquier silt loam, rolling phase (FB).—This soil is geographically associated with the Aldino and Catoctin soils and is derived from basic rocks—epidote and chlorite greenstone. Relief is dominantly rolling (7 to 14 percent). Drainage is excellent. Although runoff is rapid, the friable soil takes up a fair amount of rainfall. The natural vegetation includes white, red, black, and scarlet oaks, shortleaf and scrub pines, yellow-poplar, hickory, dogwood, black locust, and black walnut.

Representative profile:

1 to 0 inch, leafmold and forest litter.
0 to 9 inches, light yellowish-brown very friable silt loam containing tree roots and many black concretions 1/16 to 1/4 inch in diameter; strongly acid.
9 to 13 inches, light-brown friable heavy silt loam containing many small black concretions, and, as well, numerous worm and root holes 1/4 to 1 inch in size that have been filled with soil material from the layer above; strongly acid.
13 to 22 inches, strong-brown to moderate reddish-brown firm clay to silty clay that breaks out in 1/2- to 1 1/2-inch irregularly shaped lumps crushable under moderate pressure to smaller aggregates; strongly acid.
22 inches +, strong-brown, mingled with light-brown, friable silty clay to clay containing a few concretions and fragments of weathered greenstone; strongly acid.

The subsoil ranges from reddish brown where this soil is mapped near areas of Davidson soil to yellowish brown where areas of Aldino soils too small for separate delineation on the map are included. Rock outcrops occur on some areas, and on the steeper slopes the soil is much shallower over bedrock.

Use and management.—Approximately one-third of Fauquier silt loam, rolling phase, is being used for pasture, a few acres are in forest, and the rest is used for crops. The soil is generally best suited to use as cropland if contour tillage, and, on the longer slopes, strip cropping, are used.

A 5-year rotation consisting of corn, small grain, hay, and 1 or 2 years of pasture is most widely used. The general practice is to apply all of the fertilizer—250 to 400 pounds an acre of 2–12–6—for the small grain. One ton an acre of ground limestone is used during the rotation. Approximate acre yields with the rotation and treatments just described are 32 bushels of corn, 35 bushels of oats, 18 bushels of wheat, 26 bushels of barley, and 1 1/2 to 2 tons of hay (usually a mixture of red clover and lespedeza).

The long rotation in general use forces most of the farmers to crop fields that are unsuited to cultivation—those that occur on steep topography or those shallow to bedrock. A shorter rotation, one lasting 1 to 3 years, would probably be better, for it would allow use of many of the steeper areas for permanent pasture. Better results could be obtained if the fertilizer were applied every year at the rate of 200 to 300 pounds an acre.

Fauquier silt loam, undulating phase (Fc).—This phase occurs on smoother relief than the rolling phase (2 to 7 percent slopes) and can be cultivated without the use of strip cropping and other soil-conserving practices. Nearly all of this soil is used for crops, and yields average about 15 percent higher than on the rolling phase. This is a good soil for general farming.

Fauquier silt loam, eroded hilly phase (Fa).—This phase differs from the rolling phase in degree of slope (about 90 percent occurs on hilly relief), in having lost a large part of the original surface soil, and in having a subsoil shallower to bedrock. Outcrops of greenstone rock and loose rock are more common. Relief ranges dominantly from 14 to 25 percent, but some areas that have slopes of 25 to 40 percent or more are included. Gullies are more numerous on some cultivated areas. Approximately 30 percent of this soil is still in forest, a few acres are cropped, and the rest is in pasture. The best use for this soil is permanent pasture or forest. Applications of lime and fertilizer are necessary to obtain good stands of grasses.

Fauquier silty clay loam, rolling phase (Fe).—This soil is the equivalent of Fauquier silt loam, rolling phase, with approximately 75 percent or more of the silt loam surface removed by accelerated erosion. The present plow layer is a moderate-brown loose friable silty clay loam. The subsoil is strong-brown to moderate reddish-brown firm or slightly compact silty clay that breaks out in subangular aggregates ¼ to 1½ inches in diameter. At depths of 4 to 12 inches the subsoil is underlain by strong-brown friable silty clay material containing many fragments of weathered greenstone. The thickness of the surface soil and the depth to bedrock depend on the degree of sheet erosion. The spotted appearance of some fields is a result of unequal erosion losses. Shallow and deep gullies are in some fields.

Use and management.—Although all of Fauquier silty clay loam, rolling phase, has been cultivated at some time, approximately 15 percent has now reverted to nearly pure stands of scrub pine, 15 percent is idle, 30 percent is used for cropland (pl. 3, *B*), and the rest is used for pasture. There is a tendency toward droughtiness during short dry spells because of the severely eroded condition. This soil is best suited to hay or pasture, but manure, lime, and fertilizer (pl. 3, *C*) are required to obtain good stands of desirable grasses or good crop yields.

Included with this soil are small areas of Fauquier silty clay loam that have a comparatively smooth surface (2 to 7 percent slopes) and a surface soil only slightly eroded in all except the more sloping places. These included soils are good agricultural land and can be used advantageously for growing the crops common to the county. Under good treatment high yields could be obtained.

Fauquier silty clay loam, eroded hilly phase (FD).—The slopes on which this soil occurs are steeper than those of Fauquier silty clay loam, rolling phase. The relief is mostly hilly (14- to 25-percent slopes), but about 100 acres occur on steeper relief (25- to 40-percent slopes). The soil is similar to the rolling phase in color, but its surface soil is generally thinner and the subsoil is shallower to bedrock. In most places it is also more eroded and gullied, and outcrops of greenstone rock and loose rock are common on the surface.

Use and management.—Most of Fauquier silty clay loam, eroded hilly phase, is used for pasture or forest, but some is cultivated where it joins areas of smoother land, and some is idle. Because the soil is difficult to cultivate and conserve, it is best used for pasture. Gullies should be stabilized by seeding them to fast-growing grasses or trees and fencing them to keep out stock. Nearly all of the original surface soil and, in many places, part or most of the subsoil have been removed by accelerated erosion. The water-absorbing capacity and fertility of the soil are therefore low. Barnyard manure, lime, and fertilizer are required to get good stands of pasture grasses.

HALEWOOD SERIES

The Halewood series consists of light-colored soils with yellowish-brown subsoil. They occur in and near the foothills of the Blue Ridge Mountains (pl. 4, *A*) in the extreme western part of the county. They are geographically associated with the Hayesville soils. In color and structure they bear the same relation to the Hayesville soils that the Appling soils do to the Cecil. They are underlain by and derived from weathered material of granite, granite gneiss, and mica schist and are characterized by being very friable throughout their profile. By approximate percentages, the land area occupied by Halewood soils is 5 percent undulating, 40 percent rolling, 40 percent hilly, and 15 percent steep. About 10 percent of the total area mapped has lost 75 percent or more of its surface soil, and 20 percent has been subject to both sheet and gully erosion. Most of the Halewood soils are best suited to pasture, but some of the smoother areas give fair yields when cropped.

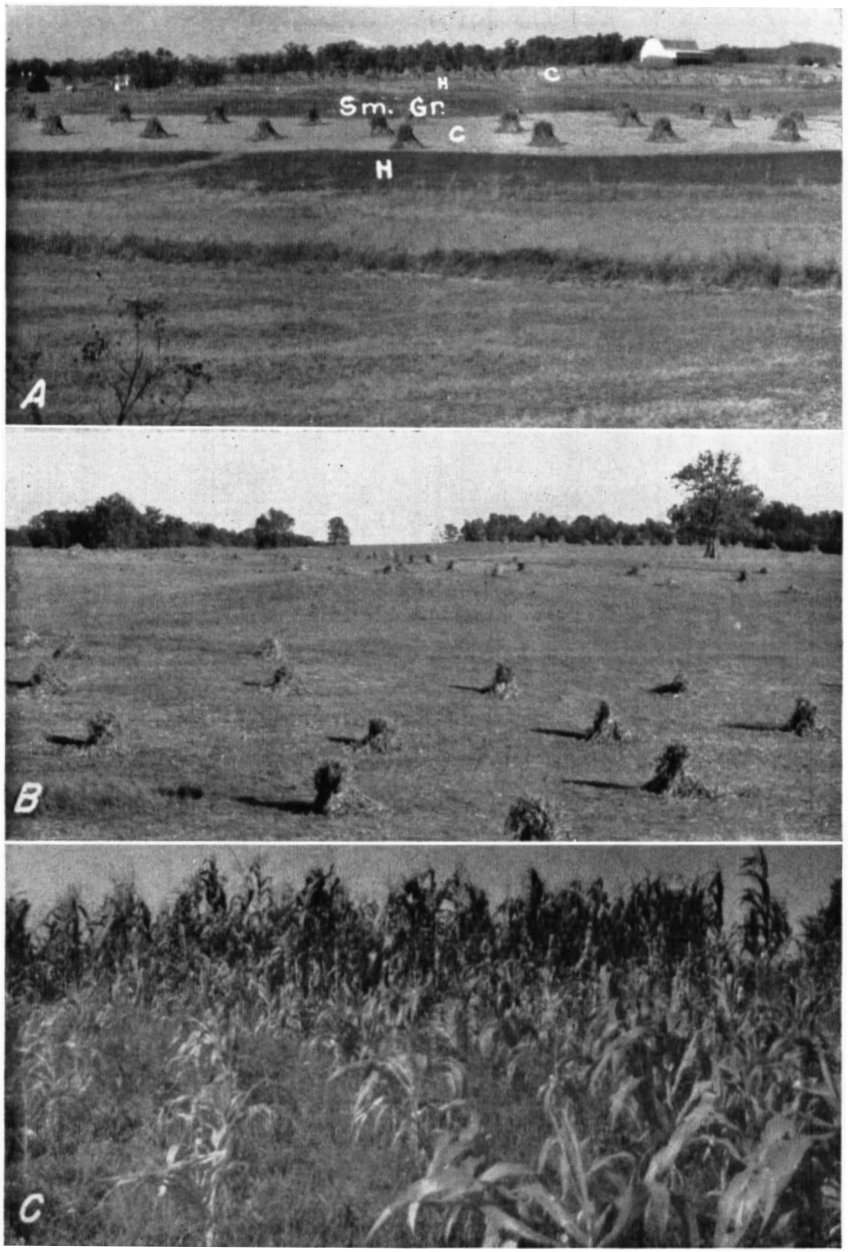
Halewood loam, rolling phase (HC).—This soil occupies rolling topography with slopes of 7 to 14 percent but includes some undulating areas with slopes of 2 to 7 percent. It occurs in rather large irregular-shaped bodies closely associated with the Hayesville soils. Surface and internal drainage are good. Rain water runs from the steepest slopes rapidly. White, red, scarlet, and chestnut oaks, white and scrub pines, yellow-poplar, black birch, chestnut sprouts, and dogwood are the natural vegetation.

Representative profile:

2 to 0 inch, leafmold and forest litter, generally 1 to 2 inches thick; extremely acid.

0 to 14 inches, weak-yellow very friable loam containing some coarse material; partly weathered granite gneiss and fragments of schist ½ to 3 inches in diameter scattered throughout; in places on the surface are loose stones, mostly granite and quartz, that range up to 10 inches in diameter; strongly acid.

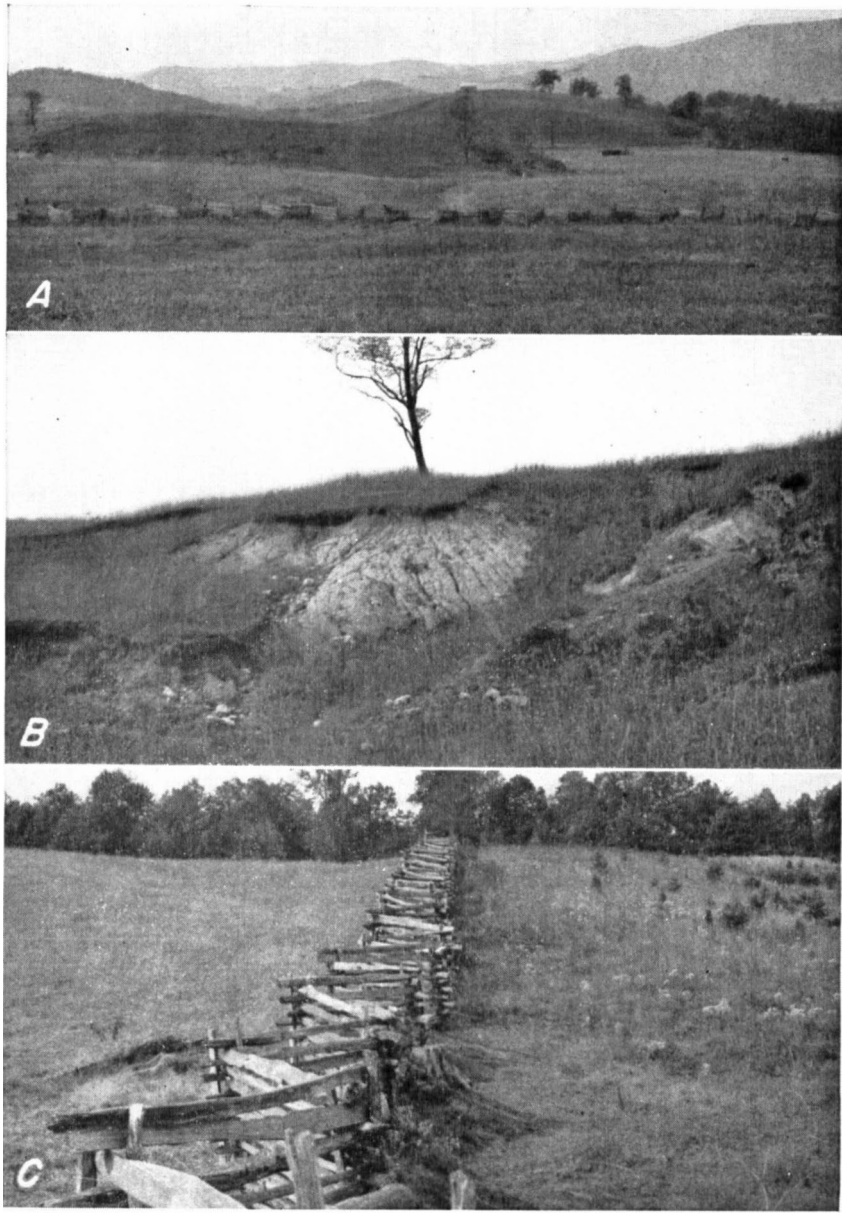
14 to 28 inches, moderate yellowish-brown friable fine sandy clay loam to light clay loam, slightly micaceous in places; contains numerous ¼-inch quartz fragments, a few small fragments of mica schist, and some 1- to 3-inch angular rocks; strongly acid.



A, Contour strip cropping in a 3-year rotation of corn, small grain, and hay on Culpeper loam, rolling phase. Letters indicate crops: C=corn, H=hay, and Sm. Gr.=small grain.

B, Contour strip cropping in a 3-year rotation of corn, small grain, and hay on Fauquier silty clay loam, rolling phase.

C, Fertilizer demonstration on Fauquier silty clay loam, rolling phase: Land in background received fertilizer; land in foreground received none. All the corn was planted at the same time.



A, Foothill topography characteristic of Hayesville and Halewood soils. Blue Ridge Mountains in background.

B, Hilly and steep Hayesville and Halewood soils after they have been used for clean-cultivated crops a number of years.

C, Poor and good pasture management on Hayesville loam soil: Field on the left, covered with a good sod of bluegrass, crabgrass, and lespedeza, has received applications of lime and phosphate fertilizer and has been clipped regularly. Field on the right received no treatment and is covered with weeds, broomsedge, and redcedar, and scrub pine seedlings. The good stand of bluegrass in the right foreground was established because water from the treated pasture ran under the fence and brought some lime and fertilizer with it.

28 inches +, light yellowish-brown very friable loam material containing a high percentage of weathered granite gneiss and mica schist; weathered fragments of rock easily crushed between the fingers; strongly acid.

The soil varies in depth to bedrock, and in texture it ranges from silt loam to fine sandy loam. A few areas are included that have a lighter colored surface and yellow subsoil; these would have been mapped as Edneyville soil had they been of greater extent. Approximately 10 percent of this soil has been severely eroded (pl. 4, *B*).

Use and management.—Approximately 35 percent of Halewood loam, rolling phase, is in forest, 30 percent is idle, 10 percent is used for crops, and the remaining 25 percent is in pasture. Most of the soil can be used as cropland, but average yields are low; it is best suited to pasture and apples. On the included undulating areas the soil is less eroded, the subsoil is slightly thicker, and yields are 10 to 15 percent higher.

Where Halewood loam, rolling phase, is cultivated, a 3-year rotation consisting of corn, small grain, and hay (usually lespedeza) is used. Fertilizer, generally 2–12–6, is applied at the rate of 150 to 200 pounds an acre for small grain and 100 pounds for corn. One-half ton an acre of ground limestone is applied during the rotation. Average yields under these practices are 27 bushels of corn, 14 bushels of wheat, 16 bushels of barley, 20 bushels of oats, and ¾ ton of lespedeza hay. By increasing the application of fertilizer and lime, much higher yields could be obtained, and it would be possible to grow clover in the rotation.

Tillage operations should follow the contour to reduce runoff of surface waters; strip cropping is advisable on suitable long slopes. Gullied areas should be protected against further soil losses by seeding to fast-growing grasses or planting pine trees.

Halewood loam, hilly phase (HB).—This soil occupies steeper slopes than the rolling phase, which is considered to be the normal phase of the type, and is shallower to bedrock. Slopes range from 14 to 25 percent.

Use and management.—About 50 percent of Halewood loam, hilly phase, is in woods, 10 percent is idle, a few acres are being cropped, and the rest is in pasture. This soil is not well adapted to cultivation, because it is hilly. Pasture is the use to which it is best suited. Lime and fertilizer are required to establish and maintain good pasture.

Halewood loam, eroded hilly phase (HA).—The most eroded steep areas of the Halewood loam are included in this phase. Half of the phase has slopes above 25 percent; the rest, slopes of 14 to 25 percent. The soil resembles the rolling phase in color but is shallower to bedrock, occupies steeper slopes, and is more severely eroded. In places there is a close network of gullies, many of which are deep. Rock fragments are numerous on the surface.

Use and management.—Most of Halewood loam, eroded hilly phase, has been cleared and cultivated at some time. Now much of it is idle, forested, or in pasture. Some areas are now covered by pure stands of scrub pine. Owing to the difficulty of working and conserving this soil and its present eroded condition, it is usually not economical to try reclaiming it for pasture. Pine will succeed on the severely gullied areas.

HAYESVILLE SERIES

The Hayesville series consists of brown-colored soils with a moderate reddish-brown subsoil. They occur in and near the foothills of the Blue Ridge Mountains in the extreme western part of the county, where they are associated with Halewood soils. They differ from Cecil soils in being less thoroughly leached and in having a deeper organic layer, a lighter colored subsoil, and a more friable consistence throughout the profile. They are underlain by and derived from the weathered material of granite gneiss, granodiorite, and mica schist. By approximate percentage the total area of Hayesville soils can be divided as follows: Undulating, 15 percent; rolling, 50 percent; hilly, 30 percent; and steep, 5 percent. About 15 percent of the total area mapped has lost 75 percent or more of its surface soil, and 10 percent has been subject to both sheet and gully erosion. Most of the Hayesville soils are best suited to pasture, but some of the smoother areas give fair yields of general crops.

Hayesville loam, rolling phase (He).—The large irregular-shaped areas of this dominantly rolling soil occur in close association with Halewood soils. Slopes range mainly from 7 to 14 percent, but some undulating areas of 2- to 7-percent slope are included. Drainage, both surface and internal, is good; rain water runs off rapidly from areas under clean cultivation. Natural vegetation consists of white, chestnut, and scarlet oaks, scrub and white pines, hickory, chestnut sprouts, yellow-poplar, dogwood, and blackgum.

Representative profile:

0 to 14 inches, thin layer of leafmold and forest litter on light yellowish-brown very friable loam; first inch or two of layer slightly darker because of organic matter; very strongly acid.

14 to 25 inches, strong-brown to moderate reddish-brown friable clay loam that breaks out into irregularly shaped aggregates 1 to 3 inches in diameter; aggregates can be crushed to a granular mass with slight pressure; small round holes and root holes filled with soil from the upper layers occur throughout; a few fragments of highly weathered granite gneiss also occur in this layer; strongly acid.

25 inches +, strong-brown friable sandy clay loam material streaked and mingled with light gray and pale yellow; layer contains many partly weathered granite gneiss fragments; strongly acid.

Included are small areas that have developed from basic rocks or mica schist. These have a browner colored surface soil and subsoil than the typical soil does. The texture varies from silt loam to fine sandy loam. Sheet erosion has occurred on most cultivated areas. In some places it is slight; in others, severe.

Use and management.—Approximately 17 percent of Hayesville loam, rolling phase, is now in forest, 6 percent is idle, 10 percent is used for crops, and the rest is in pasture. This soil is suited to pasture and crops under careful management. Although no commercial orchards are now located on it, this soil is well suited to apples. In Rappahannock County a number of commercial orchards are located on Hayesville soils.

Management is the same as that for Halewood loam, rolling phase, and the two soils occur together in many fields. The fertilizer most commonly used is 2–12–6, the applications ranging from 150 to 200 pounds an acre for small grain to 100 pounds for corn. Ground limestone is applied at the rate of ½ ton an acre during the rotation,

which is usually a 3-year one. Average acre yields under the practices just described are 32 bushels of corn, 16 of wheat, 24 of barley, 30 of oats, and 1½ tons of clover and lespedeza hay. Heavier applications of lime and fertilizer are needed on this soil—200 to 400 pounds an acre of a complete fertilizer each year, and 1 ton of ground limestone during the rotation. All tillage operations should be on the contour, and strip cropping is effective on the long slopes.

Hayesville loam, undulating phase (HF).—This phase has smoother relief and a thicker solum and is not so badly eroded as Hayesville loam, rolling phase. Slopes range from 2 to 7 percent. The soil generally occurs on the tops of ridges and broader divides.

Use and management.—A small percentage of Hayesville loam, undulating phase, is still in forest but the greater part is about equally divided between cropland and pasture. This soil is easily tilled and responsive to treatment. Yields are slightly higher and management practices are about the same as on the rolling phase, but row crops can be grown more frequently with less attention to erosion control. The comparatively smooth surface of this phase makes it the most desirable Hayesville soil for general farming.

Hayesville loam, eroded hilly phase (HD).—Steeper relief, a thinner more eroded surface soil, and a subsoil thinner over rock differentiate this soil from the rolling phase. Seventy-five percent or more of the original surface soil has been lost through sheet erosion on areas under long cultivation, and gullies, some of which are deep, are prominent in most fields. About three-fourths of the total acreage occupies hilly slopes of 14 to 25 percent; the rest occupies steep slopes of 25 to 50 percent.

Use and management.—Much of Hayesville loam, eroded hilly phase, is in forest, some of the formerly cultivated areas have seeded to scrub pine, a considerable acreage is in pasture, and a small percentage on the smoother lying areas is cropland.

Except for those areas severely eroded, most of this soil is best used for pasture. The severely eroded areas are best for forest, as it would be difficult to reclaim them for pasture. Without treatment even the areas less eroded are not productive of good pasture grasses and have a low carrying capacity. Organic matter is low, and active erosion should first be checked. This requires a protective cover of grasses on the bare spots and gullies. The water-holding capacity of the surface soil can be greatly increased by adding organic matter in the form of stable manure. Heavy applications of lime and fertilizer are needed to establish and maintain a pasture of desirable grasses like white clover and bluegrass (pl. 4, *C*).

HAZEL SERIES

Soils of the Hazel series are shallow over rock and occur on hilly to steep slopes near streams and intermittent drainageways in the northern part of the county. They have developed principally from the weathered material of garnetiferous and mica schists and arkosic sandstone. Drainage is good to excessive. Approximately 80 percent of these soils have lost some of their original surface through sheet erosion, and some shallow gullies have formed. Good pasture grasses are produced in normal seasons. These soils are strongly acid.

Hazel loam, hilly phase (Hg).—The rocks giving rise to this soil are garnetiferous and mica schists and arkosic sandstone. The soil occurs in close geographic association with Albemarle, Manor, and Culpeper soils on hilly relief of 14 to 25 percent. Some areas on rolling topography (7- to 14-percent slopes) are included. Drainage is good to excessive. White, red, scarlet, and black oaks, yellow-poplar, hickory, mountain-laurel, dogwood, and chestnut sprouts compose the natural vegetation.

Representative profile:

0 to 10 inches, brownish-gray to dark yellowish-brown very friable loam containing ½- to 3-inch angular fragments of garnetiferous schist and mica schist; locally loose arkosic sandstone boulders are scattered over the surface, and in some places, outcrops of solid rock; very strongly acid.

10 to 14 inches +, weak- to moderate-brown very friable loam containing a large proportion of weathered rock and rock fragments ¼ to 6 inches in size; strongly acid.

Surface texture varies from silt loam to very fine sandy loam, depending on the parent material. Locally, on smooth topography the subsoil may be 8 inches thick over rock, whereas in some places the subsoil is very thin or entirely lacking. This subsoil is reddish-brown clay loam. The color of the surface soil is influenced by the content of organic matter and may be brown or pale brown. Most areas of this soil not in forest are eroded to some extent.

Use and management.—Approximately 46 percent of Hazel loam, hilly phase, is still in woods, 7 percent is idle, 9 percent is being cropped, and 38 percent is in pasture. Shallowness and steepness make pasture and forest the best uses. Both lime and phosphate are needed to establish and maintain a stand of desirable grasses and clovers, such as bluegrass and white clover.

Hazel loam, steep phase (Hh).—Steeper slopes (25 to 50 percent), less depth to bedrock in most places, and more rock outcrops are important differences between this soil and the hilly phase. A few of the short breaks near streams or bottom land are very abrupt. All the soil is well drained to excessively drained. More than half the acreage is still in forest, a few acres are idle, and the rest is used for pasture. This soil makes fair pasture when it is limed and fertilized, but it is more droughty than the hilly phase. The steeper areas are best suited to forest.

HELENA SERIES

The Helena series is of little importance in Culpeper County. It is represented only by Helena fine sandy loam, which is scattered over a wide area in small irregular-shaped bodies usually less than 10 acres in size. The soil occurs in close geographic association with Wilkes and Appling soils. The Helena soil has a more uniform profile than the Wilkes and occurs on smoother topography. Compared with the Appling it has a much heavier and definitely mottled subsoil. It is underlain by and developed from a mixture of acidic and basic rocks such as granite and quartz diorite or arkosic sandstone and quartz diorite.

Helena fine sandy loam (Hk).—Two-thirds of the acreage of this soil has an undulating to gently sloping surface, and the rest a rolling surface. Relief ranges from 2 to 14 percent. Drainage is fair to poor, varying with slope; internal drainage is slow because the subsoil is

heavy. The natural vegetation is white, scarlet, red, and black oaks, hickory, scrub and shortleaf pines, and dogwood.

Representative profile:

0 to 8 inches, weak-yellow to yellowish-gray very friable fine sandy loam.
8 to 26 inches, light yellowish-brown very firm clay mingled and streaked with moderate yellowish brown, plastic when wet.
26 inches +, light yellowish-brown very firm clay streaked and mingled with yellowish gray, light gray, and strong brown; plastic when wet.

This soil grades toward the Appling soils on one extreme and the Iredell soils on the other. About one-sixth of it has been severely eroded, 75 percent or more of the surface having been removed by accelerated erosion.

Use and management.—Approximately one-fifth of Helena fine sandy loam is in forest. A few acres are being cropped, but most of the land is in pasture. The best use in this county appears to be pasture. In other places where this soil occurs in large bodies it is considered to be poor to fair cropland. To establish pastures that contain desirable grasses and legumes such as bluegrass and white clover, applications of fertilizer and lime are required.

HIWASSEE SERIES

The soils of the Hiwassee series occupy high terraces (pl. 5, *A*) along all the larger streams. They are developed from old alluvial materials that were washed from the Piedmont Plateau and the Blue Ridge Mountains and deposited when the streams flowed at higher levels. These soils have light-brown to moderate-brown surface soil and reddish-brown to red subsoil. They are good to excellent for agriculture—well drained, easy to work, and productive. Approximately 60 percent of the total acreage has undulating relief; 30 percent, rolling; and 10 percent, hilly. Perhaps 20 percent has been moderately or severely eroded.

Hiwassee loam, undulating phase (Hp).—Most of this soil has a gently undulating surface, the slope ranging from 2 to 7 percent. A few nearly level acres are included that have a slope range of 0 to 2 percent. Drainage is good. This soil lies 50 to 175 feet above the first bottoms and is never subject to overflows. The natural vegetation was hardwoods and a few scattered shortleaf pine, but almost all the land has now been cleared.

Representative profile:

0 to 8 inches, moderate-brown very friable loam containing a thick mat of roots; layer intensively worked by earthworms.
8 to 60 inches, moderate reddish-brown to dark-red firm clay breaking out in irregular-shaped aggregates 1 to 6 inches in size; aggregates easily crushed to coarse granular mass between the fingers; a few small rounded black concretions present
60 inches +, weak reddish-brown friable clay loam or clay material streaked and mingled with yellowish gray; contains fragments of highly weathered rock and many rounded quartz gravel and cobblestones ranging from less than 1 inch up to 8 inches in diameter.

The old alluvial material is from 3 to 10 or more feet thick. The texture of the surface soil varies from a very fine sandy loam to a silt loam. Areas are included that have a number of rounded quartz pebbles and cobblestones on the surface.

Use and management.—Nearly every acre of Hiwassee loam, undulating phase, has been cleared and can be used for cropland. Approxi-

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mately half of it is now being cultivated, a few acres are idle, and the rest is in pasture. Corn, small grain, and clover hay are the main crops. A few acres are used for alfalfa. This is one of the best soils in the county, as it is easy to work, very productive, and responds readily to good management.

A 3-year rotation of corn, small grain, and hay is most commonly used. Ground limestone is applied at the rate of ½ to 1 ton an acre every 3 to 4 years. Usually some manure is applied during the rotation, and fertilizer is added at the rate of 200 to 250 pounds an acre of 2–12–6 for the small grain and at the rate of 0 to 100 pounds for corn. Average acre yields with the above practices are 40 bushels of corn, 18 of wheat, 28 of barley, 35 of oats, and 1½ tons of clover hay. These yields can be increased by applying larger quantities of mixed fertilizer, or where a heavy sod of clover is turned under, by using 200 to 400 pounds an acre of 0–14–6 or its equivalent each year. One farmer near Batna uses a 3-year rotation of corn, small grain, and clover hay; he applies 300 pounds an acre of 2–12–6 fertilizer and manure for his corn and small grain, and 1 ton of ground limestone during the rotation. Under this management he obtains 75 bushels of corn, 22 bushels of wheat, 32 bushels of barley, and 2 tons of clover hay an acre.

Hiwassee loam, eroded rolling phase (Hn).—This soil is more eroded and occupies steeper relief than the undulating phase. It is shallower to bedrock or to a soil buried under the alluvial deposits. Relief for most of the soil ranges from 7 to 14 percent, but perhaps 25 percent of the soil is a hilly inclusion. Most of this 25 percent occurs on steep slopes near the first bottoms.

Use and management.—Some attempts have been made at one time or another to crop nearly all the steep areas of Hiwassee loam, eroded rolling phase, and as a result, most of them have become severely eroded. Their best use is pasture. About 100 acres, or nearly 50 percent, of the remaining rolling area has been subject to severe sheet erosion, and in many places a few shallow gullies are present. Some of the less eroded areas can be cropped, but the best use for most of them is pasture or hay. The rest of this soil is suitable for cropland if carefully managed to control runoff. Contour tillage and strip cropping are very effective in many places. Yields on these less eroded areas are similar to those on the undulating phase.

A few acres of this soil are now in the process of returning to forest; most of the young trees are scrub pine and black locust. Part of this acreage is used for pasture and some is idle, but most of it is being used for crops.

Hiwassee loam, undulating light-colored phase (Ho).—This soil differs from the undulating phase chiefly in having dusky-yellow or light-brown rather than moderate-brown surface soil and moderate reddish-brown subsoil rather than one ranging from moderate reddish-brown to dark red. It occurs in small areas on terraces along the larger streams. Some nearly level areas of 0 to 2 percent slope are included. Drainage, both surface and internal, is good. The natural vegetation is white, black, scarlet, and red oaks, hickory, dogwood, and scrub and shortleaf pines.

Use and management.—Nearly all of this phase has been cleared. A few acres are idle, approximately one-third of the soil is used for

pasture, and the rest is used for crops, a use to which the soil is best suited.

A 4-year rotation consisting of corn, small grain, and 2 years of hay is in general use. Lime is applied at the rate of 500 to 1,000 pounds an acre once every 4 years; and fertilizer, usually 2–12–6, is applied at the rate of 250 to 300 pounds per rotation. Approximate acre yields with these treatments are 35 bushels of corn, 15 bushels of wheat, 24 bushels of oats, and 1½ tons of mixed hay. Improved practice would be to substitute a 3-year rotation for the 4-year rotation now used, and in this 3-year rotation apply 1 ton of lime an acre every 4 years, grow clover as the hay crop, and apply 600 to 1,000 pounds an acre of complete fertilizer and 100 pounds of nitrate of soda or its equivalent when deficiency of nitrogen is evident.

Hiwassee loam, eroded rolling light-colored phase (HM).—From the undulating light-colored phase this soil differs in occurring on steeper slopes (7 to 14 percent), in being more eroded, and in having a lighter colored surface soil and slightly less reddish subsoil.

Use and management.—Approximately 375 acres of Hiwassee loam, eroded rolling light-colored phase, have had moderate to severe sheet and gully erosion and are best suited to pasture or forest. The remaining acreage, if cropped, should be tilled on the contour and be used for a rotation of small grain and hay. Practically all of this phase has been cleared, but some areas have been allowed to return to forest, a small acreage is idle, about a third is used for cropland, and the rest is used for pasture.

Hiwassee loam, eroded hilly light-colored phase (HL).—This phase occurs on the steeper breaks along the rivers and the sides of drains that cut through the high terraces. Slopes range from 14 to 25 percent. Over half of this phase has lost 75 percent of the surface soil, and most areas have occasional gullies.

Use and management.—A large part of Hiwassee loam, eroded hilly light-colored phase, is in forest. Attempts are being made to crop a few acres, and some land is in pasture. Pasture is the best use for the smoother and less eroded areas, but applications of lime and phosphate fertilizer are required to establish and maintain good stands of grass. The best practical use for this phase is forest.

IREDELL SERIES

Soils of the Iredell series, locally known as blackjack land, are level to gently rolling and characterized by light-gray silty surface soil and very heavy plastic clay subsoil. These soils occur largely in what is known as the Cedar Flats section of the county, and are developed from diabase, a dark-colored basic rock containing some quartz. About 7 percent of the area occupied by Iredell soils has been subject to both sheet and gully erosion; 45 percent occurs on level topography, and the rest on undulating topography. About 20 percent is stony. Iredell soils are best suited to use as pasture. Surface drainage ranges from fair to poor and internal drainage is very slow.

Iredell silt loam, undulating phase (IC).—This soil, occupying undulating to very gently sloping relief of 2 to 7 percent, occurs in large continuous areas closely associated with Mecklenburg and Elbert soils. Where there is appreciable slope, surface drainage is fair.

Internal drainage is very slow because of the impervious, dense clay subsoil. The parent rock from which the soil is derived occurs as intrusions of basic rock, mainly diabase, that pushed up through the Triassic plain and overflowed Triassic shales. The natural vegetation is redcedar, scrub pine, blackjack, post, swamp white, and white oaks, red maple, and hickory.

Representative profile:

0 to 8 inches, light-gray friable light silt loam having a smooth feel; contains lighter splotches of gray that give a somewhat mottled appearance; concretions less than ¼ inch in diameter nearly always present on the surface and in some places cover it; these concretions are found throughout and become more numerous with depth; semicemented yellowish-white layer ½ to 1 inch thick lies just above the plastic subsoil; strongly acid

8 to 28 inches, light olive to light olive-brown heavy clay; very plastic and tenacious when wet, hard and intractable when dry; contains a few small brown concretions; layer shrinks upon drying and develops cracks as great as 1 inch in width; few roots penetrate layer; very strongly acid.

28 inches +, pale-olive friable fine sandy clay or soft rock material streaked and mingled with light gray, yellowish gray, and black; layer consists mainly of decomposed diabase rock; slightly acid.

In texture the surface soil ranges from loam to silt loam. Included are a few small areas developed from greenstone schist that have bedrock at the surface. These areas grade toward the Mecklenburg soil in color and consistence in some places. The subsoil ranges from 12 to 24 inches thick over the soft disintegrated rock.

Use and management.—Nearly all of Iredell silt loam, undulating phase, is in forest. Only a few acres are in pasture, and a few are idle. Most of this soil can be used to produce hay, including lespedeza and timothy, and for pasture. To get a good growth of pasture grasses, applications of lime and fertilizer are required. One ton an acre of ground limestone every 4 to 5 years should be used, and a fertilizer high in potash and phosphate, as 0–12–12, should be applied at the rate of 200 pounds an acre each year.

Iredell silt loam, eroded undulating phase (Ia).—This soil differs from the undulating phase mainly in that its original surface soil is thinner and contains less organic matter. Some of the soil has been moderately to severely sheet eroded, and a few shallow gullies have formed.

Use and management.—About one-fourth of Iredell silt loam, eroded undulating phase, is now in second-growth forest consisting mainly of redcedar and scrub pine; the rest is about equally divided as idle land, cropland, and pasture. The soil is best used for hay and pasture except on severely gullied areas. The gullied areas are best suited to forest. A 4- to 5-year rotation is usually followed where this soil is used for crops, and in this rotation the hayfields are grazed the last year or two. South of Mount Pony several farmers of this soil are using practices well above average, but yields are low. They use ½ ton an acre of ground limestone once every 4 or 5 years, 200 pounds of 16-percent superphosphate for the small grain, and 150 pounds of 4–16–4 and manure for the corn. Average acre yields are 25 bushels of corn, 20 of barley, and 16 of wheat. The hay—a mixture of lespedeza, clover, timothy, and redtop—yields ½ to 1 ton an acre.

Iredell silt loam, level phase (Ib).—Degree of slope is the main difference between this soil and the undulating phase. Surface

drainage is not so good as for the undulating phase, because the soil is level. After heavy rains shallow ponds are often formed on extremely level areas or in slight depressions, and water may remain for several days before it sinks in or evaporates. As mapped, a few small areas of Elbert silt loam are included, particularly in wooded areas.

Use and management.—One-third or more of Iredell silt loam, level phase, is now in forest, one-fourth is idle, and the rest is about equally divided between cropland and pasture. Pasture and hay are the best practical uses for this soil.

Iredell stony silt loam (ID).—Except for loose stones scattered over the surface and throughout the profile, this soil is similar to Iredell silt loam, undulating phase. The subangular stones are 1 foot to several feet in diameter. On some areas it is possible to pick up the smaller loose stones and cultivate the soil. About one-third of the acreage is stony Elbert silt loam, which occupies level land and has poor surface and internal drainage. The rest has an undulating surface, the slope ranging from 2 to 7 percent.

Use and management.—Approximately one-fourth of Iredell stony silt loam is used for pasture, a few acres are cropped, and the rest is in forest. Most of this soil could be used for pasture (pl. 5, *B*); some artificial drainage would be necessary on the level or nearly level areas to take off excess water. It is best to leave forested areas in forest.

Iredell stony silt loam, eroded phase (IE).—This soil differs from Iredell stony silt loam in having lost more of its surface soil through accelerated erosion and in occurring on undulating topography (2- to 7-percent slopes). It is the least extensive soil of the series. A small percentage is moderately gullied and heavily eroded.

Use and management.—All of Iredell stony silt loam, eroded phase, has been cleared at some time. Approximately 20 percent is idle, 40 percent is in pasture, and the rest is in forest of second-growth scrub pine and redcedar. All but the badly gullied areas can be used for pasture. Forest is the best use for the gullied areas.

KELLY SERIES

The soil of the Kelly series has developed in the Triassic plain near intrusions of basic material. The parent material may be either red or gray Triassic shale or sandstone mixed with varying quantities of basic material. This soil is characterized by a brownish-gray silt loam surface soil and a very heavy plastic clay subsoil. Kelly silt loam, the only member of the Kelly series mapped, is best used for pasture and hay.

Kelly silt loam (KA).—This soil is found chiefly in small irregularly shaped areas near zones of basic rock intrusion. It is closely associated with Lansdale, Brecknock, Croton, Penn, and Iredell soils. Relief is nearly level to undulating (0 to 7 percent). Surface drainage is somewhat poor; internal drainage, very slow. The natural vegetation includes post, willow, swamp white, white, and scarlet oaks, blue beech, and elm.

Representative profile:

0 to 4 inches, light brownish-gray very friable silt loam containing a few black concretions; worm activity evident; grass roots confined principally to this layer; strongly acid.

4 to 8 inches, light brownish-gray friable but slightly compact silt loam mottled with light gray and yellowish gray; material breaks out in irregular-shaped lumps 1 to 3 inches in size; strongly acid.

8 to 28 inches, pale-olive heavy tough plastic clay mottled with light gray, yellowish brown, and medium gray; contains many black concretions, some ¼ inch in diameter; strongly acid.

28 to 36 inches, weak-olive heavy plastic clay, less mottled and less plastic than layer above; strongly acid.

36 inches +, weak-olive sticky very fine sandy clay material mingled and streaked with light gray, yellowish brown, and moderate brown; minute mica flakes, numerous particles of weathered diabase rock, black concretions, and 1-inch calcium carbonate concretions present.

Where the parent material is predominantly shale, concretions are absent. The surface layer varies from 1 to 4 inches thick. The underlying parent material is mainly Triassic shale. The depth at which the plastic layer occurs varies from 8 to 16 inches.

Use and management.—About one-fifth of Kelly silt loam is still in woods, a small percentage is idle, approximately one-third is used for cropland, and the remaining one-third is in pasture. The uses to which it is best suited are pasture and hay production.

A 4-year rotation of corn, small grain, and 2 years of hay is usually followed where this soil is cropped. Complete fertilizer used is applied at the acre rates of 200 pounds for corn and 250 to 300 pounds, plus manure, for small grain. Yields under these practices are 25 bushels of corn, 12 bushels of wheat, and 1 ton of mixed lespedeza and timothy hay. A 3–12–6 fertilizer or its equivalent applied at the rate of 200 to 400 pounds an acre each year would increase yields. Pasture now receives no fertilizer, but it should be top-dressed with 200 pounds of 0–12–12 fertilizer or its equivalent each year.

LANSDALE SERIES

The soils of the Lansdale series are developed throughout the Triassic plain from brownish and yellow shale of Triassic age. The surface soil is weak yellow to pale brown, and the subsoil is light yellowish brown. About 20 percent of the acreage is level, and the rest is undulating.[7] Slopes range from 0 to 10 percent. Very little of the land has been eroded. Lansdale soils make fair cropland when limed and fertilized liberally.

Lansdale silt loam, undulating phase (LB).—This soil occurs in large areas in close association with Croton, Penn, Bucks, and Wadesboro soils. Relief is dominantly undulating (2- to 7-percent slopes), but some gently sloping areas (7- to 10-percent slopes) are included. Surface drainage is good; internal drainage, fair. White, scarlet, willow, black, post, and red oaks, hickory, redcedar, and scrub pine are the natural vegetation.

[7] The level phase of this series and those areas on smoother relief have been correlated as of the Calverton series in Fauquier County. The Lansdale soils as mapped in Culpeper County are shallower than the typical Lansdale soils mapped in the States farther north.

Representative profile:

1 to 0 inch, leafmold and forest litter; extremely acid.
0 to 7 inches, weak-yellow or pale-brown very friable silt loam, easily crushed to a floury mass; extremely acid.
7 to 13 inches, weak-yellow friable silty clay loam mingled with light yellow; material breaks out in irregular-shaped aggregates hard to crush between the fingers; extremely acid.
13 to 19 inches, light yellowish-brown firm slightly compact but fairly brittle silty clay loam mingled with yellowish gray; breaks out in irregular-shaped aggregates hard to crush between the fingers; very strongly acid.
19 inches +, light yellowish-brown friable silty clay loam material mingled with yellowish gray and light gray; very strongly acid.

The depth of this soil over parent material varies from 20 to 30 inches. Some areas somewhat poorly drained and showing slight mottlings at a depth of about 18 inches are included. Where Lansdale silt loam, undulating phase, grades into Bucks or Wadesboro soils its subsoil is browner than that described. Some sheet eroded areas are included.

Use and management.—Nearly all of Lansdale silt loam, undulating phase, has been cleared and only about one-seventh of it is still in forest. Approximately one-fifth is classed as idle land, and the rest is equally divided between pasture and cropland. It is best suited to use for crops.

Most commonly used is a 4-year rotation consisting of corn, small grain, and hay for 2 years (pl. 5, *C*). On a number of farms the hay fields are grazed during the last year of the rotation. Lime is usually applied at the rate of 1 ton an acre of ground limestone once during the rotation. The fertilizer most widely used on this soil, 20-percent superphosphate, is usually applied at the rate of 100 pounds an acre for corn and at a rate of 250 pounds with the small grain. Some manure is added during the rotation. Approximate acre yields under these management practices are 32 bushels of corn, 18 bushels of wheat, 25 bushels of barley, 30 bushels of oats, 1¼ tons of clover hay, and 1½ tons of mixed hay.

Experiments on Lansdale silt loam, undulating phase, in Pennsylvania indicate that it is very low in potash. A complete fertilizer applied at the rate of 300 to 500 pounds an acre yearly and an additional treatment of 100 to 150 pounds of nitrate of soda or its equivalent applied as side dressing for corn or as a top dressing for small grain should increase yields considerably.

Lansdale silt loam, level phase (La).—This phase is not so well drained as the undulating phase and it occupies smoother topography with slopes of 0 to 2 percent. It is closely associated with Croton silt loam and grades into it in places. A few poorly drained areas too small to be shown individually are included. A large part of this soil is used for pasture or cropland. Where it is cropped, average yields are 10 to 15 percent less than on Lansdale silt loam. Under proper treatment good pasture and hay could be produced.

LIGNUM SERIES

The only soil of the Lignum series in this county, Lignum silt loam, occurs in the extreme eastern part in close association with Tatum, Nason, and Manteo soils. It is underlain by and derived from very fine-grained sericitic schist. About 15 percent of the acreage is level, 75 percent undulating, and 10 percent rolling.

Lignum silt loam (Lc).—Relief for this soil is dominantly undulating or gently sloping, although some nearly level and some hilly areas are included. Slopes range from 0 to 14 percent. Surface drainage is fair to good and internal drainage is slow. White, black, red, and scarlet oaks, hickory, shortleaf and scrub pines, and dogwood are the natural vegetation.

Representative profile:

0 to 9 inches, pale-yellow to weak-yellow very friable silt loam with a shallow covering of leafmold and forest litter.
9 to 24 inches, dusky-yellow friable to firm (slightly plastic when wet) silty clay loam containing a few small quartz particles.
24 inches +, light yellowish-brown friable silty clay loam material mingled and splotched with yellowish gray and pale yellow; contains particles of soft partly decomposed schist.

A few areas at the base of slopes have a shallow overlay of recent alluvial or colluvial material that imparts a loam texture to the surface soil. A few areas are included that have a slightly plastic subsoil. Also, in some places, small somewhat poorly drained areas are included. Where this soil was developed from the weathered material of a mixture of granite and schist, the surface texture is a gritty silt loam.

Use and management.—Lignum silt loam is nearly all in forest; little of it has ever been cleared. Because its productive capacity for crops grown in this area is very low, pasture or forest are considered the best for this soil under present conditions.

LLOYD SERIES

The soils of the Lloyd series occur in close association with the Davidson and Cecil soils and in color and origin are intermediate between them. They are derived from a mixture of basic and acidic rocks such as greenstone and granite gneiss or granodiorite. They have slightly lighter colored surface soil and subsoil than the Davidson. By approximate percentages the land area occupied by Lloyd soils is on relief as follows: Undulating, 25 percent; rolling, 55 percent; and hilly, 20 percent. About 40 percent of the acreage has been moderately to severely sheet eroded, and shallow gullies are present in a number of areas. Where relief is favorable and erosion is not too severe, Lloyd soils are good for agriculture, being adapted to all of the crops grown in the county. Average yields are higher than on the Cecil soils but not so high as on the Davidson.

Lloyd loam, undulating phase (Lg).—This soil occurs as small scattered areas throughout the western part of the county. It is in close geographic association with Davidson and Cecil soils. Relief is undulating to gently sloping (2 to 7 percent). Both surface and internal drainage are good. The natural vegetation consists of white, red, scarlet, and black oaks, black walnut, dogwood, yellow-poplar, scrub and shortleaf pines, and hickory.

Representative profile:

0 to 9 inches, moderate-brown very friable loam containing some quartz fragments; strongly acid.
9 to 17 inches, strong-brown friable clay loam to clay containing a few fragments of highly weathered dusky-yellow greenstone; material breaks out in irregularly shaped lumps ½ to 2 inches in diameter, which in turn break down into a granular mass when considerable pressure is applied; medium acid.

17 to 28 inches, moderate reddish-brown firm clay that becomes hard when dry; layer contains mica flakes in the lower part; number of greenstone fragments is greater than in layer immediately above; soil breaks out in irregularly shaped lumps 1 to 4 inches in diameter; medium acid.
28 inches +, strong-brown friable clay loam material high in content of fine mica; strongly acid.

Included with this soil are gravelly and stony areas, others that vary in texture from a fine sandy loam to a silt loam, and yet others that have thin solums.

Use and management.—Nearly all of Lloyd loam, undulating phase, has been cleared and is now being used for crops, its best use.

A 3-year rotation is in general use. In this rotation a 4–12–6 or 2–12–6 fertilizer plus some manure is usually applied at the rate of 100 pounds an acre for corn and at the rate of 200 pounds with the small grain. A half ton an acre of ground limestone is applied during the rotation. Average yields under these practices are 38 bushels of corn, 20 bushels of wheat, 32 bushels of barley, 35 bushels of oats, 1¾ tons of clover hay, and 3 tons of alfalfa hay. Present practices could be improved by applying 1 ton of lime every 4 years and the fertilizers at a heavier rate of 300 to 500 pounds an acre annually. If nitrogen deficiency is evident, a side dressing of 100 pounds of nitrate of soda or its equivalent for corn and a top dressing of like nature for small grains probably would be desirable.

Lloyd loam, eroded rolling phase (LF).—Steeper topography, more erosion, and bedrock nearer the surface are the main characteristics differentiating this soil from the undulating phase. Relief ranges from 7 to 15 percent for the greater part, but some included hilly areas have 14- to 30-percent slopes. All areas are naturally well drained, and on the steeper slopes rain water runs off rapidly. Erosion has been active under clean cultivation, and in some places shallow gullies have developed.

Use and management.—Lloyd loam, eroded rolling phase, has to be managed more carefully than Lloyd loam, undulating phase. All tillage operations should be on the contour, and on long slopes, strip cropping may be effective. Nearly half of the total acreage is now being used for pasture. Some areas are forested.

Lloyd clay loam, rolling phase (LE).—This soil is the equivalent of Lloyd loam, eroded rolling phase, with approximately 75 percent or more of the surface removed by accelerated erosion. The surface relief is mainly rolling (7 to 14 percent), but about 15 percent of the acreage is an inclusion with slopes of 2 to 7 percent. The 4- to 9-inch surface soil, a strong-brown clay loam, has lost practically all of its original organic matter. The subsoil consists of moderate reddish-brown firm slightly compact silty clay to clay, varying in thickness from 12 to 18 inches. This subsoil is sticky when wet but dries out hard. The deeper material is the same as that underlying other Lloyd soils.

Use and management.—Lloyd clay loam, rolling phase, because of the large amount of surface soil lost through accelerated erosion, is best suited for pasture but a rotation of small grain and hay can be used on the smoother less eroded areas. Organic matter is low; water-holding capacity and workability can be greatly improved by adding organic matter in the form of green-manure crops and stable manure. Nearly all pasture on this soil needs applications of lime

and phosphate fertilizer. More than half the total acreage of this soil is now being cropped, but a few acres are idle, and some are in pasture.

Lloyd clay loam, eroded hilly phase (LD).—Steeper relief, a more eroded condition, and a shallower surface soil distinguish this soil from the rolling phase. Slopes range from 14 to 25 percent.

Use and management.—About one-fourth of Lloyd clay loam, eroded hilly phase, is idle, a few acres have seeded naturally to scrub pine, and the rest is in pasture. Pasture is the best use because relief is hilly and much of the soil has been removed by accelerated erosion. A few areas have been so severely eroded that the best practical use for them is forest. Lime, manure, and phosphate fertilizer are needed to establish and maintain good stands of desirable grasses.

LOUISBURG SERIES

Soils of the Louisburg series are shallow and have little or no subsoil over the soft disintegrated rock. They occur in the western part of the county in close geographic association with Appling, Cecil, Albemarle, Culpeper, and Wilkes soils. They are underlain by and developed from highly acidic granite and granite gneiss or from arkosic sandstone. The fine sandy loam is the predominant type. About 10 percent of the total area of these soils occurs on rolling relief, 70 percent on hilly relief, and 20 percent on steep relief. Drainage is good to excessive. Large areas are forested.

Louisburg fine sandy loam, rolling phase (LK).—This excessively drained to well-drained soil has dominantly rolling relief of 7 to 14 percent. Most of it occurs near the heads of drains and on the tops and smoother sides of small mountains and higher hills. The natural vegetation is white, red, black, scarlet, and chestnut oaks, hickory, and shortleaf and scrub pines.

Representative profile:

Surface soil, light-gray to yellowish-gray very friable fine sandy loam ranging from 6 to 14 inches thick.

14 inches +, yellowish-gray to light yellowish-brown very friable fine sandy loam material containing many fragments of disintegrated granite, arkosic sandstone, or granite gneiss; material grades into partly disintegrated rock at depths varying from 2 to 10 inches.

This soil is extremely variable. There is no uniformity in texture, which ranges from a sandy loam to a very fine sandy loam. Local areas are light brown. In many places the sandy loam surface soil grades into soft rock. Rocks varying from moderately hard to soft and disintegrated may be on or near the surface; solid bedrock outcrops in places.

Use and management.—Approximately one-third of Louisburg fine sandy loam, rolling phase, is still in forest, nearly 20 percent is idle, and the rest is used for pasture or cropland. Its shallowness makes it droughty during dry seasons. Fair stands of grass can be obtained by applying lime and phosphate.

Louisburg fine sandy loam, eroded hilly phase (LH).—This soil is more extensive, occurs on steeper relief, is generally shallower to rock, is more eroded, and has more outcrops of rock than the rolling phase. Most of it occurs on the steep slopes of 14 to 25 percent.

About 20 percent occurs on steep slopes of 25 to 50 percent. Some 30 percent is severely gullied and sheet eroded.

Use and management.—More than half of Louisburg fine sandy loam, eroded hilly phase, is in forest; the rest is cropland, pasture, and idle land. Most pasture now consists of broomsedge and weeds, but fair stands of grass can be obtained on smoother relief through liberal applications of lime and of phosphate fertilizer.

MANOR SERIES

The soils of the Manor series are light yellowish brown, have a highly micaceous subsoil, and occur throughout the western part of the county in close geographic association with Cecil, Elioak, and Hazel soils. They are underlain by and developed from mica schist, which contains stringers of quartz in places. By approximate percentages, the land area occupied by Manor soils has relief as follows: Undulating, 5 percent; rolling, 60 percent; hilly, 30 percent; and steep, 5 percent. All of these soils have been eroded to some extent, and about 40 percent have been moderately to severely eroded. Steep relief and eroded condition limit the use of most of these soils to pasture or forest.

Manor silt loam, rolling phase (Mc).—Tops of ridges and wooded areas of 7 to 14 percent slope that have not been cleared are occupied by this soil. Moisture conditions are favorable, runoff of rain water is moderately rapid, and subsoil drainage is good. White, red, scarlet, and black oaks, and shortleaf and scrub pines are the natural vegetation.

Representative profile:

0 to 7 inches, light yellowish-brown very friable silt loam containing many mica flakes that give it a greasy feel; very strongly acid.

7 to 20 inches, light yellowish-brown friable heavy silt loam to silty clay loam containing mica in quantity sufficient to impart a slick greasy feel; strongly acid.

20 inches +, light yellowish-brown very friable silt loam material containing a high percentage of mica that imparts a very greasy feel; locally, lower parts of layer have narrow bands of light-gray and light yellowish-brown material similar to the parent rock in color; narrow stringers of platy micaceous rock also occur; smooth satinlike or shiny appearance is characteristic of a fresh cut; strongly acid.

There is no uniformity in depth—the surface soil may join the soft disintegrated schist, or the subsoil may continue downward to a depth of 1 to 3 feet. The surface soil in some areas is pale brown. A few areas are included that have platy fragments of schist on the surface and throughout the profile. Numerous quartz rocks are on the surface in some areas. Approximately 200 acres are included that occur on undulating topography of 2 to 7 percent.

Use and management.—Although all of Manor silt loam, rolling phase, is suitable for crops, approximately half is still in forest, a few acres are idle, and the rest is about equally divided between pasture and cropland. In many cases tillage is with the slope rather than across it, a practice especially conducive to sheet and gully erosion (pl. 6, *A*).

A 3-year rotation consisting of corn, small grain, and hay is in general use. The most commonly used fertilizer is 20 percent superphosphate applied at the acre rates of 250 pounds for small grain and

150 pounds for corn. Stable manure is applied if available. One ton of ground limestone an acre is added during the rotation. Average yields under these practices are 35 bushels of corn, 18 of wheat, 26 of barley, 30 of oats, 1¼ tons of clover hay and, 1½ tons of mixed hay (clover and lespedeza).

To improve present practices contour tillage could be used on the steeper slopes and supplemented with strip cropping on the longer slopes; a complete fertilizer could be used at the rate of 200 to 400 pounds an acre a year; and corn could be side-dressed and small grains top-dressed with 100 to 150 pounds of nitrate of soda or its equivalent.

Manor silt loam, eroded rolling phase (MB).—This soil differs from the rolling phase mainly in being more eroded, in having a thinner surface soil, and in containing less organic matter. Slopes range from 7 to 14 percent. All of the soil is well to excessively drained.

Use and management.—About half the acreage of Manor silt loam, eroded rolling phase, has been so severely sheet and gully eroded that the only practical use for it is pasture or forest. The rest, not so severely eroded, occurs on the smoother relief and may be used for crops, but all tillage operations should be on the contour and strip cropping may be effective on the long slopes. Rotations consisting of small grain and hay are suggested for the steeper areas in cultivation.

Manor silt loam, eroded hilly phase (MA).—The surface soil of this phase is thinner, its relief is steeper, and erosion is more severe than on the rolling phase. Nearly all of this phase occurs on slopes of 14 to 25 percent along drains and streams. The use recommended for this soil is pasture, except in the most severely sheet and gully eroded areas, which should be in forest. In order to obtain good stands of grass, pasture needs to be treated with lime and phosphate fertilizer.

MANTEO SERIES

The soils of the Manteo series are shallow, light colored, and have little or no subsoil over broken and partly weathered schist. They occur in the extreme eastern part of the county in close geographic association with Tatum and Nason soils. They are developed over and from sericite schist. By approximate percentages the total area occupied by Manteo soils has relief as follows: Rolling, 10 percent; hilly, 50 percent; and steep, 40 percent. All areas are well to excessively drained. Manteo soils rarely exceed 6 inches in thickness and are best suited to forest.

Manteo shaly silt loam, hilly phase (MD).—This soil occurs on steep slopes along drains and steep bluffs near rivers. Relief ranges from hilly to steep (14 to 60 percent). Drainage is excessive and runoff is high. White, red, black, and scarlet oaks, scrub pine, dogwood, hickory, mountain-laurel, and beech are the natural vegetation.

Representative profile:

0 to 6 inches, light yellowish-brown to yellowish-gray very friable shaly silt loam having a thin covering of leafmold and forest litter; layer contains small fragments of weathered schist; very strongly acid.

6 inches +, light yellowish-brown to yellowish-gray very friable, shaly silt loam material composed mostly of schisty fragments ½ to 12 inches in diameter; very strongly acid.

Included are areas that have occasional solid rock outcrops, most of which are granite. Severely eroded areas of Tatum soils that are brown to moderate reddish brown and from 4 to 6 inches thick over schisty material are included. Near several of the larger streams are included areas having many rounded quartz stones on the surface.

Use and management.—The greater part of Manteo shaly silt loam, hilly phase, is still in forest. A few cleared acres were cultivated for a short time and then abandoned. A small acreage is in pasture consisting almost entirely of undesirable plants. This soil is best used for forest.

Manteo shaly silt loam, rolling phase (ME).—This soil differs from the hilly phase in having a slightly thicker solum and in occurring on smoother relief (7- to 14-percent slopes). A few included acres occur on undulating relief.

Use and management.—Fair stands of grass can be obtained on Manteo shaly silt loam, rolling phase, by making heavy applications of lime and phosphate fertilizer. The soil is naturally droughty, and during ordinary dry spells most of the desirable grasses die. A small acreage is used for crops and pasture or left idle, but most of the soil is still in forest, its best use.

MASADA SERIES

The soils of the Masada series occur on high second bottoms or stream terraces and have developed from old alluvial deposits containing sand and various rounded water-worn quartzite pebbles and stones. They are confined to the extreme eastern part of the county and are closely associated with the Hiwassee soils but are much lighter colored throughout. By approximate percentages the total area of Masada soils is divided according to different classes of relief as follows: Undulating, 70 percent and rolling, 30 percent. Masada soils make fair cropland if properly limed and fertilized.

Masada loam, undulating phase (MG).—This soil usually occurs in areas of 20 acres or more on the higher second bottoms or stream terraces over half a mile from the rivers. Relief is undulating (2 to 7 percent), surface drainage is good, and internal drainage is fair to good. The natural vegetation is white, black, red, and post oaks, hickory, shortleaf and scrub pines, blackgum, dogwood, and redcedar.

Representative profile:

1 to 0 inch, leafmold and forest litter; extremely acid.
0 to 10 inches, weak-yellow very friable loam with a number of quartzite pebbles and cobblestones ½ to 10 inches in diameter scattered over the surface and throughout; very strongly acid.
10 to 23 inches, light-brown friable to firm clay loam mingled with pale brown; contains a number of quartzite pebbles and stones; very strongly acid.
23 inches +, light-brown friable to firm clay loam material splotched with pale brown and containing many small pebbles ⅛ to ½ inch in diameter; strongly acid.

The surface soil varies in texture from a silt loam to a fine sandy loam, and the solum varies from 2 to 3½ feet deep over the residual sericite schist. Some areas have on the surface many rounded quartzite cobblestones that interfere with cultivation.

Use and management.—A few acres of Masada loam, undulating phase, are in cropland and a small part is in pasture, but most of the soil is now in forest. About 75 percent of the forested area has never

been cleared. Except for the stony areas, all of this soil can be used for crops.

A 4- to 5-year rotation consisting of corn, small grain, lespedeza hay, and 1 or 2 years of pasture is used on the few acres being cropped. Lime is applied at the rate of ½ ton an acre each rotation. The only fertilizer used, 16-percent superphosphate, is applied at the rates of 200 pounds an acre for corn and 300 pounds for small grain. Average acre yields under these practices are 35 bushels of corn, 15 bushels of wheat, 20 bushels of barley, and 1¼ tons of lespedeza hay.

In order to improve present practices, a 3-year rotation should be substituted for the present 5-year one, and lime should be applied at the rate of 1½ tons an acre during the first rotation and at the rate of 1 ton every 3 years thereafter. Clover should be planted with the lespedeza for hay. A yearly application of 200 to 400 pounds an acre of complete fertilizer, together with 100 pounds of nitrate of soda or its equivalent applied as a side dressing for corn and as a top dressing for small grains, would be desirable.

Masada loam, rolling phase (MF).—Steeper relief of 7 to 14 percent and more erosion distinguish this soil from the undulating phase.

Use and management.—Nearly all of Masada loam, rolling phase, has at some time been cleared, but most of it is now in forest consisting mainly of scrub pine. About one-third has lost 75 percent or more of its original surface soil, and shallow gullies are in some areas. The present use (forest) is probably the best one for these eroded areas. The two-thirds of the soil not so severely eroded can be used for pasture or crops. Where this soil is used for crops, all tillage should be on the contour and strip cropping may be advisable on the long slopes.

MECKLENBURG SERIES

The soil of the Mecklenburg series (Mecklenburg silt loam) is located in the southeastern part of the county in close geographic association with Davidson and Iredell soils. It is intermediate in color and consistence, particularly in the subsoil, between these two soils and is underlain by and developed from the weathered material of dark-colored basic rocks such as diorite and diabase. By approximate proportions Mecklenburg soil is 85 percent undulating and 15 percent rolling. Mecklenburg soil, though not so good agriculturally as the Davidson soils, is much better than the Iredell soils, and all but a few severely eroded acres can be used for crops.

Mecklenburg silt loam (MH).—This soil is dominantly undulating but has some rolling and hilly relief. The slope range is 2 to 14 percent. Surface drainage is good, but internal drainage is slow because the subsoil is heavy. The soil occurs in relatively small areas scattered throughout the southeastern part of the county. The natural vegetation includes white, red, post, and scarlet oaks, hickory, scrub pine, and redcedar.

Representative profile :

0 to 12 inches, light brownish-gray to moderate yellowish-brown friable silt loam.

12 to 28 inches, dark yellowish-brown firm moderately tough but somewhat plastic clay containing a few black concretions ranging from very small to ¼ inch in diameter.

28 inches +, dusky-yellow to strong yellowish-brown clay material more friable than the layer immediately above; contains fragments of quartz, small fragments of weathered diabase, and a few black concretions

A few areas have loose stone on the surface, and in some places the soil is as much as 3½ feet deep over parent material. Where this soil grades toward Davidson soils its subsoil has a reddish-brown cast. About 150 acres of eroded rolling phase, on which sheet erosion has been active, are included.

Use and management.—Approximately a third of Mecklenburg silt loam is now used for pasture, a small part is in forest, and a small part is idle, but the soil, nonetheless, is used mainly as cropland. Except for a small acreage that is eroded and hilly, all this soil is suitable for crops and it should be one of the first soils considered in making changes from pasture to cropland.

A 3-year crop rotation is in general use. Lime is applied at the rate of 1 ton an acre every 4 years, and 250 to 300 pounds an acre of 2–12–6 fertilizer is applied during the rotation, usually with the small grain. Average yields are 34 bushels of corn, 17 bushels of wheat, 26 bushels of barley, 34 bushels of oats, 1½ tons of clover hay, and 2 tons of mixed hay. The present fertilizer application should be increased to 200 to 300 pounds an acre per year.

MIXED ALLUVIUM

Mixed alluvium (Mx) occurs in close geographic association with the Congaree, Chewacla, and Wehadkee soils and is a mixture of soils rather than a definite soil type. Most areas occur in narrow strips adjacent to the larger streams such as the Rapidan, Rappahannock, and Hazel Rivers, and are subject to frequent overflow and deposition. The largest areas are in the big bends of the streams. The soils mapped as Mixed alluvium are some of the youngest in the county and have no appreciable profile development.

Variation in texture is extremely wide, depending on the source of material and also on the condition of the stream at the time the material was deposited. Locally the texture varies from silt loam to sand. Along some of the smaller streams drainage is variable within short distances, and the soils range from well to poorly drained. Other variations included with this separation are areas of Congaree silt loam that have bars of sand and gravel deposited on top of them and areas containing a number of shallow channels, which were cut by the streams during flood stage. Narrow bottoms along some of the small streams south of Richardsville, like Mine Run, which have been worked for gold deposits and are now nothing more than a mixture of material, are also included.

Use and management.—About a fourth of this land is used for permanent pasture, and a considerable acreage is in forest. As a result of the wide variation in texture, and more particularly because of the flood hazard, only a small part of these alluvial soils is used for crops. The main crops are hay and corn. Lespedeza—about the only type of hay grown—yields 1 to 1¼ tons an acre.

NASON SERIES

The soils of the Nason series occur in the extreme eastern part of the county, which is locally known as the Neck Section. They occur in close geographic association with Tatum, Lignum, and Manteo soils. They are underlain by and derived from very fine-grained sericitic schist. The surface soil is weak yellow to yellowish gray, and

the subsoil, yellowish brown. Classified by approximate proportions on different classes of relief, the total area occupied by Nason soils is 55 percent undulating, 35 percent rolling, and 10 percent hilly. Productive capacity is very low, and heavy applications of fertilizer and lime are required to obtain moderate yields.

Nason silt loam, undulating phase (Nc).—Large continuous areas of this soil occur on undulating slopes of 2 to 7 percent in the southeastern part of the county. The parent rock is chiefly yellowish-gray to light yellowish-brown sericitic schist; a few areas east of Richardsville have developed from quartz monzonite. Surface drainage is good; internal drainage, fair to good. The natural vegetation includes white, chestnut, scarlet, post, and black oaks, shortleaf and scrub pines, redcedar, hickory, holly, blackgum, dogwood, mountain-laurel, and beech.

Representative profile:

½ to 0 inch, leafmold and forest litter; extremely acid.
0 to 10 inches, weak-yellow very friable silt loam; top 1½ inches of layer discolored by stains from organic layer just above; extremely acid.
10 to 20 inches, strong yellowish-brown firm silty clay loam to silty clay containing a few quartz fragments and becoming very brittle when dry; layer breaks out in irregular-shaped aggregates 1 to 3 inches in diameter; very strongly acid.
20 inches +, strong yellowish-brown, mingled with weak yellow and yellowish gray, friable to firm silty clay loam material; fragments of weathered schist in lower part; very strongly acid.

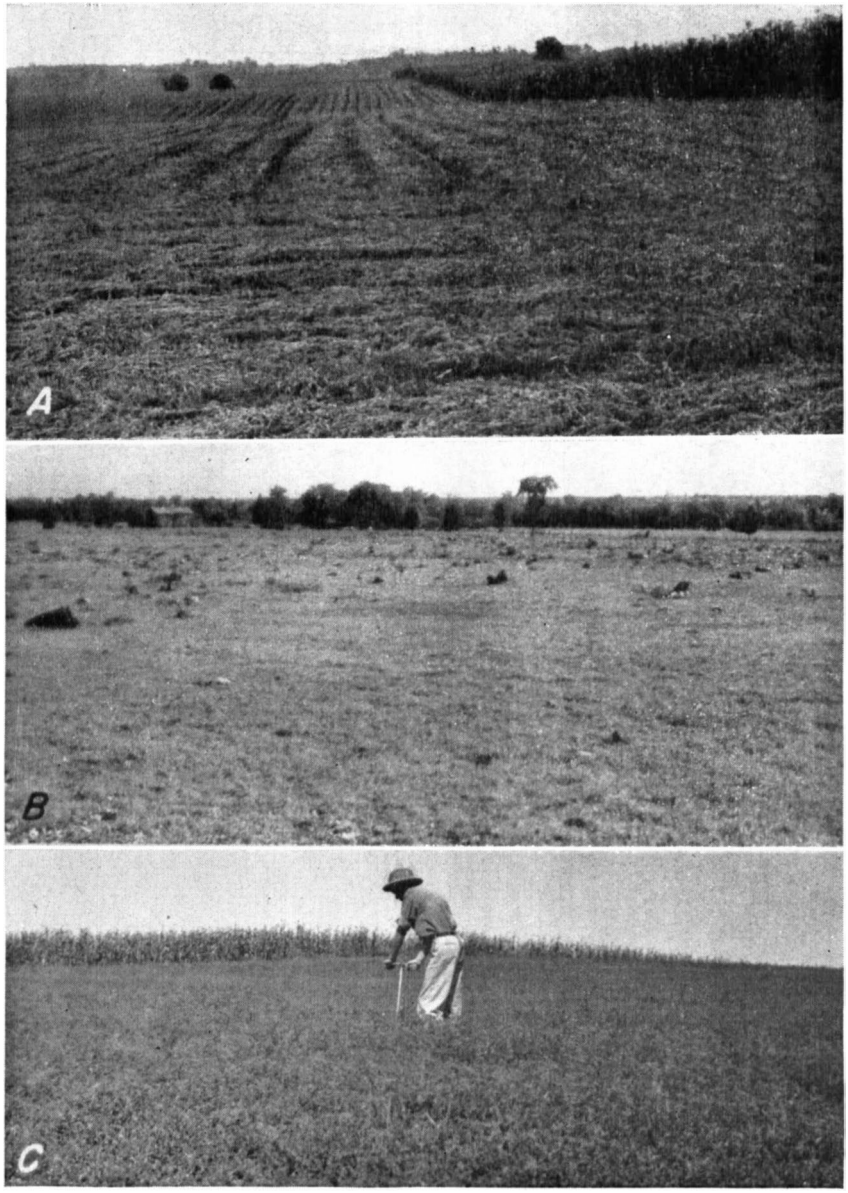
A few acres having a loam or fine sandy loam surface soil and a few areas having a gravelly layer 8 to 14 inches below the surface are variations. In wooded areas small bodies of Tatum and Lignum soils that could not be separated accurately are included.

Use and management.—Approximately five-sixths of Nason silt loam, undulating phase, is supporting stands of second-growth hardwood timber. Of the rest, a small part is being cultivated and a small acreage is in pasture, but the largest part has been abandoned and is idle or is in the process of returning to forest, chiefly scrub pine.

The yields that can be expected from this soil without special treatment are very low, and it is therefore best to let forested areas stand. The few hundred acres that are being cropped are now inadequately limed and fertilized. A 4-year rotation of corn, small grain, and 2 years of lespedeza hay is in general use. Small grains receive 16-percent superphosphate at the rate of 200 pounds an acre and a little manure. Yields vary, depending upon the quantity of manure used. Under ordinary management, corn yields 18 bushels; wheat, 10 bushels; and lespedeza hay, ¾ ton.

Lime is needed at the rate of 2 tons an acre for the initial application and at the rate 1 ton an acre every 3 years thereafter. From 200 to 400 pounds an acre of fertilizer a year should be applied. Corn should be side-dressed and small grain top-dressed with 150 pounds an acre of nitrate of soda or its equivalent, and clover should be used in a mixture with lespedeza for hay. If these practices are followed, yields 50 percent greater than those now obtained can be expected.

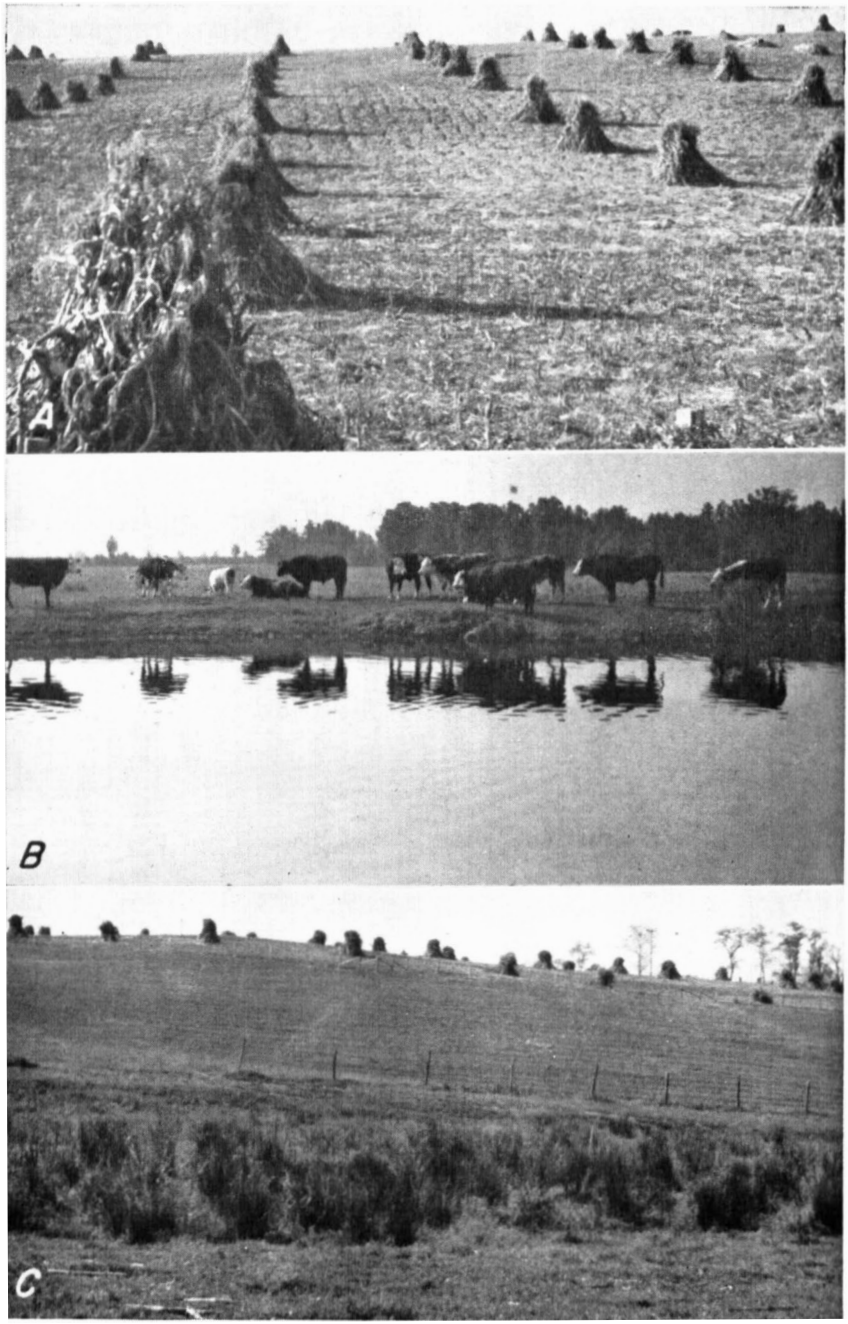
Nason silt loam, rolling phase (Nb).—This soil differs from the undulating phase in occurring on steeper relief (7 to 14 percent) and in containing some areas that have been more severely eroded. About three-fourths of this soil is still in forest, a few acres are being cropped,



A, Landscape of long gently rolling slopes of Hiwassee soils which yield 14 tons of ensilage corn or 3 tons of alfalfa an acre.

B, Pasture is the only practical use for Iredell stony silt loam. Even where stones are loose and could be removed, low crop yields would not justify the cost of removal.

C, Korean lespedeza on gentle slopes of Lansdale and Bucks soils; yields average 1½ tons an acre.



A, Loss of the soil by running rows straight up and down a hill; soil in foreground is wash from hillsides above, and shallow gullies have formed between rows in the background.

B, Shorthorn, Hereford, Angus, and Hereford-Angus cross steers at a water hole in a pasture on Croton and Penn soils; the Penn soils are on the higher levels in the background.

C, Permanent pasture on steep hillside of Penn silt loam, eroded hilly phase, with contour furrows constructed for water conservation; strip cropping in the background is on Hiwassee loam, undulating phase

some is used for pasture, and the rest has been abandoned and is growing up in scrub pine thickets. Under present conditions, the best practical use is forest. Pasture has a very low carrying capacity, which could be increased by applying lime and phosphate fertilizer.

Nason silt loam, hilly phase (NA).—This soil differs from the undulating phase in being generally shallower over the soft partly disintegrated rock and in occurring on steeper relief. Slopes range from 14 to 25 percent, and a few acres are mapped on slopes of 25 to 40 percent. Nearly all of this soil is now in forest, its best use.

PENN SERIES

The soils of the Penn series are developed in the southeastern part of the county, which is shown on figure 2, page 5, as the undulating Piedmont uplands. They are underlain by and derived from reddish-brown and purplish-red shale and mudstone of Triassic age, which impart the purplish-red color to the soils. Penn soils have a shallower solum (usually less than 18 inches) than the Bucks soils, which are derived from the same parent material. By approximate proportions Penn soils are on relief as follows: Level, 5 percent; undulating, 65 percent; rolling, 25 percent; hilly, 4 percent; and steep, 1 percent. About 10 percent of the land occupied by Penn soils has been severely eroded.

Penn silt loam, undulating phase (PC).—The fairly large areas of this soil are scattered throughout the Triassic plain in close geographic association with Bucks, Brecknock, Lansdale, Wadesboro, and Croton soils. Surface drainage is good, but the soil is droughty where bedrock is near the surface. The undulating to gently sloping relief ranges from 2 to 7 percent. The natural vegetation is chiefly a hardwood forest in which white, red, scarlet, and black oaks, hickory, redcedar, and dogwood are the common species.

Representative profile:

0 to 11 inches, pale-brown (with purplish cast) very friable silt loam containing a number of ⅛- to ¼-inch shale fragments; strongly acid.

11 inches +, pale reddish-brown (with purplish cast) very friable silt loam material containing more and larger shale fragments than surface layer; solid beds of partly weathered shale and mudstone at 14 inches; strongly acid.

The color of the surface soil of some areas is much lighter than that described, and depending upon the hardness of the shale, there is considerable variation in depth of the profile. Where the shale has been baked hard, the profile ranges from 4 to 6 inches thick. In a few places outcrops of baked shale occur. Some included areas are nearly level (0- to 2-percent slopes).

Use and management.—All but a few acres of Penn silt loam, undulating phase, have been cleared and are now being used for cropland or pasture (pl. 6, *B*). The greater acreage is in crops. All of this soil except the shallower areas can be used as cropland. The shallower areas are better suited to pasture or forest.

A 4-year rotation is in general use. Lime is applied at the rate of 1,000 pounds and 2–12–6 fertilizer at the rate of 300 pounds an acre during the rotation; available stable manure is also applied. Usually the small grain receives all of the amendments applied. Average yields under these practices are 30 bushels of corn, 16 bushels of wheat,

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22 bushels of barley, 25 bushels of oats, and 1½ tons of mixed hay. For improvement in practices it is suggested that 1 ton of lime and 600 to 1,000 pounds of a complete fertilizer an acre be applied during the rotation.

Penn silt loam, eroded rolling phase (PB).—This phase occupies steeper slopes than the undulating phase and has a thinner solum. Slopes range from 7 to 14 percent. About 100 acres that occur on undulating relief are included because they are severely eroded.

Use and management.—Most of Penn silt loam, eroded rolling phase, has at some time been cleared, but a small part has been allowed to revert to forest. A considerable acreage is now idle and a number of areas are still being cropped, but the main use is pasture. All of this soil has lost 25 percent or more of the original surface soil, and shallow gullies are present in most areas. Except for about 400 acres, which have lost more than 75 percent of the surface soil and have shallow gullies, this soil will make fair pasture if treated with lime and fertilizer. The best use for the severely eroded areas is forest.

Penn silt loam, eroded hilly phase (PA).—Steeper topography (14- to 25-percent slopes) along drains and permanent streams is occupied by this soil. It has been more severely eroded than the undulating phase. All of it has been eroded to a certain extent, and more than half is so severely eroded that very little remains except fragments of shale. Approximately half of it is now in forest, its best use; the rest is in pasture (pl. 6, *C*).

RAPIDAN SERIES

The Rapidan series consists of reddish-brown soils developed from rock called by Roberts (*5*), trap conglomerate and by Furcron (*1*), fanglomerate (pl. 7, *A*). The matrix of this rock weathers first and leaves behind more resistant pieces of greenstone that were held together by the matrix. These rock fragments are usually on the surface and throughout the profile of the soils in this series. They are small, usually less than 1 inch in dimension, and are brown to reddish brown on the surface. Freshly broken surfaces, however, are yellow to yellowish brown.

Rapidan soils are among the most productive and responsive in the county, but they are very erosive, and on the steeper slopes productivity can be destroyed in a short time by careless management. They rank third in extent of all the soils of the county, and most of the dairy farms are located partly or entirely on them.

Classified by relief, approximately 40 percent of the total acreage is undulating, 50 percent is rolling, 9 percent is hilly, and 1 percent is steep. About 20 percent of these soils have lost 75 percent or more of their surface soil through erosion; about 10 percent have been subject to both sheet and gully erosion. Rapidan soils are associated with and closely related to the Davidson and Bucks soils, particularly the Davidson. Small areas of Bucks and Davidson soils are included with soils of the Rapidan series in mapping.

Rapidan silty clay loam, undulating phase (RC).—Fairly large areas of this soil occur on undulating to gently sloping (2 to 7 percent) relief. The soil is in close geographic association with Bucks, Davidson, Starr, and Fauquier soils. Surface drainage is medium and

internal drainage is good. The natural vegetation is white, red, scarlet, and black oaks, black walnut, dogwood, hickory, yellow-poplar, black locust, redcedar, and scrub and shortleaf pines.

Representative profile:

0 to 9 inches, moderate reddish-brown friable silty clay loam containing fragments of highly weathered greenstone, which are very light in weight and ⅛ to 1½ inches in diameter.

9 to 38 inches, moderate reddish-brown firm silty clay to clay that is stiff and brittle; small weathered greenstone fragments scattered throughout.

38 inches +, moderate reddish-brown friable silty clay loam material mingled and streaked with strong yellowish brown and yellowish gray; contains fragments of weathered greenstone varying from very small in the upper part to 3½ inches in diameter at lower depths.

Depth over solid bedrock varies from 4 to 12 feet, depending on the nature of the underlying rock. The color of the soil ranges from that of Bucks on one hand to that of Davidson on the other. In places small areas of Bucks and Davidson soils are included. Outcrops of parent rock are present in many areas but are mapped as Stony land (basic rocks) where they are numerous. Near Cedar Mountain several small areas are lighter in color and range in texture from a loam to a silt loam. These variations in texture and color are caused by the presence in the substratum of granite and arkosic sandstone mixed with the greenstone. Locally loose stones on the surface are numerous enough to interfere with cultivation.

Use and management.—Nearly all of Rapidan silty clay loam, undulating phase, has been cleared; about 60 percent is cropland, 35 percent is pasture, and the rest is idle land or forest. Favorable slope and high natural productivity make this soil well suited as cropland.

Good management of this soil is evidenced by the small acreage that has been severely eroded. A 3-year rotation of corn, small grain, and hay is most common (pl. 7, *B*). Where alfalfa is grown, rotations of 5, 6, and, in some cases, 7 years are used. Because most of the farms located on this soil are dairy farms, there is considerable manure to add to the fields. In addition, 1 ton of ground limestone an acre is applied during a 3-year rotation. In such a rotation corn is fertilized with 200 pounds an acre of 0–16–8, and small grain receives 250 to 300 pounds of 0–16–8 and a top dressing of 150 pounds of 20-percent superphosphate. The following average yields are obtained when the management practices just described are used: Corn, 55 bushels; wheat, 22 bushels; barley, 35 bushels; oats, 45 bushels; soybean hay, 2 tons; and clover hay, 1¾ tons.

Rapidan silty clay loam, eroded rolling phase (RB).—This phase is similar to the undulating phase except for the steeper slopes of 7 to 14 percent, more rapid runoff, and more erosion. Much of this soil has lost 75 percent or more of its surface soil, some areas have undergone both gully and severe sheet erosion, and a few small areas have many deep gullies.

Use and management.—Gullied areas of Rapidan silty clay loam, eroded rolling phase, should be planted with black locust or some other fast-growing tree. More of this soil is used for pasture than for cropland (pl. 7, *C*). Where it is used for crops, tillage operations should be on the contour. In a few places strip cropping can be used to advantage. Average yields are about 10 percent lower than on the undulating phase.

Rapidan silty clay loam, eroded hilly phase (RA).—A shallower surface soil, a slightly heavier texture, and a thinner subsoil over rock distinguish this soil from the undulating phase. The hilly to broken relief is much steeper than that of the eroded rolling phase. The general slope range is 14 to 25 percent, but some areas with slopes of 25 to 40 percent are included. Rock outcrops occur frequently. About 1,000 acres moderately to severely sheet eroded and 100 acres that have been subject to both gully and severe sheet erosion are included.

Use and management.—Rapidan silty clay loam, eroded hilly phase, is best suited to pasture and woodland. The addition of manure, lime, and fertilizer will aid in establishing a good sod and increase the carrying capacity of old pastures.

ROANOKE SERIES

The only soil of the Roanoke series in this county is Roanoke silt loam, which is poorly drained and occurs in close geographic association with the Altavista and Hiwassee soils. Roanoke soil is usually adjacent to uplands on the low terraces along the Rapidan and Rappahannock Rivers and has developed from materials that were washed from soils in the steeper Piedmont Plateau and from soils in the Blue Ridge Mountains. It is waterlogged during wet seasons. As it is one of the least extensive in the county, Roanoke soil is of minor importance.

Roanoke silt loam (RD).—This soil occupies level to nearly level areas or slight depressions or old sloughs in stream terraces. Natural surface drainage is poor, and water may stand on the surface for some time after heavy rains. Internal drainage is very slow. The natural vegetation consists of willow, scarlet, and swamp white oaks, red maple, and American elm.

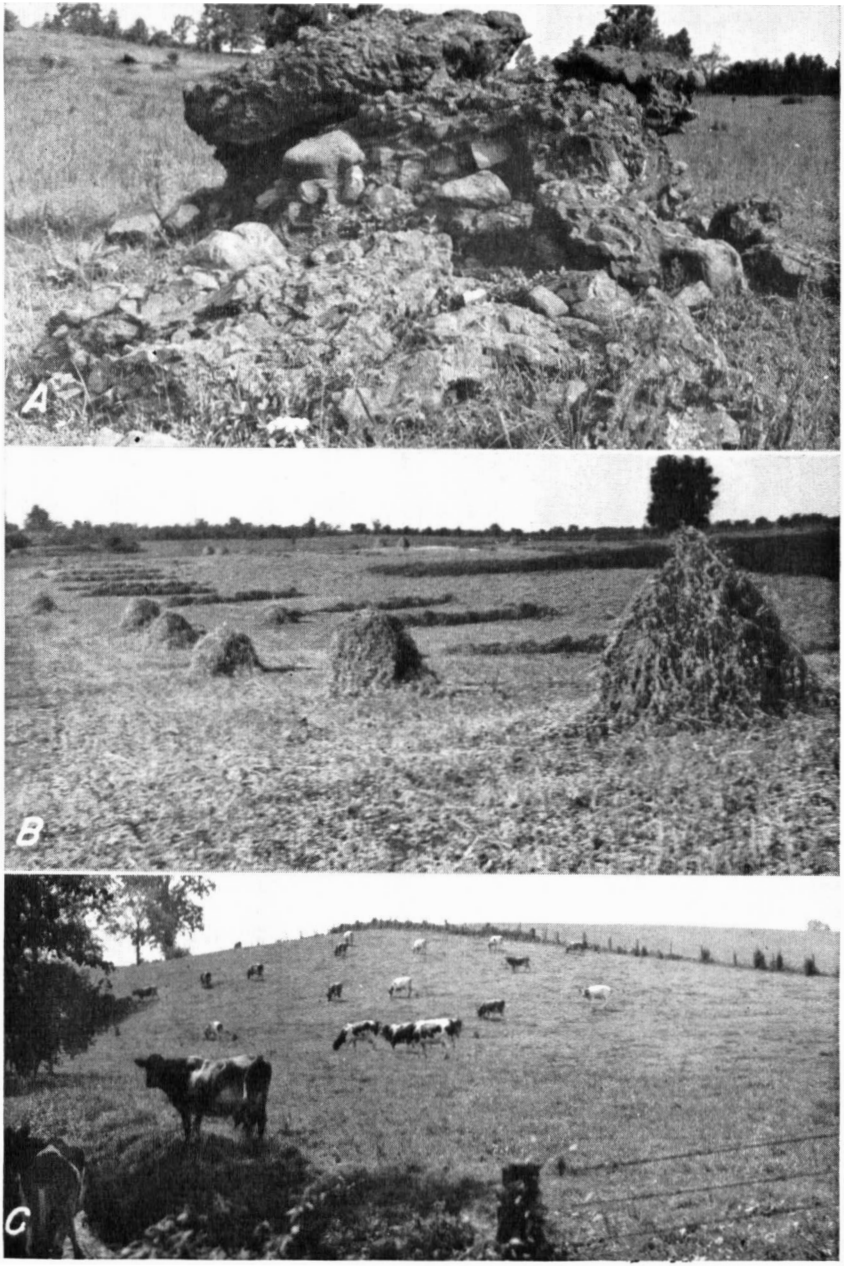
Representative profile:

0 to 8 inches, very pale-brown or brownish-gray highly mottled with light-gray friable silt loam.
8 to 26 inches, highly mottled strong yellowish-brown, light-gray, and pale-brown very firm heavy clay; moderately plastic when wet.
26 inches +, highly mottled medium-gray and strong yellowish-brown firm heavy clay material; plastic when wet.

One-third of Roanoke silt loam is still in forest, and the rest is in pasture, its best use.

ROUGH GULLIED LAND

Rough gullied land (RE), as the name implies, is land that has become badly gullied, no matter what soil type. It is most common on hilly or steep relief of 14 to 40 percent. About 75 percent or more of the total area has been gullied; in some places erosion has made it difficult to determine what the original soil was. Mappable areas are generally less than 10 acres in extent and occur on what was originally the hilly phases of Cecil, Culpeper, Penn, Davidson, Hayesville, Halewood, Fauquier, Louisburg, or Rapidan soils. The only practical use is forest, and perhaps the main purpose in getting a stand of trees established on these gullied areas is to control erosion and prevent the gullies from spreading to other areas.



A, Outcrop of trap conglomerate, or fanglomerate, one-half mile south of Culpeper on State highway No. 3. Rapidan soils are derived from this conglomerate, which is composed mainly of blocks of Catoctin greenstone, cobblestones, and pebbles bound together by smaller fragments that have been cemented by ferric oxide. In many places the conglomerate contains pebbles and angular fragments of brown Triassic shale and sandstone.

B, Soybean hay on Rapidan silty clay loam, undulating phase.

C, Holstein-Guernsey herd grazing hillside pasture of bluegrass and white clover on Rapidan silty clay loam, eroded rolling phase. Pasture has received liberal applications of lime and phosphate and has a carrying capacity of nearly a cow to the acre.

SENECA SERIES

The soil of the Seneca series occurs in the western and extreme eastern part of the county in close geographic association with Appling, Albemarle, Culpeper, Nason, Cecil, Hazel, Louisburg, Halewood, and Starr soils and is derived from recent alluvial-colluvial materials sloughed and washed down from them. Little or no profile development is evident. Relief is nearly level to gently sloping, the range in slope being 0 to 7 percent. Seneca silt loam is the only member of the series mapped in this county.

Seneca silt loam (SA).—The small areas of this soil occur at the foot of slopes, along intermittent drains, and along permanent streams. In many places it consists of partly alluvial deposits mixed with colluvial materials. Relief is nearly level to gently sloping (0 to 7 percent). Surface runoff is medium to moderately low and internal drainage is moderate to moderately slow. White, red, black, and scarlet oaks, yellow-poplar, hickory, and shortleaf and scrub pines are the natural vegetation.

Representative profile:

0 to 22 inches, yellowish-gray very friable silt loam faintly mottled with weak yellow and light gray.
22 inches +, light yellowish-brown friable light silty clay loam material mottled and mingled with strong yellowish brown, pale yellow, and light gray; contains many minute mica flakes.

This soil ranges in thickness from 14 to 36 inches, and in texture it ranges from silt to fine sandy loam, depending upon the soil type from which the material was washed. Small somewhat poorly to poorly drained areas and a few areas having loose stones scattered over the surface are included with this soil.

Use and management.—Areas of Seneca silt loam are in general so small that they have to be used in the same way as the soils with which they are associated. Approximately one-fourth of the land is used for pasture, one-fourth is in forest, a small part is idle, and the rest is used for crops. It is best suited to use as cropland.

A 3-year rotation of corn, small grain (usually wheat but sometimes barley), and hay (a mixture of clover and lespedeza) is most widely used. Fertilizer is applied at the rate of 200 to 250 pounds an acre during the rotation, and lime at the rate of 1,000 pounds. The fertilizers most widely used are 20-percent superphosphate and 2–12–6. Approximate yields under the above management are 35 bushels of corn, 16 of wheat, 26 of barley, 32 of oats, 2 tons of mixed hay, and 1 ton of clover hay. Suggested improvements in practices are application of 1 ton an acre of lime every 4 years and the use of 600 to 1,000 pounds of a complete fertilizer during a 3-year rotation.

STANTON SERIES

The soil of the Stanton series mapped in this county is Stanton silt loam, which occurs in small scattered areas throughout the southeastern part. Stanton soil has developed from brown, yellow, and gray Triassic shales in close geographic association with Croton, Lansdale, Penn, and Bucks soils. It occurs on level relief or in slight depressions. After hard rains water often stands on the soil for several days, and because of poor drainage, the soil is suitable only for pasture or forest.

Stanton silt loam (SB).—This soil occupies nearly level areas and slight depressions. Surface drainage is poor and internal drainage is very slow. Water stands on the surface during and after heavy rains. The natural vegetation includes cork elm and swamp white, willow, scarlet, and post oaks. The one-third of this soil that has been cleared is used mainly for pasture and produces fair pasture grasses; the rest is still in forest.

Representative profile:

1 to 0 inches, leafmold, moss, and forest litter on surface; very strongly acid.
0 to 9 inches, yellowish-gray to dark-gray friable silt loam mottled with yellowish brown; very strongly acid.
9 to 16 inches, yellowish-gray very compact heavy silt loam to silty clay loam mottled with dusky yellow and moderate yellowish brown; contains a few dark-brown concretions ranging up to ¼ inch across; very strongly acid.
16 inches +, weak-yellow friable clay material highly mottled with dusky yellow and yellowish gray; contains much partly weathered reddish-brown shale; strongly acid.

STARR SERIES

The soil representing the Starr series in this county, Starr silt loam, is colluvial in origin and has developed from materials washed and sloughed down from areas of Davidson, Rapidan, Lloyd, Cecil, Culpeper, Elioak, Manor, Fauquier, Hayesville, and Bucks soils. Starr soil represents relatively recent deposits, and no normal profile has developed. Because it consists of colluvium from some of the most fertile soils in the county, it is very productive.

Starr silt loam (SC).—This soil is mapped in small areas at the base of slopes and in slight depressions scattered through the entire county. It has nearly level to gently sloping relief (0 to 7 percent). Most of the areas have good surface and internal drainage, but a few are somewhat poorly drained. White, red, black, and scarlet oaks, black walnut, yellow-poplar, hickory, and shortleaf pine compose the natural vegetation.

Representative profile:

0 to 16 inches, moderate reddish-brown very friable silt loam containing numerous dark-brown concretions 1/16 to ½ inch in diameter and a few small fragments of greenstone; strongly acid.
16 to 25 inches, moderate reddish-brown friable heavy silt loam to silty clay loam that breaks out in irregular-shaped 1- to 5-inch aggregates; contains many dark-brown concretions and greenstone fragments larger than those in the layer above; medium acid.
25 inches +, moderate-brown friable silty clay loam material containing a high percentage of partly weathered angular greenstone and trap conglomerate rock fragments ranging from ¼ to 2 inches across; medium acid.

The soil varies considerably in thickness. In some places it is not more than 18 inches thick, and in others it is more than 40 inches. The texture ranges from a loam to a silty clay loam. Many areas are entirely free of concretions and rock fragments, and some small local areas are somewhat poorly drained colluvium. This soil is darker and heavier than it is farther south where it is composed of material washed from Lloyd, Cecil, and other reddish soils.

Use and management.—Nearly all of Starr silt loam has been cleared and only in a few places has it been allowed to revert to forest. A small acreage is now idle, but most of it is used about equally for

cropland or pasture. As this is one of the good agricultural soils of the county, it is best used as cropland. Alfalfa, however, does not last so long on this soil as it does on soils like the Rapidan and Davidson.

A 4-year rotation of corn, small grain, and 2 years of hay is in general use. Lime is applied at the rate of 1 ton an acre, and superphosphate or 2–12–6 at the rate of 250 to 300 pounds, during the rotation. Approximate acre yields with this management are 50 bushels of corn, 25 bushels of wheat, 35 bushels of barley, 50 bushels of oats, and 2 tons of clover hay.

STATE SERIES

The soil representing the State series in this county—State loam—is similar in structure and color to the Congaree soils, but it occurs at slightly higher elevations and in most places has a slight profile development. It occupies high first bottoms and low terraces along the Rapidan, Rappahannock, and Hazel Rivers and is derived from materials washed mainly from the soils of the Blue Ridge Mountains, foothills, and Piedmont Plateau. It is in close geographic association with the Congaree, Chewacla, Wehadkee, and Hiwassee soils. Yields of nearly all the crops grown on State soil are excellent, and only light applications of lime and fertilizer are required.

State loam (Sd).—This nearly level to gently undulating soil has a slope range of 0 to 5 percent. Both surface and internal drainage are good, but the soil is subject to overflow by very high waters. White and red oaks, black walnut, yellow-poplar, hackberry, and sycamore are the natural vegetation.

Representative profile:

0 to 10 inches, light yellowish-brown very friable loam.
10 to 24 inches, moderate yellowish-brown friable clay loam to sandy clay loam much firmer than the material in the layer above but easily crushed between the fingers.
24 inches +, light yellowish-brown friable very fine sandy loam material, mingled with dusky yellow and containing many rounded quartzite and granite gravelstones 1/16 to 1/4 inch across.

The texture of the surface soil varies from silt loam to fine sandy loam. Some local gravelly areas are included.

Use and management.—Nearly every acre of State loam has been cleared and is being used mainly for crops. It is well adapted to vegetables. A 4-year rotation consisting either of corn, small grain, and 2 years of hay or of 2 years of corn and 2 years of hay is generally used. Lime is applied at the rate of 1,000 pounds an acre during the rotation, and 100 to 200 pounds an acre of 2–12–6 fertilizer is usually applied for the corn. Approximate acre yields with these treatments are as follows: Corn, 45 bushels; wheat, 18 bushels; barley, 24 bushels; oats, 24 bushels; and mixed hay, 2 tons. This soil is naturally best adapted to corn; a 2-year rotation of corn and hay will give good results. A fertilizer treatment of 300 to 600 pounds an acre of 0–14–7 or its equivalent during the rotation, or of 200 pounds of a complete fertilizer where legumes are not used, is very satisfactory. When clover is to be grown a soil acidity test is advisable to determine the quantity of lime needed.

STONY LAND (ACIDIC ROCKS)

Stony land (acidic rocks) (Se) represents areas in the Cecil, Appling, Albemarle, Culpeper, Louisburg, Hazel, Hayesville, Halewood, and Wilkes soils where there are numerous loose stone and frequent outcrops of bedrock. The relief is rolling (7 to 14 percent). All of the land is well drained or excessively drained in the surface layers, but where the subsoil is heavy, internal drainage is slow.

Use and management.—Most of Stony land (acidic rocks) is now in forest, but some is in pasture. Outcrops of acidic rocks, mainly granite or granite gneiss, occur so frequently that the soil is unsuitable for the use of tillage implements, but most of the area could be used for pasture. Stony land (acidic rocks) is not so inherently fertile as Stony land (basic rocks) and does not support the same quality of vegetation, particularly pasture grasses. Fair pasture can be maintained by using lime and phosphate fertilizer. The severely eroded areas are best suited to forest.

STONY LAND (BASIC ROCKS)

Stony land (basic rocks) (Sf) represents areas of Davidson, Mecklenburg, Rapidan, Lloyd, Elbert, Iredell, Aldino, Fauquier, and Catoctin soils that have many loose stones on the surface and frequent outcrops of dark-colored basic rock. The rolling relief ranges from 7 to 14 percent. All areas are well drained to excessively drained on the surface, but where the subsoil is heavy, internal drainage is slow.

Use and management.—As bedrock outcropping or lying just under the surface prohibits use of tillage implements, Stony land (basic rocks) can best be utilized for pasture or forest. Most of the soil is fertile, and good pasture can be obtained by applying lime and phosphate fertilizer. During dry seasons, however, pasture becomes droughty where the bedrock is near the surface.

TATUM SERIES

The soils of the Tatum series occur in the extreme eastern part of the county in what is known locally as the Neck Section. They are derived from fine-grained sericite schist and are in close geographic association with Nason, Manteo, and Lignum soils. They bear the same relationship to Nason soils as the Cecil do to the Appling. The surface soil ranges in color from weak yellow to moderate brown, and the subsoil ranges from strong brown to moderate reddish brown. All areas are well drained. By approximate percentages the land area occupied by Tatum soils can be divided according to different classes of relief as follows: Undulating, 65 percent; rolling, 25 percent; and hilly, 10 percent. About 20 percent of the total land area has been severely eroded, and a number of the areas contain occasional shallow gullies.

Tatum silt loam, undulating phase (Tc).—This soil has excellent to good surface drainage and good internal drainage. Relief is undulating to gently sloping (2 to 7 percent). The natural vegetation is composed of white, chestnut, post, and scarlet oaks, scrub and shortleaf pines, hickory, and dogwood.

Representative profile:

1 to 0 inch, leafmold and forest litter; extremely acid.
0 to 3 inches, weak-yellow very friable silt loam containing a few angular quartz fragments ½ to 3 inches in diameter; extremely acid.
3 to 10 inches, light yellowish-brown very friable silt loam; breaks out into irregular-shaped lumps that can be broken down into a granular mass under slight pressure; many larger roots present; very strongly acid.
10 to 40 inches, strong-brown to moderate reddish-brown firm silty clay to clay; breaks out in irregular-shaped lumps that break down to a granular mass under considerable pressure; strongly acid.
40 inches +, strong-brown to moderate reddish-brown, mingled with dusky yellow and light yellowish brown, friable silty clay loam to clay material; contains weathered fragments of yellowish-brown to grayish-brown schist; strongly acid.

The subsoil varies from 2 to 3 feet thick, and in some places the surface soil contains numerous ½- to 1-inch quartz particles. Solid outcrops of white quartz occur in a few places.

Use and management.—A small percentage of Tatum silt loam, undulating phase, is used for pasture and cropland and the rest is either idle or growing up in dense thickets of scrub pine. This soil can be used as cropland, but it is not recommended that wooded areas be cleared for crop production unless the owner is willing to spend large amounts for fertilizer and lime.

A 4-year rotation consisting of corn, small grain, and 2 years of hay is in general use. Little lime is used, and fertilizer, usually 2–12–6, is applied at the rate of 200 pounds an acre each rotation. Approximate yields with these treatments are 25 bushels of corn, 12 of wheat, 22 of barley, 22 of oats, and 1 ton of lespedeza hay an acre. If at least 2 tons of lime an acre were used in the initial application and 1 ton were applied every 4 years thereafter; if clover were grown for hay and a complete fertilizer were applied at the rate of at least 600 pounds an acre during the rotation; and if corn were side dressed and small grain were top-dressed with 150 pounds of nitrate of soda or its equivalent, an increase of 50 percent or more over average yields now obtained could be expected.

Tatum silt loam, rolling phase (TB).—This phase differs from the undulating mainly in slopes, which range from 7 to 14 percent. A large part of the soil is still wooded, a small part is used for cropland and pasture, and the rest is idle or growing up to thick stands of scrub pine. Where this soil is used for crops, contour tillage is needed, and strip cropping of the long slopes might be desirable. The carrying capacity of pasture could be greatly improved by applying lime and phosphate fertilizer.

Tatum silt loam, hilly phase (TA).—This soil occurs on steeper slopes (14 to 25 percent) than the undulating phase and is generally shallower to the soft schist. Most areas are now forested, and though this soil could be made to produce fair pasture, it is not recommended that it be cleared when there are idle areas of soils on smoother relief associated with it that will produce just as good or better pasture.

Tatum silty clay loam, rolling phase (TE).—This soil is similar to Tatum silt loam, rolling phase, but has lost 75 percent or more of the original silt loam surface through erosion. The present surface soil, 3 to 8 inches thick, is a strong-brown friable to firm silty clay loam, and the 12- to 30-inch thick subsoil is a strong-brown to moder-

ate reddish-brown firm clay or silty clay. More than 70 percent of the acreage has shallow or deep gullies. Most of the soil occurs on rolling to moderately steeply sloping relief of 7 to 14 percent, but included are about 85 acres on undulating relief of 2 to 7 percent.

Use and management.—A few acres of Tatum silty clay loam, rolling phase, are being used for cropland, some is used for pasture, and the rest is idle or has returned to forest. It is best used for pasture, but heavy applications of lime and phosphate fertilizer should be made to obtain good stands of grass. Stable manure will do this on the more severely eroded areas.

Tatum silty clay loam, hilly phase (TD).—Except for occurring on steeper relief (14- to 25-percent slopes) and having a subsoil generally shallower to parent material, this soil is similar to the rolling phase. Nearly all of it is now in woods, mainly scrub pine, which is probably the best use for it.

VERY STONY LAND (ACIDIC ROCKS)

Very stony land (acidic rocks) (VA) is similar to Stony land (acidic rocks) except that bedrock outcrops are more numerous and the relief is steeper (14 to 30 percent). Outcrops are so frequent that forest is the only practical use. Most of this land is on the steep breaks along rivers and drains or on mountains formed from acid rock. About one-tenth of it is severely eroded. All areas are well drained to excessively drained on the surface, but in some places internal drainage is somewhat slow because of the heaviness of the subsoil.

VERY STONY LAND (BASIC ROCKS)

Very stony land (basic rocks) (VB) is well drained to excessively drained on the surface, but internal drainage is somewhat slow where the subsoil is heavy. It is similar to Stony land (basic rocks) except rock outcrops are more numerous and relief is steeper (14 to 30 percent). In a few places, as the top of Mount Pony, solid masses of rock were included. Forest is the only practical use.

WADESBORO SERIES

Soils of the Wadesboro series occur in the east-central part of the county in close geographic association with the Bucks, Penn, Lansdale, and Brecknock soils. They are derived from the weathered material of brown, reddish-brown, and purplish-colored shale and mudstone of Triassic age. In color they closely resemble the Cecil soils, but they differ from them in being more friable throughout the subsoil and in being derived from very different parent materials. About 80 percent of the acreage occurs on undulating relief; 20 percent, on rolling relief. About 10 percent of the total acreage has been severely eroded.

Wadesboro silt loam, undulating phase (WB).—The fairly large areas of this soil occur on undulating to gently rolling relief of 2 to 7 percent. In general, relief is 3 or 4 degrees steeper than that of Bucks and Lansdale soils. Surface drainage is very good and internal drainage is good. The natural vegetation includes white, black, and scarlet oaks, hickory, yellow-poplar, dogwood, blackgum, and sassafras.

Representative profile:

0 to 8 inches, yellowish-gray to weak-yellow very friable silt loam; first inch of the surface part stained darker by organic matter; a few rounded quartzite rocks scattered over the surface; very strongly acid.

8 to 13 inches, moderate yellowish-brown friable silty clay loam, firmer than the layer above; very strongly acid.

13 to 28 inches, strong-brown to moderate reddish-brown firm clay to silty clay loam, breaks out in irregular-shaped ½- to 2-inch aggregates hard to crush to a granular mass between the fingers; very strongly acid.

28 inches +, strong-brown, mingled with light brown, friable silty clay loam to clay material containing fragments of brown partly weathered shale; very strongly acid.

Areas are included that have many rounded quartzite rocks in the surface soil and through the subsoil. In places the surface texture is a loam rather than a silt loam. Small areas of Bucks and Lansdale soils are included.

Use and management.—All but a very small part of Wadesboro silt loam, undulating phase, has been cleared. A small acreage is now idle, about half is cropland, and the rest is pasture. The soil is well suited to use as cropland.

A 4-year rotation of corn, small grain, and 2 years of hay (mostly lespedeza) is in general use. Lime is applied at the rate of 500 to 1,000 pounds an acre each rotation, and 2–12–6 fertilizer is used at the rate of 100 pounds for corn and 200 pounds with small grain. Stable manure is also applied whenever available. Approximate acre yields with these treatments are 40 bushels of corn, 20 of wheat, 30 of barley, 38 of oats, and 1½ tons of mixed hay. Improved management could include use of a 3-year rotation of corn, small grain, and clover hay; 2 tons of lime per acre as an initial application and 1 ton each 4 years thereafter; 600 to 1,000 pounds an acre of a complete fertilizer for each round of the rotation; and, where nitrogen deficiency is evident, 100 to 150 pounds an acre of nitrate of soda or its equivalent as a side dressing for corn and as a top dressing for small grain.

Wadesboro silt loam, eroded rolling phase (WA).—This soil is shallower to bedrock and more eroded and occurs on steeper slopes (7 to 14 percent) than the undulating phase. A few areas only moderately eroded have been included. Most of this soil has been cleared and is now in idle land, cropland, or pasture; part of it has reverted to forest. It is suitable for pasture, but heavy applications of lime and phosphate fertilizer are required to establish a good sod.

WATT SERIES

The shallow soils of the Watt series occur on rolling to hilly relief in small isolated bodies throughout the west-central part of the county. They have developed over and from the weathered products of graphitic slate and schist. They range from light olive gray when dry to dark gray or almost black when wet. Pasture is the use to which they are best suited.

Watt silt loam, rolling phase (WD).—This soil occurs on rolling topography (7 to 14 percent) but includes some areas of the undulating phase with slopes ranging from 2 to 7 percent. It occurs in small isolated bodies in close geographic association with Manor, Elioak, Cecil, Hazel, and Appling soils. Surface drainage is good to excessive. The natural vegetation is white, scarlet, red, chestnut, and black oaks, yellow-poplar, scrub and white pines, hickory, dogwood, and mountain-laurel.

Representative profile:

1½ to 0 inch, leafmold and forest litter; very strongly acid.
0 to 13 inches, light olive-gray very friable floury silt loam; contains fragments of graphitic and quartz mica schist from ½ to 3 inches in diameter; very strongly acid.
13 inches +, light olive-gray friable heavy silt loam material; contains large quantities of partly weathered dark-gray graphitic schist mixed with strong yellowish-brown and brownish-gray quartz mica schist; very strongly acid.

In color the surface soil ranges from light olive gray to light gray. The amount of graphitic schist in the surface soil varies from place to place. The thickness of the uneroded soil varies from 5 to 13 inches. Areas that have lost over 25 percent of the surface soil are included.

Use and management.—About 60 percent of Watt silt loam, rolling phase, is still in forest. Areas that have been cleared are chiefly in pasture, and the few acres in cropland give poor yields. The soil is best suited to pasture, and most of the areas now in forest could produce a fair stand of grasses. Few of the pastures have received any treatment; their carrying capacity could be increased by applying lime and phosphate fertilizer.

Watt silt loam, eroded hilly phase (Wc).—Steeper slope (14 to 25 percent) and greater shallowness to bedrock differentiate this soil from the rolling phase. One-fourth of its total area has slopes greater than 25 percent; approximately 50 acres have been severely eroded. One-half of the acreage is being used for pasture, and the rest is in forest. The more badly eroded areas now in pasture should be in forest, as they support only a meager growth of grasses.

WEHADKEE SERIES

The soil of the Wehadkee series occurs in first bottoms along streams and is in close geographic association with Congaree and Chewacla soils. Wehadkee soil is light-colored and has a mottled subsoil. It is composed of materials washed from soils of the Piedmont Plateau and the Blue Ridge Mountains. It is the most poorly drained soil of the first bottoms in the county. The Wehadkee series in this county is represented only by Wehadkee silt loam.

Wehadkee silt loam (We).—This soil occupies flat or slightly depressed bottom lands. It is subject to frequent overflows. Internal drainage is very poor because of the high water table, and surface drainage is poor. The natural vegetation consists of buttonbush, smooth alder, sycamore, spicebush, river birch, willow oak, cork elm, willow, and red-osier dogwood.

Representative profile:

0 to 6 inches, light-gray very friable silt loam mottled with weak yellow and moderate yellowish brown.
6 to 30 inches, light-gray firm silty clay loam to clay mottled with weak yellow and strong yellowish brown; slightly plastic when wet; varies from 24 to 38 inches deep.
30 inches +, light-gray very friable fine sandy loam material mottled with weak yellow and strong yellowish brown; contains a few rounded pebbles.

Use and management.—Approximately one-sixth of Wehadkee silt loam is now in forest, mainly river birch; one-third is idle and grown up in buttonbush, sedges, and red-osier dogwood; and the rest is in pasture. Artificial drainage, usually by open ditches, is required for good production of pasture.

WILKES SERIES

Soils of the Wilkes series vary greatly in texture, color, depth of he surface soil, and in the thickness and consistence of the subsoil. They occur in the western part of the county in association with the Cecil, Culpeper, Appling, Helena, and Lloyd soils. They are underlain by and derived from the weathered material of a mixture of basic and acidic rocks, including granite, granite gneiss, basic schist, granodiorite and schisty greenstone. By approximate percentages the total acreage of Wilkes soils is on different classes of relief as follows: Rolling, 20 percent; hilly, 45 percent; and steep, 35 percent. About 35 percent of the acreage has been severely eroded, and most of the eroded areas contain shallow gullies. Wilkes soils are mapped as one unit in this county—Wilkes soils, undifferentiated.

Wilkes soils, undifferentiated (WF).—These soils are mapped in a single unit because of their complex nature. Textures range from silt loam to fine sandy loam, the loam probably predominating. There is considerable variation in the color, consistence, and depth of both surface soil and subsoil. In places the surface soil grades into soft rock; in other places loose stones are scattered over the surface and there are occasional bedrock outcrops. The color of the surface soils is gray or yellowish gray, and the subsoils, where present, are mottled yellow, brown, and red. The subsoils have much heavier texture than the surface soils. Relief ranges from rolling and hilly to steep, with slopes ranging from 7 to 40 percent. Surface runoff is moderate to very rapid, and internal drainage is relatively slow. Cleared areas are moderately to severely eroded. Small patches of this mapping unit occur over a wide area in the western part of the county.

Use and management.—Almost half the acreage of Wilkes soils, undifferentiated, is in forest consisting of white, red, black, and scarlet oaks, hickory, shortleaf and scrub pines, and redcedar. About 45 acres are idle, a few acres are cultivated, and the rest is used for pasture. Except for the severely eroded and steepest areas, which are best suited for forest, pasture is the best use for this land.

WORSHAM SERIES

The soil of the Worsham series occurs in the western and the extreme eastern part of the county in close geographic association with the Cecil, Appling, Manor, Tatum, and Nason soils. Worsham soil is poorly drained and is derived from granite, gneiss, and schist and, to some extent, from colluvial material that has sloughed and washed down from adjacent slopes. It occupies small areas at the base of slopes bordering streams, slight depressions, and level or gently sloping areas at the heads of drains and streams. Worsham silt loam is the only member of the Worsham series mapped in this county.

Worsham silt loam (WG).—This soil is gently sloping to level (0 to 2 percent) and in some places occupies slight depressions. Surface drainage is poor to fair; internal drainage is very slow. The poor drainage is partly due to seepage water from higher lying soils. Willow and scarlet oaks, red maple, smooth alder, hazelnut, elm, spicebush, and smilax are the natural vegetation.

Representative profile:

0 to 9 inches, light-gray friable silt loam mottled with weak yellow and strong yellowish brown.

9 to 32 inches, light-gray firm to slightly plastic clay mottled with yellow and strong yellowish brown; strong yellowish-brown color more pronounced than in surface soil.
32 inches +, light-gray somewhat plastic clay mottled with strong yellowish brown; contains many quartz fragments; layer not so tough as the one above.

Locally some areas have a shallow covering of brown material recently deposited on the original surface soil, which ranges from light gray to dark gray. Some subsoil is medium gray with light yellowish-brown mottlings. The texture of the surface soil in some areas is a fine sandy loam.

Use and management.—Approximately 50 percent of Worsham silt loam is now in forest, 25 percent is used for pasture, 10 percent is idle, and the rest is used for crops. The cultivated areas occur in fields of other soils that are used for crops. This soil is best suited to use as pasture.

YADKIN SERIES

The well-drained soil of the Yadkin series (Yadkin loam), is closely associated with the Cecil, Hayesville, and Halewood soils. It has developed over granite, granodiorite, and mica schist and is characterized by its brown surface soil and brown to reddish-brown friable subsoil. The land area occupied by Yadkin soil can be divided by classes of relief approximately as follows: Undulating, 45 percent; rolling, 35 percent; and hilly, 20 percent. About 7 percent of the Yadkin soil area has been severely eroded.

Yadkin loam (YA).—This soil is undulating to rolling and hilly (2- to 25-percent slopes). Drainage, both surface and internal, is good. The natural vegetation consists of white, red, black, and scarlet oaks, hickory, chestnut sprouts, sourwood, and dogwood.

Representative profile:

0 to 11 inches, light-brown to moderate-brown very friable loam.
11 to 28 inches, moderate-brown to dark-brown friable clay loam or clay.
28 inches +, moderate-brown, mingled with moderate yellowish brown, friable clay loam or clay material; contains fragments of highly weathered granite or schist and many minute mica flakes.

A few small areas are included that are developed from basic rock and have a reddish-brown subsoil. The color of the surface soil ranges from weak brown to dark brown. Loose stone and occasional rock outcrops occur on some of the steeper areas.

Use and management.—Nearly all of Yadkin loam has been cleared. A small percentage is forested, but in greater part the soil is about equally divided as pasture land and cropland. All but the steeper slopes are suited to crops; the steeper slopes are best for pasture.

A 3-year rotation consisting of corn, small grain, and hay is in general use. Lime is applied at the rate of 1,000 pounds an acre each rotation, and 2–12–6 fertilizer at the rate of 300 pounds. Approximate yields with these treatments are 40 bushels of corn, 20 of wheat, 30 of barley, 38 of oats, and 1½ tons of mixed hay. More adequate treatment would be 1 ton of lime per acre every 4 years, 600 pounds of a complete fertilizer every 3-year rotation, and 100 pounds of nitrate of soda or its equivalent as a side dressing for corn or as a top dressing for small grain.

ZION SERIES

The soils of the Zion series have developed from a mixture of parent materials where basic dikes and sills join rocks of the Triassic forma-

tion. They occur in the southern part of the county in close geographic association with the Iredell, Mecklenburg, Bucks, Penn, and Catlett soils. Relief is undulating to gently sloping, and drainage is fair.

Zion silt loam (ZA).—This undulating to gently sloping soil (2- to 7-percent slopes) has fair surface drainage and slow internal drainage. The natural vegetation consists of white, post, scarlet, and swamp white oaks, redcedar, and scrub pine.

Representative profile:

0 to 7 inches, dusky yellow or brownish-gray friable silt loam containing many black and brown concretions; locally a few fragments of yellow and moderate-gray Triassic shale are scattered over the surface and throughout; concretions are less than ⅛ inch in diameter but the shale fragments are ¼ to 4 inches in diameter; the concretions impart a streaked appearance to a vertically cut surface; strongly acid.

7 to 14 inches, yellowish-gray firm heavy silt loam to slightly plastic light silty clay loam; material breaks out in irregular-shaped ½- to 3-inch lumps when dry; concretions and shale fragments more numerous than in layer above; slightly acid.

14 inches +, yellowish-gray moderately friable to firm silty clay loam material, streaked with yellowish white and light yellowish brown; contains a few concretions, most of them very small; half of the soil mass composed of partly weathered fragments of Triassic shale and basic rock; about neutral.

In places rock and shale fragments are numerous enough to interfere with cultivation. A few areas having moderate-brown surface soil are included, and where Zion silt loam joins the Iredell soils, small areas of Iredell soils are included.

Use and management.—A small percentage of Zion silt loam is still in forest, a small part is idle, one-fourth is used for pasture, and the rest is used for cultivated crops, the use to which the soil is best suited.

A 4-year rotation consisting of corn, small grain, and 2 years of hay is in general use. Lime at the rate of 1,000 pounds and 2–12–6 fertilizer at the rate of 250 to 300 pounds an acre are applied each rotation. Approximate acre yields with these treatments are 32 bushels of corn, 16 of wheat, 24 of barley, 32 of oats, and 1½ tons of mixed hay. Improvement in present practices would include the application of lime at the rate of 1 ton every 4 years, an application of a complete fertilizer at the rate of 600 to 1,000 pounds each rotation, and top dressing small grain and side dressing corn with 100 pounds an acre of nitrate of soda or its equivalent.

Zion silt loam, eroded phase (ZB).—This soil is more eroded and in many places is thinner to soft rock than the normal phase. Relief ranges from 2 to 7 percent. About 90 percent of the soil has lost 25 to 50 percent of its original surface soil and has occasional shallow gullies; the rest has lost 25 to 75 percent of the surface soil and has occasional deep gullies. Most of this soil is used for crops, but average yields are 12 to 15 percent lower than on Zion silt loam. A small acreage is in pasture. Most of the acreage is best suited to crops, but where it has been subjected to both sheet and gully erosion, it should be in pasture or forest.

ESTIMATED YIELDS

The soils of Culpeper County are listed alphabetically in table 5, and estimated yields of the important crops grown on them are given for two levels of management. The two kinds of management are indicated by the letters A and B at the heads of columns in the table.

TABLE 5.—*Estimated average yield per acre of principal crops on soils of Culpeper County, Va., unaer two levels of management*

[Yields in columns A are those obtained under common management practices; yields in columns B may be expected under the best management practices. Blank spaces indicate crop is not grown at the management level indicated or the soil is unsuited to its production.]

Soil	Corn		Wheat		Barley		Oats		Clover		Alfalfa		Mixed hay [1]		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [2]	*Cow-acre-days* [2]
Albemarle fine sandy loam:																
Eroded hilly phase															20	35
Eroded rolling phase	20	30	8	14	12	20	14	24					¾	1¼	25	50
Rolling phase	25	35	10	16	14	22	14	24		1		2½	1	1½	30	60
Undulating phase	35	42	12	18	16	26	16	28		1½		3	1½	1¾	30	60
Aldino silt loam:																
Eroded rolling phase	24	35	14	20	18	26	24	30	1	1½			1¼	1¾	35	70
Undulating phase	28	40	16	22	20	30	28	36	1½	2			1½	2	40	100
Altavista loam:																
Level phase															50	70
Undulating phase	35	45	15	18	20	24	24	28	1	2			1½	2	35	85
Appling fine sandy loam:																
Eroded rolling phase										¾		1¾	¾	1¼	25	40
Rolling phase	24	35	12	15	16	22	16	22		1		2½	1	1½	20	40
Undulating phase	28	40	14	16	20	24	22	26		1½		3	1	1½	20	45
Brecknock silt loam	35	45	20	30	28	35	30	40	1½	2	2	3½	1¾	2	50	125
Bucks silt loam:																
Eroded rolling phase	35	45	20	24	22	32	26	36	1½	2			1¾	2¼	65	100
Undulating phase	42	55	22	28	34	50	42	50	1½	2	3	4	2¼	2½	90	150
Buncombe loamy fine sand	15	30											½	¾	15	20
Catlett silt loam:																
Eroded rolling phase															25	40
Undulating phase	25	40	12	22	20	30	22	32	1	1½			1½	2	35	70

Catoctin silt loam															25	50
Cecil fine sandy loam:																
Eroded hilly phase															25	50
Eroded rolling phase	25	38	10	16	18	28	22	28	1	1½			1¼	2	25	100
Eroded undulating phase	34	42	12	18	18	26	26	30	1	1¾		2½	1¼	1¾	30	115
Rolling phase	28	42	12	18	20	30	24	30	1	1¾		2	1½	2¼	30	110
Undulating phase	37	48	14	18	24	30	30	34	1	2		3½	1½	2	30	125
Chewacla silt loam [3]	25	30											1½	2	60	90
Congaree fine sandy loam [3]	45	50	10	12	20	25			1¼	2			1½	2	70	90
Congaree silt loam [3]	45	55	18	22	30	35			1½	2			1½	2½	115	160
Croton silt loam:																
Level phase	15	20	10	16	12	18							1	1¾	30	70
Undulating phase	24	36	14	20	18	26	22	28					1½	2	30	90
Culpeper clay loam:																
Eroded hilly phase															25	40
Eroded rolling phase	26	30	10	16	18	28	22	26	¾	1¼		2¼	1¼	1¾	30	55
Eroded undulating phase	28	42	12	20	22	32	28	34	1	1¾		2¾	1½	2	35	85
Culpeper loam:																
Eroded hilly phase															30	60
Eroded rolling phase	30	45	12	18	20	30	26	32	1	1¾		2¼	1½	2	35	110
Eroded undulating phase	35	40	14	18	24	32	34	38	1	2		3	2	2¼	40	135
Rolling phase	35	45	12	18	20	30	26	34	1	2		2½	1½	2¼	35	120
Undulating phase	35	50	16	20	24	34	34	40	1¼	2¼		3½	2	2½	40	135
Davidson clay loam:																
Eroded hilly phase															65	100
Hilly shallow phase															35	75
Rolling phase	48	55	24	30	36	45	46	52	1¾	2½	3½	4	2	2½	90	145
Undulating phase	55	60	24	32	40	52	50	55	2	2½	3½	4	2	2½	100	150
Davidson clay:																
Eroded hilly phase															60	75
Rolling phase	40	48	22	26	32	38	40	46	1¾	2½	3	3½	2	2½	85	120
Elbert silt loam [4]																
Elioak loam	35	50	18	22	24	35	32	38	1¼	2		2½	1½	2¼	35	120
Eroded phase													1	1½	35	60
Fauquier silt loam:																
Eroded hilly phase															40	90
Rolling phase	32	45	18	25	26	32	35	40	1½	2		3	1½	2	45	120
Undulating phase	35	45	20	25	28	35	38	45	1½	2		3½	2	2½	80	150

See footnotes at end of table.

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TABLE 5.—*Estimated average yield per acre of principal crops on soils of Culpeper County, Va., under two levels of management*—Continued

Soil	Corn		Wheat		Barley		Oats		Clover		Alfalfa		Mixed hay [1]		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [2]	*Cow-acre-days* [2]
Fauquier silty clay loam:																
Eroded hilly phase															35	75
Rolling phase	30	35	16	22	24	30	30	35	1¼	1¾	-----	2½	1¼	1¾	40	100
Halewood loam:																
Eroded hilly phase [4]																
Hilly phase															25	50
Rolling phase	27	30	14	16	16	22	20	26	-----	1	-----	2½	¾	1½	25	60
Hayesville loam:																
Eroded hilly phase															25	35
Rolling phase	32	45	16	20	24	35	30	36	1	2	-----	3	1½	2	40	125
Undulating phase	35	50	16	22	24	38	30	40	1	2	-----	3½	1½	2½	40	125
Hazel loam:																
Hilly phase															30	55
Steep phase															25	40
Helena fine sandy loam	18	28	10	16	16	24	20	26	1	1¼	-----	-----	1¼	2	25	50
Hiwassee loam:																
Eroded hilly light-colored phase															25	50
Eroded rolling light-colored phase	25	38	12	16	16	28	18	28	¾	1¼	-----	2	1½	2	35	80
Eroded rolling phase									-----	1½	-----	2¼	1½	2	40	75
Undulating light-colored phase	35	50	15	18	24	32	28	33	1	1¾	-----	3½	1½	2½	50	115
Undulating phase	40	55	18	22	28	35	35	38	1½	2½	2½	4	2	2	90	145
Iredell silt loam:																
Eroded undulating phase													½	1	30	65
Level phase													¾	1¼	25	60
Undulating phase													1	1½	30	70

Iredell stony silt loam																25	55
Eroded phase																25	45
Kelly silt loam	25	30	12	18	18	25							1	1½		30	75
Lansdale silt loam:																	
Level phase	28	32	14	20	20	26	22	32		1¼			1	1½		35	115
Undulating phase	32	45	18	24	25	34	30	36	1¼	1¾			1½	2		35	115
Lignum silt loam	10	18								1¼			¾	1½		20	45
Lloyd clay loam:																	
Eroded hilly phase																30	55
Rolling phase	32	40	14	18	20	30	28	34	1¾	2½		3¼	1½	2		30	90
Lloyd loam:																	
Eroded rolling phase	35	50	18	20	30	35	30	35	2	2¾		3½	2	2½		90	140
Undulating phase	38	50	20	24	32	40	35	45	1¾	2½	3	3¾	2	2½		90	140
Louisburg fine sandy loam:																	
Eroded hilly phase [4]																	
Rolling phase																20	35
Manor silt loam:																	
Eroded hilly phase																40	60
Eroded rolling phase	30	35	15	20	22	26	26	30	1	1½			1¼	1¾		35	75
Rolling phase	35	40	18	22	26	30	30	35	1¼	1¾			1½	2		40	100
Manteo shaly silt loam:																	
Hilly phase [4]																	
Rolling phase																15	30
Masada loam:																	
Rolling phase	25	35	10	16	14	22	14	24		1			1	1½		30	60
Undulating phase	35	45	15	18	20	24	24	28		1½			1½	2		30	60
Mecklenburg silt loam	34	45	17	20	26	32	34	40	1½	2			2	2½		80	145
Mixed alluvium																30	40
Nason silt loam:																	
Hilly phase [4]																	
Rolling phase										1		2¼		1¼		20	40
Undulating phase	18	40	10	20						1½		2¾	¾	1½		20	50
Penn silt loam:																	
Eroded hilly phase [4]																	
Eroded rolling phase																25	45
Undulating phase	30	40	16	22	22	30	25	32	1	1½			1½	2		30	60

See footnotes at end of table.

TABLE 5.—*Estimated average yield per acre of principal crops on soils of Culpeper County, Va., under two levels of management*—Continued

Soil	Corn		Wheat		Barley		Oats		Clover		Alfalfa		Mixed hay [1]		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [2]	*Cow-acre-days* [2]
Rapidan silty clay loam:																
Eroded hilly phase															40	65
Eroded rolling phase	45	55	20	30	30	42	40	50	1½	2	2½	3½	2	2½	90	125
Undulating phase	55	60	22	32	35	50	45	55	1¾	2½	3	5	2	2½	95	150
Roanoke silt loam															25	35
Rough gullied land [4]																
Seneca silt loam	35	45	16	22	26	35	32	34	1	2			2	2¼	75	130
Stanton silt loam															20	30
Starr silt loam [5]	50	55	25	30	35	40	50	55	2	2½	3	3½	2	2½	120	160
State loam [6]	45	55	18	24	24	32	32	36	1	2		3	2	2½	85	140
Stony land (acidic rocks)															35	45
Stony land (basic rocks)															40	60
Tatum silt loam:																
Hilly phase															20	40
Rolling phase	18	30	10	20	20	28				1¾		2	1	1½	20	50
Undulating phase	25	38	12	25	22	30	22	32		2		3¼	1¼	1¾	25	60
Tatum silty clay loam:																
Hilly phase [4]																
Rolling phase										¾		1¾		1¼	20	40
Very stony land (acidic rocks) [4]																
Very stony land (basic rocks) [4]																
Wadesboro silt loam:																
Eroded rolling phase	25	35	14	18	20	28			1	1½		2¼	1½	2	25	85
Undulating phase	40	45	20	28	30	35	38	50	1¼	1¾		3½	1½	2	40	125

Watt silt loam:																
Eroded hilly phase	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	20	35
Rolling phase	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	25	40
Wehadkee silt loam	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	25	50
Wilkes soils, undifferentiated	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	25	45
Worsham silt loam	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	35	45
Yadkin loam	40	50	20	25	30	35	38	45	1¼	2	-----	3½	1½	2	40	125
Zion silt loam	32	40	16	25	24	32	32	38	1	1¾	-----	-----	1½	2	35	115
Eroded phase	28	36	14	20	20	30	22	32	¾	1½	-----	-----	1¼	1¾	30	90

[1] Mixed hay refers to stands of hay sown as a mixture, usually consisting of lespedeza, clover, timothy, and sometimes a small quantity of orchard grass. Lespedeza is the most important plant in the mixture, and after the first year it often makes up nearly the whole stand.

[2] Cow-acre-days is a term used to express the carrying capacity of pasture land. As used here, it is the product of the number of animal units carried per acre multiplied by the number of days the animals are grazed without injury to the pasture. For example, a soil type able to support 1 animal unit per acre for 360 days of the year rates 360, whereas another soil able to support 1 animal unit on 2 acres for 180 days rates 90. Again, if 4 acres of pasture support 1 animal unit for 100 days, the rating is 25.

[3] Average yields reduced by flood losses, which amount to 1 crop in every 4 to 6 years.

[4] Best suited to forest; not suitable for cultivated crops or pasture.

[5] Alfalfa stands die after 2 or 3 years because of high water table caused by seepage water from higher lying soils.

[6] Subject to overflow during extremely high water.

In columns A are estimates of yields to be expected under practices of management now prevailing, and in columns B, yields to be expected under the best known practices of soil management. As will be noted in studying this table, the soils differ widely in productivity and in their response to different methods of management.

For the soils of the uplands the management defined for columns A includes light to moderately heavy applications of complete fertilizer with small grains that are to be followed by hay crops, and light or no applications for corn. Phosphate alone is used in many areas on corn and small grain and in some areas with small grain alone. Lime is used on the uplands by a considerable number of farmers, and the quantity used has increased rapidly in the last few years. Few permanent pastures receive any treatment in the form of lime or phosphate fertilizer. Neither the rotation nor the selection of crops is best suited to soil needs. Strip cropping and contour tillage are being practiced in parts of the county but are not yet common.

The figures in columns B are largely estimates because only a small part of the land in the county is being managed under the best known practices of soil management. Although accurate data are not sufficient to support these figures adequately, it is thought that they represent reasonably well the yields to be expected under best practices of management. These management practices include the best choice of crops and rotations; use of commercial fertilizer, lime, and manure; proper tillage methods; the return of all possible organic matter to the soil; and mechanical means of water and erosion control where necessary—all carried on with the object of maintaining and increasing soil productivity within profitable limits.

The data in table 5 are based chiefly on information acquired through field observations and consultation with farmers in the county and competent agricultural specialists in the State. Actual crop yields were used whenever available, as they furnish the best available summation of the factors that contribute to productivity—mainly climate, soil (including drainage and relief), and management. The specific management requirements of individual soils are discussed in the section Soil Series, Types, and Phases.

It may be interesting to compare the productivity of the soils of Culpeper County (table 5) with what might be considered average yields on some of the best soils of the United States as shown in the following tabulation.

Crop:	*Area*	*Yield*
		Bushels
Cereals:	Iowa-Illinois, on Muscatine silt loam:	
Hybrid corn	Good management	75. 0
	Fair management	65. 0
Winter wheat	Illinois-Iowa, on dark prairie soils (good management).	25. 0
Barley	California, on irrigated soils	40. 0
	Illinois-Iowa-Minnesota, on dark prairie soils (good management).	34. 0
Oats for grain	Illinois-Iowa, on dark prairie soils (good management).	50. 0
Hay:		*Tons*
Red clover	Illinois-Iowa, on dark prairie soils (good management).	1. 7
Alfalfa	California, on irrigated soils	4. 5
	Iowa-Illinois, on nonirrigated dark prairie soils.	2. 7
Red clover and timothy mixed.	Northeastern States, on better soils	2. 0

Crop—Continued	Area	Yield (Cow-acre-days)
Permanent pasture	Iowa-Illinois, on dark prairie soils (good management).	190
	Oregon-Washington coastal sections, on better alluvial soils.	500
	California, on irrigated soils	500

SOILS GROUPED ACCORDING TO THEIR RELATIVE SUITABILITY FOR FARMING

Each soil unit is differentiated on the basis of both internal and external characteristics significant to land use; and each possesses individuality significant to land use and to management requirements. By assembling this detailed data for individual units it is possible to group the units for specific purposes. The soils of the county are grouped according to their physical suitability for farming in table 6. The grouping is based on productivity, workability, and conservability and consists of five classes. The land classes indicate relative suitability of soil units for crops, grazing, and forestry.

TABLE 6.—*Soils of Culpeper County, Va., grouped according to relative suitability for farming*

Soil	Productivity	Workability	Conservability
FIRST-CLASS SOILS—GOOD TO EXCELLENT CROPLAND AND GOOD TO EXCELLENT PASTURE LAND			
Davidson clay loam, undulating phase.	High [1]	Fairly easy	Fairly easy.
Hiwassee loam, undulating phase.	do	Easy	Do.
Rapidan silty clay loam, undulating phase.	do	Fairly easy	Do.
Starr silt loam	do	Easy	No problem.
State loam	do	do	Do.
SECOND-CLASS SOILS—FAIR TO GOOD CROPLAND AND FAIR TO EXCELLENT PASTURE LAND			
Brecknock silt loam	Moderately high	Easy	Fairly easy.
Bucks silt loam, undulating phase.	do	do	Easy.
Cecil fine sandy loam:			
Eroded undulating phase	do	Fairly easy	Fairly easy.
Undulating phase	do	Easy	Do.
Congaree fine sandy loam	High	Easy (except in flood season).	Considerable washing takes place in plowed fields during high floods.
Congaree silt loam	do	do	Do.
Culpeper loam:			
Eroded undulating phase	Moderately high	Fairly easy	Fairly easy.
Undulating phase	do	Easy	Do.
Davidson clay loam, rolling phase.	High [1]	Fairly easy	Moderately difficult.
Fauquier silt loam, undulating phase.	Moderately high [1]	do	Fairly easy.
Hayesville loam, undulating phase.	do	Easy	Do.
Hiwassee loam, undulating light-colored phase.	do	do	Do.
Lloyd loam, undulating phase	do [1]	do	Do.
Mecklenburg silt loam	do	Fairly easy	Do.
Rapidan silty clay loam, eroded rolling phase.	do	Moderately difficult	Moderately difficult.
Seneca silt loam	do [1]	Fairly easy	No problem.
Wadesboro silt loam, undulating phase.	do	do	Fairly easy.
Zion silt loam	do	do	No problem.

See footnote at end of table.

TABLE 6.—*Soils of Culpeper County, Va., grouped according to relative suitability for farming*—Continued

THIRD-CLASS SOILS—POOR TO FAIR CROPLAND

Soil	Productivity	Workability	Conservability
Albemarle fine sandy loam			
Eroded rolling phase	Medium to low [1]	Moderately difficult	Moderately difficult.
Rolling phase	Medium	Fairly easy	Do.
Undulating phase	do [1]	Easy	Fairly easy.
Aldino silt loam:			
Eroded rolling phase	Medium to low	Moderately difficult	Moderately difficult.
Undulating phase	Medium [1]	Fairly easy	Fairly easy.
Altavista loam, undulating phase.	do [1]	do	Do.
Appling fine sandy loam:			
Rolling phase	Medium to low [1]	do	Moderately difficult.
Undulating phase	Medium [1]	Easy	Fairly easy.
Bucks silt loam, eroded rolling phase.	do	Moderately difficult	Moderately difficult.
Buncombe loamy fine sand	Medium to low [1]	Easy	No problem.
Catlett silt loam, undulating phase.	Medium	Fairly easy	Fairly easy.
Cecil fine sandy loam:			
Eroded rolling phase	do	Moderately difficult	Moderately difficult.
Rolling phase	Moderately high	Fairly easy	Do
Chewacla silt loam	Medium	Moderately difficult (some areas require drainage).	No problem.
Croton silt loam:			
Level phase	Medium to low	Moderately difficult	Do
Undulating phase	do	do	Do.
Culpeper clay loam			
Eroded rolling phase	do [1]	Difficult	Difficult
Eroded undulating phase	Moderately high [1]	Moderately difficult	Moderately difficult.
Culpeper loam:			
Eroded rolling phase	Medium [1]	do	Do.
Rolling phase	Moderately high [1]	Fairly easy	Do.
Davidson clay, rolling phase	do [1]	Moderately difficult	Do.
Elioak loam	do [1]	Fairly easy	Do.
Fauquier silt loam, rolling phase.	do [1]	Moderately easy	Do.
Fauquier silty clay loam, rolling phase.	Medium to low	Moderately difficult	Difficult.
Halewood loam, rolling phase	do [1]	Fairly easy	Moderately difficult.
Hayesville loam, rolling phase	Medium	do	Do
Helena fine sandy loam	Medium to low	Moderately difficult	Fairly easy.
Hiwassee loam, eroded rolling light-colored phase.	do	do	Moderately difficult
Kelly silt loam	do	Difficult	Fairly easy.
Lansdale silt loam.			
Level phase	do [1]	Moderately difficult	No problem.
Undulating phase	do	Fairly easy	Fairly easy.
Lignum silt loam	Low [1]	Moderately difficult	Do
Lloyd clay loam, rolling phase	Medium to low	do	Difficult.
Manor silt loam			
Eroded rolling phase	do [1]	Fairly easy	Moderately difficult
Rolling phase	Medium [1]	do	Do.
Masada loam:			
Rolling phase	Medium to low [1]	do	Do.
Undulating phase	Medium [1]	Easy	Fairly easy.
Nason silt loam, undulating phase.	Medium to low [1]	Fairly easy	Do.
Penn silt loam, undulating phase.	Medium [1]	do	Do.
Tatum silt loam:			
Rolling phase	Medium to low [1]	Moderately difficult	Moderately difficult.
Undulating phase	do [1]	Fairly easy	Fairly easy.
Wadesboro silt loam, eroded rolling phase.	do [1]	Moderately difficult	Moderately difficult.
Yadkin loam	do [1]	Fairly easy	Fairly easy.
Zion silt loam, eroded phase	Medium to low [1]	Moderately difficult	Do.

See footnote at end of table.

TABLE 6.—*Soils of Culpeper County, Va., grouped according to relative suitability for farming*—Continued

FOURTH-CLASS SOILS—GENERALLY BEST SUITED TO PASTURE

Soil	Productivity	Workability	Conservability
Albemarle fine sandy loam, eroded hilly phase.	Low	Difficult	Difficult.
Altavista loam, level phase	do	Difficult (requires drainage).	No problem.
Appling fine sandy loam, eroded rolling phase.	Medium to low	Difficult	Difficult.
Catlett silt loam, eroded rolling phase.	Low	Moderately difficult	Do.
Catoctin silt loam	do	Difficult (parent rock near surface).	Do.
Cecil fine sandy loam, eroded hilly phase	Medium to low	Difficult	Do.
Culpeper clay loam, eroded hilly phase.	Low	do	Do.
Culpeper loam, eroded hilly phase.	Medium to low	do	Do.
Davidson clay, eroded hilly phase.	do	do	Do.
Davidson clay loam:			
Eroded hilly phase	do	do	Do.
Hilly shallow phase	do	do	Do.
Elioak loam, eroded phase	Medium	Moderately difficult	Do.
Fauquier silt loam, eroded hilly phase.	do	do	Do.
Fauquier silty clay loam, eroded hilly phase.	do	Difficult	Do.
Halewood loam, hilly phase	Medium to low	Moderately difficult	Do.
Hayesville loam, eroded hilly phase.	Low	Difficult	Difficult.
Hazel loam:			
Hilly phase	Medium to low	do	Do.
Steep phase	Low	do	Do.
Hiwassee loam:			
Eroded hilly light-colored phase.	do	do	Do.
Eroded rolling phase	Medium to low	Moderately difficult	Moderately difficult.
Iredell silt loam:			
Eroded undulating phase	Low	Difficult	Difficult.
Level phase	do	do	No problem.
Undulating phase	Medium	do	Fairly easy.
Iredell stony silt loam	Medium to low	do	Do.
Eroded phase	Low	do	Moderately difficult.
Lloyd clay loam, eroded hilly phase.	do	do	Difficult.
Lloyd loam, eroded rolling phase.	Medium to low	Fairly easy	Do.
Louisburg fine sandy loam, rolling phase.	Low	do	Moderately difficult.
Manor silt loam, eroded hilly phase.	do	Difficult	Difficult.
Manteo shaly silt loam, rolling phase.	Low	Moderately difficult	Do.
Mixed alluvium	Medium to low	do	No problem.
Nason silt loam, rolling phase	do	Fairly easy	Moderately difficult.
Penn silt loam, eroded rolling phase.	do	Moderately difficult	Do.
Rapidan silty clay loam, eroded hilly phase.	do	Difficult	Difficult.
Roanoke silt loam	Low	Difficult (requires drainage).	No problem.
Stanton silt loam	do	do	Do.
Stony land:			
Acidic rocks	do	Difficult	Moderately difficult.
Basic rocks	Medium	Practically impossible	Fairly easy.
Tatum silty clay loam, rolling phase.	Medium to low	Moderately difficult	Moderately difficult.
Tatum silt loam, hilly phase.	do	Difficult	Difficult.
Watt silt loam:			
Eroded hilly phase	Low	do	Do.
Rolling phase	Medium to low	Moderately difficult	Do.
Wehadkee silt loam	Low	Difficult (requires drainage).	No problem.
Wilkes soils, undifferentiated	do	Difficult	Difficult.
Worsham silt loam	do	Difficult (requires drainage).	No problem.

See footnote at end of table.

TABLE 6.—*Soils of Culpeper County, Va., grouped according to relative suitability for farming*—Continued

FIFTH-CLASS SOILS—GENERALLY BEST SUITED TO FOREST

Soil	Productivity	Workability	Conservability
Elbert silt loam	Low	Difficult (requires drainage)	No problem.
Halewood loam, eroded hilly phase.	do	Difficult	Difficult.
Louisburg fine sandy loam, eroded hilly phase	do	do	Do.
Manteo shaly silt loam, hilly phase.	do	do	Do.
Nason silt loam, hilly phase	do	do	Do
Penn silt loam, eroded hilly phase.	do	do	Do.
Rough gullied land	do	Practically impossible	Do.
Tatum silty clay loam, hilly phase.	do	Difficult	Do.
Very stony land:			
Acidic rocks	do	Practically impossible	Do.
Basic rocks	do	do	Do.

[1] With amendments.

FIRST-CLASS SOILS

First-class soils are good to excellent cropland and comprise approximately 5 percent of the county. They differ in profile development, parent materials, relief, and other respects but all are similar in productivity, workability, and requirements for conservation.

First-class soils are relatively high in plant nutrients and contain a moderate quantity of organic matter. They are acid but not to a degree detrimental to plant growth. All the soils require only moderate quantities of lime and are responsive to other soil amendments. They are well drained, retentive of moisture, and can be depended upon to produce a crop when other soils might fail because of less favorable moisture conditions. Tilth conditions are generally favorable, but the suitable moisture range is narrower in Rapidan silty clay loam, undulating phase, and in Davidson clay loam, undulating phase, than in other soils of the group. Good soil structure and aeration combined with favorable moisture conditions favor the growth of soil micro-organisms which aid in the decomposition of plant residues and release of plant nutrients.

First-class soils possess moderately smooth slopes and present little or no conservation problem resulting from runoff. They are suitable for continuous cultivation to all crops grown in the county, although the crops should be grown in rotations to conserve the soil and produce maximum yields.

SECOND-CLASS SOILS

Second-class soils, fair to good cropland, cover approximately 15 percent of the county. They are all moderately productive but present problems in workability and conservability. They possess to varying degree one or more less favorable soil factors, as frequent overflow, moderate leaching, limited supply of plant nutrients, rolling relief, and erosion damages. These factors are absent or present to only slight degree in First-class soils.

Second-class soils are medium in content of plant nutrients and contain a small quantity of organic matter under the farming now practiced. They are derived from a variety of parent materials. These soils are acid and require moderate to large quantities of lime. They are all responsive to fertilizers. They are well drained to somewhat poorly drained but vary among themselves in moisture-retention capacity. The soils of the uplands in this group have slightly less favorable moisture conditions than First-class soils of the uplands. Crops can be produced under normal conditions of rainfall. Tilth conditions are favorable except on the heavier soils, which have a narrower moisture range over which tillage operations can be carried on. Soil structure and aeration are moderately good.

These soils are slightly more difficult to conserve than those of the First class because they are subject either to periodic flooding or to moderately high runoff. They are adapted to all the common crops if those crops are grown in suitable rotations. Some of the soils are moderately eroded; these, as well as those on more sloping areas, require contour tillage, and in places strip cropping may be advisable.

THIRD-CLASS SOILS

Third-class soils, fair to poor cropland, make up almost one-third of the total land area. They are medium to low in productivity, moderately difficult to work, and in general present more difficult problems of conservation than the Second-class soils. Each possesses to varying degree one or more of the following undesirable soil characteristics: Low organic-matter content, poverty of plant nutrients, rolling relief, erosion damage, shallowness to bedrock, and impeded drainage. Because these detrimental soil characteristics affect the use suitability and management requirements, these soils are more difficult to manage than Second-class soils. Some Third-class soils are adapted to row crops, whereas others should have only close-growing crops planted on them. Yields are low.

FOURTH-CLASS SOILS

Fourth-class soils, occupying approximately 39 percent of the total area, are unsuitable for crop production because of low productivity, difficult workability, or excessive conservation requirements. They are moderately productive of grasses, however, and for this reason are recommended for pasture. They possess to a pronounced degree one or more of such unfavorable soil characteristics as low organic-matter content, poverty of plant nutrients, hilly relief, severe erosion, shallowness to bedrock, stoniness, impeded drainage, and susceptibility to occasional overflow. Few profile features are common to all of these soils because the soils are derived from a wide variety of parent materials and include many types and phases. The soils do have about the same productivity, however, and all of them present many management problems where cultivation is attempted.

Pasture is generally the best use for Fourth-class soils. Not all of them listed (table 6) are now used for pasture; some are cultivated and others are in woods. On individual farms needing pasture land it may be necessary to stop using these soils for crops and to pasture some of the wooded areas. Some of the eroded or hilly soils do not have a high moisture-holding capacity and are low in organic-matter

content. It may be difficult to get a sod established on the eroded soils unless lime, fertilizer, and manure are used.

FIFTH-CLASS SOILS

The Fifth-class soils differ from the Fourth-class in having a greater number or more intense expression of such undesirable soil and land characteristics as low water-holding capacity, poverty of plant nutrients, shallowness to bedrock, steepness of slope, severe erosion damage, stoniness, and poor drainage. Unlike the Fourth-class soils, their water-holding capacity is too low for the production of pasture grasses, and difficulty is experienced in keeping or establishing a vegetative cover on cleared land. Because they are not suitable for crops or grazing, these soils are best used for forest, even though they do not grow the best trees. The members of this class are derived from many different kinds of parent materials and include seven soil types and phases and three miscellaneous land units; they comprise about 8 percent of the total land area.

FORESTS

According to early accounts the first explorers and settlers found all this county except the Triassic plain densely wooded. The plain had some fine grassland in the level open areas. The timber growth was originally deciduous hardwood, with a few shortleaf, white, and scrub pines, and redcedar, and in the northwestern part of the county, a scattering of hemlock. The best long-bodied timber grew on the most productive soils that were first to be cleared for agriculture. Except for a small amount used to build necessary farm buildings, the timber cut in making early clearings was rolled into piles and burned.

Slightly more than a third of the total land area is now in timber. Little of the virgin timber remains; the forest stands consist of two types: (1) Cut-over hardwoods, and (2) second-growth nearly pure stands of scrub pine that have come in on land previously cleared but now abandoned.

The following is a list of the common and scientific names of trees and shrubs in Culpeper County:

Scientific name	*Common name*
Acer rubrum	Red maple
Alnus rugosa	Smooth alder
Amelanchier canadensis	Downy serviceberry
Carpinus caroliniana	Blue beech
Carya alba	Mockernut (white) hickory
C. glabra	Pignut hickory
C. ovata	Shagbark hickory
Castanea dentata	Chestnut
Celtis occidentalis	Hackberry
Cephalanthus occidentalis	Buttonbush
Cercis canadensis	Redbud
Cornus florida	Dogwood (flowering)
C. stolonifera	Red-osier
C. americana	Hazelnut
Crataegus	Hawthorn

Scientific name	*Common name*
Fagus grandifolia	American beech
Gaylussacia baccata	Huckleberry
Hamamelis virginiana	Witch-hazel
Ilex opaca	American holly
Juglans nigra	Black walnut
Juniperus virginiana	Redcedar
Kalmia latifolia	Mountain-laurel
Liriodendron tulipifera	Yellow-poplar
Nyssa sylvatica	Blackgum
Pinus echinata	Shortleaf pine
P. virginiana	Scrub pine
Platanus occidentalis	Sycamore
Quercus alba	White oak
Q. bicolor	Swamp white oak
Q. borealis	Northern red oak
Q. coccinea	Scarlet oak
Q. marilandica	Blackjack oak
Q. montana	Chestnut oak
Q. phellos	Willow oak
Q. rubra	Southern red oak
Q. stellata	Post oak
Q. velutina	Black oak
Rhus copallina	Dwarf sumac
Robinia pseudoacacia	Black locust
Salix fragilis	Crack willow
Sambucus canadensis	American elder
Sassafras albidum	Sassafras
Smilax rotundifolia	Smilax (greenbrier)
Ulmus americana	American elm
Vaccinium corymbosum	Highbush blueberry
V. stamineum	Deerberry
V. vacillans	Lowbush blueberry
Viburnum prunifolium	Blackhaw

Forest is not confined to stony, steep, and eroded lands as it is in many of the mountainous counties of the State. It may be on nearly level to gently rolling stone-free land that may or may not be eroded. Most of the forest land is in isolated wood lots that occur on nearly all farms. Exceptions are two large continuous tracts being held mainly for the forest products they produce. One of these tracts, known as the Cedar Flats or Blackjack Country, lies south of Mount Pony and parallels the Rapidan River from Rapidan to Batna. The other tract is in the extreme eastern part of the county in what is known as the Neck Section, or east of Lignum between the Rapidan and Rappahannock Rivers. This tract last-named is discussed under the forest of the Nason-Tatum group.

The type and growth of timber in an area is largely an expression of the type of soil and of land conditions such as moisture, degree of erosion, stoniness, and steepness. On the basis of predominance of certain species, the forest of Culpeper County can be discussed under the following divisions: (1) Nason-Tatum group; (2) Iredell group; (3) Davidson-Fauquier group; (4) Culpeper-Albemarle group; and (5) Congaree-Chewacla group. The forest trees and shrubs occurring in each of these groups are listed in table 7, together with the soil series belonging to each group. The five groups are discussed in the following pages.

TABLE 7.—*Common names of principal trees and shrubs in Culpeper County, Va., by groups of soil series*

Soil group	Trees	Shrubs
CONGAREE-CHEWACLA GROUP:		
Somewhat poorly and poorly drained alluvial and colluvial soils—Chewacla, Wehadkee, Worsham.	Elm, swamp white, and willow oaks, sycamore, red maple, hackberry, blue beech, and willow	Red-osier dogwood, buttonbush, elderberry, smilax, smooth alder
Excessively to moderately well drained alluvial and colluvial soils—Buncombe, Congaree, Seneca, Starr, State.	White, red, and scarlet oaks, black walnut, yellow-poplar, hackberry	Hazelnut, witch-hazel, lowbush and highbush blueberries, lowbush and highbush huckleberries, spicebush.
IREDELL GROUP (Somewhat poorly to poorly drained soils with heavy subsoil—Croton, Elbert, Iredell, Kelly, Roanoke, Stanton, Zion).	Swamp white, willow, scarlet, post, blackjack, and white oaks, redcedar, scrub pine, blue beech, elm, shagbark (scalybark), pignut and mockernut (white) hickories, red maple	Smilax, red-osier dogwood, wild rose, spicebush.
DAVIDSON-FAUQUIER GROUP (Deep well to moderately well drained soils of uplands and terraces, chiefly from basic rock materials—Brecknock, Bucks, Davidson, Elloak, Fauquier, Hiwassee, Lloyd, Mecklenburg, Rapidan).	White, black, Northern red, Southern red, scarlet, and post oaks, yellow-poplar, shortleaf, scrub, and white pines, black walnut, black locust, dogwood, redcedar, shagbark, mockernut (white) and pignut hickories.	Redbud, mountain-laurel, huckleberry, blueberry, blackhaw, hawthorn, smilax, sumac.
CULPEPER-ALBEMARLE GROUP (Excessively to somewhat poorly drained soils of uplands and terraces, chiefly from acidic rock material—Albemarle, Aldino, Altavista, Appling, Catlett, Catoctin, Cecil, Culpeper, Elloak, Halewood, Hayesville, Hazel, Helena, Lansdale, Louisburg, Manor, Masada, Penn, Wadesboro, Watt, Wilkes, Yadkin).	White, black, scarlet, post, Northern red, Southern red, and chestnut oaks,[1] chestnut sprouts,[1] scrub and shortleaf pines, dogwood, redcedar, sassafras, blackgum, shagbark (scalybark), pignut and mockernut hickories, yellow-poplar.	Serviceberry, witch-hazel, hazelnut, azalea, lowbush huckleberry, lowbush blueberry, dangleberry, mountain-laurel,[1] sumac.
NASON-TATUM GROUP[2] (Excessively to moderately well drained soils of uplands formed from sericite schist—Lignum, Manteo, Nason, Tatum).	White, red, black, scarlet, chestnut, and post oaks, scrub and shortleaf pines, blackgum, dogwood, redcedar, beech, holly, shagbark (scalybark), mockernut and pignut hickories	Dangleberry, mountain-laurel, huckleberry, blueberry, smilax, sumac.

[1] Most of the chestnut sprouts, chestnut oak, and mountain-laurel are growing on Hayesville, Halewood, and Yadkin soils in the extreme western part of the county

[2] The tree and shrub growth on this group of soils differs from that on other groups mainly in the amount of mountain-laurel on northern and eastern slopes, the number of beech trees present (these rarely occur in other parts of the county), and the predominance of white oak in oak stands.

CONGAREE-CHEWACLA GROUP

The Congaree-Chewacla group includes the well-drained Buncombe, Congaree, Seneca, Starr, and State soils and the somewhat poorly to poorly drained Chewacla, Wehadkee, and Worsham soils. Most of these soils have been cleared and cultivated, and the tree growth on the remaining uncleared areas consists largely of river or red birch, sycamore, boxelder, smooth alder, and blue beech. Some yellow-poplar and black walnut are growing on the well-drained Congaree and State soils, whereas white ash does better on the poorly drained soils.

IREDELL GROUP

The chief soils in the Iredell group—the Iredell, Elbert, Kelly, Croton, Roanoke, Stanton, and Zion—all have restricted drainage. A large part of the Iredell and Elbert soils occurs in one continuous area, known as the Cedar Flats or Blackjack Country, which is mostly in timber. A number of large farms lie around this section, and most of them have some forest on Elbert or Iredell soils. Redcedar is the most characteristic tree on the Iredell soils in this county, although in many other places blackjack oak, from which the soil derives the

local name of blackjack land, is prevalent. Where the land has been cleared pure stands of redcedar and a few scrub pine have seeded in. On the other soils of this group, swamp white and post oaks are the characteristic trees.

Redcedar probably yields the highest financial return because it is suitable for fence posts, which are in great demand. A combination fence post-and-Christmas tree harvesting cycle could be used. For this cycle plant redcedar trees so thickly that the stand left after cutting the Christmas trees will supply a crop of fence posts. Redcedar should be confined to the Iredell soils because it does not grow well on the others; swamp white oak is better adapted to the wetter soils.

DAVIDSON-FAUQUIER GROUP

The most important soils of the Davidson-Fauquier group—the Davidson, Rapidan, Bucks, Fauquier, and Lloyd—have been cleared and are now used for pasture or crops; only a few small areas remain in forest.

Where the stands have not been cut over too heavily, the percentage of yellow-poplar, black walnut, and black locust is much greater than in similar stands growing on other soils in the county. The permanent pasture on these soils, most of which are steep, could be improved by planting a few black locust and black walnut trees to each acre. The pasture would not be impaired, for some grasses, especially bluegrass, seem to grow better under the partial shade produced by the leaves of black locust and black walnut trees. The cost of planting would be small, and the fence posts and lumber these trees produce would be an extra source of income. Protection of the young trees from grazing and trampling would be necessary, however, until they were well established.

Nearly all of the forest on these soils is in the form of farm wood lots, and the total acreage is not large. These wood lots, usually hardwood and containing nearly every species native to this region, have received poor treatment and no definite system of management. The quality of the products from these wood lots would be improved and the quantity increased if a few simple measures were systematically followed. The crooked, slow-growing trees, as well as some of the less desirable species, as scarlet, pin, and black oaks, hickory, and scrub pine, should be cut for firewood. Grazing of wood lots should be stopped, for though they may furnish a little browse, the loss caused by damage to forest growth exceeds the small value gained. The young growth is trampled or bitten off by the grazing animals, and the soil becomes compacted and runoff is thereby increased. If grazing has been practiced for a long period, sheet erosion takes place on the steeper slopes. Openings with no young growth could be planted to black walnut, black locust, or white oak.

CULPEPER-ALBEMARLE GROUP

The Culpeper-Albemarle group includes, among others, the Culpeper, Albemarle, Cecil, Appling, Hayesville, Halewood, Elioak, and Manor soils. The forests were originally hardwood, but areas that have been cleared and later abandoned have seeded to scrub pine and some shortleaf pine. Although not so productive as soils of the Davidson-Fauquier group, these soils are capable of producing good forest if

they are not seriously eroded. In large percentage the soils of this group are in individual wooded tracts a few to several hundred acres in size.

Not all of the wooded areas are steep; some, as the extensive areas of Culpeper soils, are nearly level to rolling. Land use could be adjusted to bring the smoother land into cultivation and to retire some of steeper areas not suitable for farming. Much of the land in this group is idle, and the vegetation consists of a few scattered scrub pines within a growth of broomsedge and dewberry briers. Essentially no pasture grasses are present, and the short, limby, scattered pines are of little or no value.

Most of the forest stands on these soils have been heavily cut. All the older trees have been removed, leaving culls of mixed species and young scrub pine. If these stands of timber were properly managed and cut by the selective system, the yields would be larger and more frequent than under the present system, which is that of cutting every tree large enough to make a sawlog. These farm wood lots should add considerably to farm income when managed properly, especially when the forest acreage equals half or more of the total farm area and is on soils that have not been severely eroded. Where planting is necessary to establish a stand, shortleaf pine will probably give the best returns.

NASON-TATUM GROUP

The Nason-Tatum group includes the Nason, Tatum, Lignum, and Manteo soils of the eastern part of the area known as the Neck Section. These are among the least productive soils of the county. This is reflected not only in the small acreage of cleared land now cropped and in the low yields obtained, but also in the relatively slow growth of trees in forested areas. Many old fields are reverting to forest, seeding naturally to scrub pine and an occasional shortleaf pine. The areas that have never been cleared grow mixed hardwoods, an occasional white, shortleaf, or scrub pine, and a few redcedar. Some of the gravelly knolls of Nason silt loam, however, are capped with pure stands of chestnut oaks. The northern and eastern slopes of Manteo shaly silt loam are characterized by a dense undergrowth of mountain-laurel.

The height of the larger trees in a stand is considered the best indication of the quality of the site (the composite of those factors influencing the growth of the trees, of which soil is one of the most important). In this section the trees characteristically have short trunks. The tallest trees of any species are not so tall as trees of the same species on any other soil in the county except the poorly drained Elbert, Stanton, and Croton, which occur in the area known as the Cedar Flats.

Many merchantable trees are in this section; they are being cut by portable mills and the best are trucked to Culpeper or other concentration points. Under the present system of cutting all merchantable trees are removed. The growing stock on the steeper slopes of the Nason, Tatum, and Manteo soils is often so depleted that sheet erosion and, in some cases, gully erosion occurs before enough young trees have become established to provide a protective cover for the soil. This could easily be remedied by leaving enough of the stand

to protect the soil, to furnish seed to restock the area, and to serve as an insurance measure in case of fire.

The trees grow slowly in this section and a long period will elapse under the present cutting system before stands are fully restocked; consequently it is unprofitable for individuals to hold cut-over land for future timber production. This area would be best used as a combination forest and game preserve under either State or county ownership. It will probably remain in private ownership for a long time, however, because land prices have been so much inflated by past gold-mining activities.

MORPHOLOGY AND GENESIS OF SOILS [8]

Culpeper County, in the northeastern part of Virginia, lies in two important soil regions of the United States—the Red-Yellow Podzolic soils region and the Gray-Brown Podzolic soils region (*3*). The county is entirely in the Piedmont physiographic province (fig. 2).

The upland is a highly dissected old plain having much relief, whereas the lowland is less dissected but more uniformly peneplained. Local relief is increased on the upland by occasional monadnock hills and on the lowland by small hills and mountains of diabase sills and laccoliths. Drainage is well established on the upland, but less so on the lowland. The elevation ranges from 150 feet above sea level where the Rappahannock River leaves the county to 900 feet above sea level on Bald Mountain in the western part of the county.

Soil is the product of the forces of the environment acting upon the soil materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by: (1) The physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the relief or lay of the land; (4) the biologic forces acting upon the soil material—the plant and animals living upon and in it; and (5) the length of time the climatic and biologic forces have acted upon the soil material.

The parent materials of the soils, except those on the bottoms and terraces, are the decomposition products of the weathering of massive rock formations underlying the county. These formations, varying greatly in age from pre-Cambrian to Triassic, lie in a general northeast-southwest direction and are composed largely of various kinds of granite, gneiss, schist, greenstone, diabase, granodiorite, sandstone, shale, and inclusions of quartzite.

The oldest rocks are the metamorphosed sedimentaries of pre-Cambrian age included in the Wissahickon and Fauquier formations. The Wissahickon formation, in the extreme eastern part of the county, is composed principally of sericite and some chlorite-muscovite schist. The Fauquier formation, in the northern part of the county, is com-

[8] Prepared by A. J. Vessel, Division of Soil Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture.

posed of graphitic slate, quartz mica schist, and some biotite gneiss. Closely associated with the Fauquier formation is the Loudoun, of Cambrian age, that consists of arkosic sandstone and quartzite.

The western part of the county is underlain by granite, gneiss, and mica schist of pre-Cambrian age. Extending across the west-central part of the county in a northeast-southwest direction is a disconnected belt of Catoctin greenstone or metamorphosed basaltic lava of pre-Cambrian age, which comprises the oldest igneous rock of the area. Paralleling this belt is the Triassic formation that comprises the most recent sedimentary and igneous rocks of the area. It consists of red and yellow shale, mudstone, and sandstone, together with sills, dikes, and laccoliths of diabase.

Climate and vegetation are the two most important forces in the development of zonal soils. Climate directly affects the weathering of parent material and the establishment of water percolation through the soil. Indirectly, climate is responsible for the types and variations in plant and animal life. The forces of climate acting alone on parent materials without living organisms would be largely destructional, resulting in the eluviation of soluble and some colloidal materials. With the introduction of living organisms the processes become largely constructional, and a reversible cycle between intake and outgo of plant nutrients is established in which surface horizons are constantly being renewed by nutrients brought from lower horizons. The living organisms important in soil formation are plants and micro-organisms, largely bacteria and fungi functioning to decompose raw plant waste into organic matter and incorporate it in the soil. Important functions of plants are to provide the organic matter and to bring moisture and plant nutrients from lower to upper horizons. The native vegetation consisted principally of deciduous trees.

The climate of Culpeper County is moderately warm and humid. Active leaching continues throughout the greater part of the year. The zonal soils of the area belong to the Gray-Brown Podzolic and the Red-Yellow Podzolic great soil groups. Because the climate and vegetation over the county are essentially the same, no pronounced morphological differences exist between the Gray-Brown Podzolic and the Red-Yellow Podzolic soils. In fact, the two groups merge gradually into each other. Chemically it might be shown that the Gray-Brown Podzolic soils are more thoroughly leached and eluviated (podzolized) than those occurring farther north, and that the Red-Yellow Podzolic soils are less leached (podzolized), and that laterization is not so pronounced as on the same soils occurring farther south.

SOIL CLASSIFICATION

The soil series of the county are classified by orders and great soil groups in table 8, and some factors that have contributed to their morphology are given.

TABLE 8.—*Soil series of Culpeper County, Va., classified by soil orders and great soil groups, and some factors that have contributed to their morphology*

ZONAL SOILS

Great soil group and series	Relief	Internal drainage	Parent material
Gray-Brown Podzolic soils:			
Brecknock	Undulating to gently sloping	Moderate to slow	Baked medium-gray shale and mudstone of Triassic age.
Bucks	Nearly level to rolling	Moderate	Reddish-brown shale with a purplish cast ("Indian Red" shale) of Triassic age.
Elioak	Undulating to hilly	do	Mainly granite gneiss and mica schist.
Fauquier	do	do	The epidote and chlorite phases of the Catoctin greenstone.
Lansdale	Nearly level to undulating	Moderate to slow	Brownish and yellow shales of Triassic age.
Manor	Undulating to hilly	Moderate to rapid	Mica schist in places containing stringers of quartz.
Red-Yellow Podzolic soils:			
Albemarle	do	Moderate	Arkosic sandstone and quartzite, and granite gneiss.
Altavista	Nearly level to undulating	Moderate to slow	Alluvial deposits from granite and granite gneiss on second bottoms and terraces.
Appling	Undulating to rolling	Moderate	Granite and granite gneiss.
Cecil	do	do	Do.
Culpeper	do	do	Mixed arkosic sandstone, quartzite, and some granite gneiss.
Davidson	Undulating to steep	do	Basic igneous rocks—diabase, diorite, greenstone, and in places trap conglomerate.
Halewood	Rolling to hilly	do	Granite gneiss, granodiorite, and mica schist.
Hayesville	Undulating to steep	do	Do.
Hiwassee	Undulating to rolling	do	Old alluvial deposits from mountain and foothill soils such as Hayesville and Porters. Mixtures of reddish-brown Triassic shale and basic igneous rock such as greenstone and trap conglomerate.

TABLE 8.—*Soil series of Culpeper County, Va., classified by soil orders and great soil groups, and some factors that have contributed to their morphology*—Continued

ZONAL SOILS—Continued

Great soil group and series	Relief	Internal drainage	Parent material
Lloyd	Undulating to hilly	Moderate	Mixed basic and acidic igneous rock such as greenstone and granite gneiss or granodiorite.
Masada	Undulating to rolling	Moderate to slow	Old alluvial deposits of sand, silt, clay, and rounded water-worn quartzite rock.
Mecklenburg	do	Slow	Dark-colored basic rocks, as diorite and diabase.
Nason	Undulating to hilly	Moderate to slow	Very fine-grained sericite schist.
Rapidan	do	Moderate	Mixtures of reddish-brown Triassic shale and basic igneous rock such as greenstone and trap conglomerate.
Tatum	do	do	Fine-grained sericite schist.
Wadesboro	Undulating to rolling	do	Brown, reddish-brown, and purplish shale and mudstone of Triassic age.
Yadkin	do	do	Mica schist, granite, and granodiorite.

INTRAZONAL SOILS

Planosols and semi-Planosols:			
Aldino	Undulating to rolling	Moderate to slow	Light-colored greenstone and schisty greenstone of the Warrenton agglomerate member of the Catoctin series.
Croton	Nearly level to undulating	Slow to very slow	Reddish-brown shale and mudstone with purplish cast and yellow shale, gray shale, and greenish-colored shale, all of Triassic age.

Elbert	Nearly level or level	Very slow	Residual and colluvial materials from diabase, a basic igneous rock.
Helena	Undulating to rolling	Slow	Mixed acidic and basic rock such as granite and quartz diorite, or arkosic sandstone and quartz diorite.
Iredell	Nearly level to undulating	Very slow	Diabase, a basic igneous rock containing some quartz.
Kelly	do	do	Either red or gray Triassic shale, or sandstone mixed with varying amounts of basic material.
Lignum	Nearly level to rolling	Moderate to slow	Very fine-grained sericite schist.
Roanoke	Nearly level	Very slow	Alluvial deposits washed from the Piedmont and mountain uplands.
Stanton	do	do	Brown, yellow, and gray Triassic shale.
Zion	Undulating	Slow	Mixed basic igneous rock and Triassic shale.

AZONAL SOILS

Lithosols and lithosolic soils:			
Catlett	Undulating to rolling	Rapid to moderate	Bluish-gray highly metamorphosed Triassic shale.
Catoctin	Undulating to steep	do	Pale yellowish-green schisty greenstone; the agglomerate member of Catoctin greenstone series.
Hazel	Hilly to steep	Moderate to rapid	Garnetiferous and mica schists and arkosic sandstone.
Louisburg	Rolling to hilly	Rapid to very rapid	Highly acidic granite and granite gneiss, some from arkosic sandstone.
Manteo	do	Rapid to moderate	Sericite schist.
Penn	Undulating to hilly	do	Reddish-brown and purplish-red shale and mudstone of Triassic age.
Watt	Rolling to hilly	Moderate to rapid	Graphitic slate and schist.
Wilkes	Rolling to steep	Slow	Mixed basic and acidic rock, including granite, granite gneiss, basic schist, granodiorite, and schisty greenstone.

TABLE 8.—*Soil series of Culpeper County, Va., classified by soil orders and great soil groups, and some factors that have contributed to their morphology*—Continued

AZONAL SOILS—Continued

Great soil group and series	Relief	Internal drainage	Parent material
Alluvial soils:			
Buncombe	Nearly level	Very rapid	Recent alluvium washed from soils of the Piedmont Plateau and Blue Ridge Mountains.
Chewacla	do	Moderate to slow	Do.
Congaree	do	Moderate	Do.
Starr	Nearly level to gently sloping	do	Recent colluvium washed or sloughed from the reddish soils of the Piedmont Uplands.
Seneca	do	Moderate to slow	Recent colluvium washed or sloughed from the yellowish soils of the Piedmont Uplands.
State	Nearly level	Moderate	Recent alluvium washed from soils of the Piedmont Plateau and Blue Ridge Mountains.
Wehadkee	do	Very slow	Do.
Worsham	Nearly level to gently sloping	do	Residual or colluvial materials from granite, gneiss, and schist.

ZONAL SOILS

The zonal soils of the county in their virgin state range from gray to brown in surface soil color. In their uneroded state the texture ranges from fine sandy loam to clay loam. In forested areas a 1-inch layer of leafmold covers the surface and a small quantity of organic matter is mixed with the topmost inch or two of the surface soil. This organic matter, however, is soon lost when the soils are cultivated.

The A_2 horizon is relatively light colored and leached of bases. Some of these bases have accumulated in the colloidal complex of the B horizons, making them less unsaturated than the subsurface—an evidence of podzolization. The color of the B horizons ranges from light yellowish brown to moderate reddish brown; the B horizons are heavier textured than the A and show some accumulation of iron and alumina. The zonal soils of the county are low in phosphorus and in bases, particularly calcium and magnesium, although some have developed from basic rocks. They are medium, strongly, or very strongly acid.

RED-YELLOW PODZOLIC SOILS

The red subsoil members of the Red-Yellow Podzolic group are soils of the Cecil, Culpeper, Davidson, Hayesville, Hiwassee, Lloyd, Mecklenburg, Rapidan, Tatum, Wadesboro, and Yadkin series. Members with yellow subsoil are the Albemarle, Altavista, Appling, Halewood, Masada, and Nason.

The Culpeper soils are extensive and are developed from arkosic sandstone and quartzite. The following profile description of Culpeper loam, undulating phase, a characteristic Red Podzolic soil, was observed in a forested area 2 miles northwest of Culpeper:

A_0. 1½ to 0 inch, leafmold and forest litter; pH 4.0.
A_1. 0 to 1 inch, light olive-gray mellow loam containing a small quantity of organic matter.
A_2. 1 to 8 inches, yellowish-gray friable loam; pH 4.6.
B_1. 8 to 12 inches, light yellowish-gray moderately friable clay loam that breaks into irregularly shaped aggregates ½ to 2 inches in diameter; layer contains earthworm casts and numerous worm holes filled with darker soil from the layers above; pH 4.8.
B_2. 12 to 22 inches, strong-brown firm but brittle clay containing numerous small mica flakes; soil breaks out in irregularly shaped 1- to 2-inch aggregates difficult to crush to a granular mass; pH 5.0.
C. 22 inches +, strong-brown friable clay material highly streaked with pale yellow and light gray; contains a few small fragments of arkosic sandstone and mica schist; pH 5.1.

Chemical analyses of Culpeper fine sandy loam underlain by arkosic sandstone are given in table 9. Although the sample analyzed was taken in Albemarle County, it is believed that the data would apply to Culpeper soils here. The data show that podzolic processes were involved. There is higher concentration of iron, alumina, and calcium in the B horizon than in either the A or C horizon. The data showing the concentration of potassium, sodium, or phosphorus in any horizon, however, are not conclusive because compounds of these elements are soluble and may have washed into streams and rivers.

TABLE 9.—*Chemical analyses of Culpeper fine sandy loam* [1]

Depth (inches)	SiO_2	TiO_2	Fe_2O_3	Al_2O_3	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	SO_3
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
0–8	82. 59	0. 60	2. 41	7. 16	0. 055	0. 123	0. 25	1. 69	0. 091	0. 236	0. 025
8–22	55. 19	. 72	8. 92	24. 17	. 020	. 184	. 38	1. 74	. 044	. 135	. 022
22 +	61. 63	. 52	7. 32	23. 20	. 003	. 164	. 40	2. 41	. 074	. 114	. 020

[1] Analyses made in the laboratories of the Virginia Polytechnic Institute, Blacksburg, Va.

Albemarle fine sandy loam, which is associated with Culpeper loam, is a Red-Yellow Podzolic soil with a yellow subsoil and is derived from arkosic sandstone and quartzite. The following profile description of Albemarle fine sandy loam, undulating phase, observed in a wooded area near Woodlawn Church on highway No. 611, is typical:

A_0. 1½ to 0 inch, leafmold and forest litter; pH 4.2.
A. 0 to 12 inches, weak-yellow very friable fine sandy loam; pH 4.9.
B_1. 12 to 16 inches, weak-yellow very friable heavy loam containing numerous small holes and some worm holes; soil breaks out in irregularly shaped aggregates 1½ to 2 inches in diameter that crush to a granular mass under slight pressure; pH 5.0.
B_2. 16 to 28 inches, light yellowish-brown friable clay loam that breaks out into irregularly shaped lumps ¼ to 2 inches in diameter; pH 5.1.
C. 28 inches +, light yellowish-brown friable clay loam material mingled with light gray, light yellow, and moderate reddish brown; contains small quartz fragments ¼ inch or less in diameter and numerous fine mica flakes; pH 5.2.

The Davidson soils are of the Red-Yellow Podzolic group and are underlain by and derived from the weathered products of dark-colored basic rocks—dark-colored greenstones, diabase, and diorite—which contain little or no potassium. The greenstone is chiefly epidote greenstone schists, which abound in epidote and also contain some quartz. The quartz contains inclusions of titanium minerals, as ilmenite and sphene, as well as appreciable quantities of actinolite and chlorite. The red color results because free iron oxides formed during weathering of the epidote. Some laterization has taken place, as kaolinite and iron oxides are found in the clay fractions of the parent material. The slight leaching of this soil is probably due to the heavy texture and basic nature of the weathered parent material. Although the Davidson soil is derived from basic rocks, it is strongly acid throughout the solum.

The following is a profile description of Davidson clay loam, undulating phase, as observed in a pastured field 3 miles southeast of Brandy:

A. 0 to 14 inches, moderate-brown moderately friable clay loam having a fine granular structure; pH 5.4.
B. 14 to 66 inches, moderate reddish-brown to dark-red firm and compact clay that breaks out in irregularly shaped aggregates 1 to 6 inches in diameter; dark-brown concretions or streakings occur in lower part; numerous roots found throughout; pH 5.6.
C. 66 inches +, moderate reddish-brown compact clay, slightly more friable than the B horizon and containing yellowish-brown and yellowish-gray fragments of highly weathered parent rock; pH 4.9.

The chemical analyses of samples of Tatum silt loam and of Nason silt loam, Red-Yellow Podzolic soils with red and yellow subsoil, respectively, are given in table 10.

The samples for these analyses were taken in Orange County not far from where these soils occur in Culpeper County, and although the depths and thicknesses of the horizons do not correspond with the profiles described in this county, they probably represent the corresponding eluviated and illuviated horizons. There is little or no significant difference in the chemical composition of Nason and Tatum soils, although they differ in soil characteristics, particularly color.

TABLE 10.—*Chemical analyses of Nason silt loam and Tatum silt loam from Orange County, Va.*[1]

Soil type	Depth	SiO_2	TiO_2	Fe_2O_3	Al_2O_3	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	N	SO_3	Ignition loss
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Tatum silt loam	1–10	81. 09	1. 43	4. 03	7. 38	0. 06	0. 20	0. 26	1. 28	0. 03	0. 06	0. 05	0. 11	4. 03
	10–30	63. 57	1. 30	9. 06	18. 04	. 04	. 10	. 40	1. 40	. 08	. 07	. 03	. 12	6. 70
	30–40	45. 95	1. 06	14. 19	25. 97	. 04	. 26	. 47	2. 10	. 09	. 10	. 02	. 08	9. 20
Nason silt loam	1–10	80. 48	1. 71	3. 56	7. 42	. 06	(2)	. 32	1. 11	. 39	. 06	. 04	. 07	4. 60
	10–30	57. 65	1. 45	9. 96	19. 67	. 03	. 14	. 57	2. 95	. 02	. 13	. 04	. 13	6. 82
	30–40	47. 35	1. 44	12. 76	24. 81	. 03	. 20	. 73	4. 76	. 02	. 16	. 03	. 13	7. 46

[1] Analyses made by G. J. Hough, 1920.

[2] Trace.

TABLE 11.—*Chemical composition of some rocks that weather to produce Davidson and Fauquier soils*

Soil name and sample No.	Location	Kind of rock	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	SO_3	F	Ignition loss	Total
			Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Davidson:																	
C 6106	Orange County, Va.	Epidote greenstone schist	60 00	1. 60	11 34	6 37	4 77	0 14	11 57	2 42	(1)	0 06	0 16	0 11	0 02	1 72	100 28
C 7282	Albemarle County, Va.	do	52. 37	2 26	13 85	11 21	1 06	. 08	15 16	1. 11	0 02	. 00	. 37	------	. 02	1. 73	99 24
C 6082	Chatham County, N. C.	do	56. 38	1. 01	16 02	10 38	1. 39	. 28	13. 71	. 12	. 01	(1)	. 05	04	------	. 78	100 17
Fauquier:																	
C 7308	Fauquier County, Va.	Epidote actinolite-chlorite greenstone schist.	49. 01	1. 83	14. 44	5 87	6. 32	. 13	12. 66	5 47	04	1. 52	. 27	------	. 04	2. 70	100. 30
C 7314	Loudoun County, Va.	Epidote greenstone schist	50 84	1. 56	17 49	8. 17	2 03	. 09	16 21	1 51	. 34	. 20	. 30	------	. 03	1. 79	100. 56
C 7315	do	do	60. 39	1. 57	11. 36	7. 12	2. 37	. 08	12. 92	1 88	. 06	. 12	. 52	------	. 03	1. 49	99. 91

[1] Trace.

TABLE 12.—*Mechanical analyses and pH determinations of samples of five soils from Culpeper County, Va.*

Soil type and sample No.	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay	pH
Albemarle fine sandy loam, undulating phase:	*Inches*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	
213789	0–12	1.2	8.0	11.3	16.8	6.0	43.5	13.2	4.80
213790	12–16	1.7	6.9	9.6	14.3	5.4	39.1	23.0	4.90
213791	16–28	2.8	7.1	9.7	15.3	6.0	29.4	29.7	5.05
213792	28+	2.8	6.0	8.7	12.9	6.0	27.0	36.6	5.10
Culpeper loam, eroded undulating phase:									
213784	0–8	1.4	4.6	11.4	25.0	7.9	37.0	12.7	4.55
213785	8–12	1.4	3.5	7.7	19.0	6.9	35.4	26.1	4.90
213786	12–22	.9	2.3	4.9	12.4	5.5	21.2	52.8	5.05
213787	22+	.9	2.5	4.0	10.1	5.9	17.2	59.4	5.10
Davidson clay loam, undulating phase:									
213796	0–14	.7	2.5	4.1	11.7	8.2	41.5	31.3	5.60
213797	14–66	.2	1.3	2.3	7.7	4.9	27.1	56.5	5.50
213798	66+	.3	1.2	2.0	6.9	5.2	21.2	63.2	4.90
Elioak loam:									
2137119	0–7	2.8	7.0	9.2	22.6	11.8	26.0	20.6	4.70
2137120	7–22	1.4	4.3	4.8	11.3	19.3	20.2	38.7	5.10
2137121	22+	.7	4.2	6.0	16.3	26.1	23.1	23.6	5.10
Manor silt loam, rolling phase:									
213707	0–7	.9	1.6	1.8	11.3	24.4	47.4	12.6	4.90
213708	7–20	.4	.5	.6	3.4	15.2	53.5	26.4	5.00
213709	20+	.2	1.0	1.0	8.2	23.8	59.3	6.5	5.10

Both soils appear to have some potassium, but they are among the lowest in calcium, magnesium, sodium, and phosphorus—a fact reflected in their low productivities. The podzolization, or leaching, processes involved in their formation can be concluded by comparing the composition of the horizons. There is more than twice as much iron and aluminum in the subsoil as in the surface layers. Bases such as calcium, magnesium, potassium, and sodium have been lost to some extent from the surface layers. These elements do not appear to have concentrated in lower layers, as they probably were washed away into streams.

The well-drained to moderately well drained soils of the Red-Yellow Podzolic group occurring on terraces and developed from old alluvium are of the Hiwassee, Masada, and Altavista series. The Hiwassee and Masada soils occur on old terraces and terrace remnants, generally at higher levels than the Altavista soils. The Hiwassee soils resemble the Davidson, Lloyd, and Cecil soils in color; Masada soils are light-colored, having a weak-yellow surface soil and a light-brown subsoil; Altavista soils occupy lower terraces and have dusky-yellow surface soil and light yellowish-brown subsoil.

GRAY-BROWN PODZOLIC SOILS

The zonal soils of the Gray-Brown Podzolic group include the Fauquier, Elioak, Manor, Bucks, Lansdale, and Brecknock.

The Fauquier soils are derived from greenstone that contains greater amounts of potassium than that from which the Davidson soils are derived. This potassium was probably originally contained in feldspar minerals. Fauquier soils contain less free iron oxides than the Davidson because weathering of the epidote is incomplete. They are therefore not so highly colored as the Davidson soils. Some biotite, which is very low in the Davidson soils, is found in the Fauquier. Biotite is probably formed from the secondary minerals resulting from the weathering of epidote and feldspar.

The following is a profile description of Fauquier silt loam, rolling phase, in a wooded area about 1 mile northeast of Alanthus on highway No. 625:

A_0. 1 to 0 inch, leafmold and forest litter; pH 5.5.

A. 0 to 9 inches, light yellowish-brown very friable silt loam containing numerous black concretions 1/16 to 1/4 inch in diameter and many roots and rootlets; pH 4.9.

B_1. 9 to 13 inches, light-brown friable heavy silt loam to silty clay loam; breaks out in irregularly shaped 1- to 3-inch lumps that are easily crushed; contains numerous black concretions of iron or manganese oxides; 1/4- to 1-inch worm and insect holes, some filled with soil from the upper horizons, occur throughout; pH 5.0.

B_2. 13 to 22 inches, strong-brown to moderate reddish-brown firm clay to silty clay, breaks out into irregularly shaped aggregates 1/2 to 1 1/2 inches in diameter that can be crushed with moderate pressure; black concretions are more numerous in this layer than in the ones above; contains a few angular fragments of quartz ranging 1/4 to 1 inch in diameter; pH 5.2.

C. 22 to 36 or 40 inches, strong-brown friable silty clay loam to clay material mingled with light brown; contains a few black concretions and fragments of weathered greenstone; bedrock is dark-colored greenstone; pH 5.1.

The samples in table 11 present the chemical analyses of rocks giving rise to Davidson and Fauquier soils and were gathered where these soils occur in various sections of the country.

INTRAZONAL SOILS

The intrazonal soils owe their distinguishing characteristics to the overbalancing effects of parent material or relief over the normal effects of climate and vegetation. They extend over several great soil groups, and in this county are all Planosols and semi-Planosols.

The Planosols and semi-Planosols have developed by the soil-forming processes known as podzolization and, in some cases, gleization. They possess well-developed morphological characteristics that reflect the dominating influence of poor or inadequate drainage caused by lack of any appreciable slope. Most of the soils in this group possess plastic subsoil. They are nearly all strongly to very strongly acid throughout, although the parent materials may be basic. The members of this group belong to the Aldino, Helena, Lignum, Iredell, Elbert, Zion, Kelly, Croton, Stanton, and Roanoke series.

The following profile of Iredell silt loam, undulating phase, which is the most extensive and typical soil of this group, was observed in a wooded area ¼ mile west of St. Pauls Church on highway No. 647:

A_1. 0 to 8 inches, light-gray very friable silt loam splotched with gray; splotching gives horizon a slightly mottled appearance; contains some organic matter and iron and manganese oxide concretions less than ¼ inch in diameter which become more numerous with depth; pH 5.2.

A_2. 8 to 8½ inches, yellowish-white silt loam partly cemented; plant roots do not extend beyond this horizon.

B. 8½ to 28 inches, weak-olive tough plastic clay containing a few brown concretions and small particles of quartz; layer shrinks and cracks when dry; pH 4.6.

C. 28 inches +, pale-olive friable fine sandy clay material or soft rock streaked with light gray, yellowish gray, and black; contains much partly weathered diabase rock; pH 6.7.

AZONAL SOILS

The azonal soils of the area consist of two groups—Lithosols and Alluvial soils.

LITHOSOLS

The Lithosols, which include the Louisburg, Hazel, Manteo, Wilkes, Catoctin, Penn, Catlett, and Watt soils, are without well-developed soil characteristics because conditions of parent material or relief have overbalanced the normal effects of climate and vegetation and prevented the development of zonal soils. Relief or parent material, or their combined effects, are the modifying factors in the formation of the Lithosols in this area. Generally the steepest soils are the shallowest, although the smoothest are not always the deepest, as for example the Penn and Catlett soils on the Triassic plain. Relief is a direct factor in soil formation, but it is determined largely by the nature of the underlying rock formations that form the parent materials of all the soils in this area whether zonal, intrazonal, or azonal. Thus parent material exerts both a direct and indirect effect on soil formation.

ALLUVIAL SOILS

The colluvial-alluvial soils of the Alluvial great soil group occur at the bases of steep slopes or near the heads of streams and are of the Starr, Seneca, and Worsham series. These soils consist principally of local wash of mixed colluvial and alluvial material. This material

is less altered and bears the characteristics of the adjacent uplands more so than does general stream alluvium. In contrast to the Starr and Seneca, Worsham soil has a developed profile, but it constantly receives fresh deposition from the surrounding uplands, which tends to keep it a young soil.

The strictly alluvial soils occur on river and creek bottoms and include the Buncombe, Congaree, State, Chewacla, and Wehadkee soils. These soils have no profile development, because the parent material has not been in place sufficiently long to be altered by the normal soil-forming processes of the region. Periodic flooding results in frequent deposition of new soil material. The alluvium is principally wash from the uplands underlain by granite, gneiss, and schist. Although these soils show no well-developed differences in texture and structure within the profile, they do show variations in color, largely because of differences in drainage. The Buncombe and Congaree soils are well drained, the Wehadkee soil is poorly drained, and the Chewacla soil is somewhat poorly drained.

MECHANICAL ANALYSES AND pH DETERMINATIONS

Mechanical analyses and pH determinations for some of the soils of the county are given in table 12.

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U. S. GOVERNMENT PRINTING OFFICE: 1952

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