SOIL SURVEY

Fluvanna County Virginia

Series 1947, No. 5

Issued March 1958

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

How to Use THE SOIL SURVEY REPORT

THIS report is about the soils of Fluvanna County, Virginia. It describes each kind of soil and states how it can be used, how it responds to treatment, how to take care of it, and what yields to expect. Maps show the location and extent of each soil. If you want to know how the soils were formed and how they are classified, read the section, Morphology, Genesis, and Classification of Soils.

SOILS OF A FARM

To find out about the soils on a farm or other tract, first find the right place on the map. The map shows towns and villages, roads, streams, and other landmarks. Remember that an inch on the map is a quarter of a mile on the ground. Each soil is shown by an alphabetical symbol, such as Bd, and the extent of each area of that kind of soil is shown by a boundary line. Color patterns also help you pick out the areas of different soils, although each color is used for several soils that resemble each other in some ways.

The map legend shows the soil symbols, arranged in order so you can find them easily, and the name of each soil. The symbol Bd, for example, is used for Buncombe loamy fine sand. All areas of this soil, wherever they appear on the map, are shown by this symbol and in the same color tint. Soil names are listed in the table of contents, so you can turn easily to the right page in the section, Soil Types and Phases. This section describes each soil briefly and gives some statements about its use and management.

Yields that you can expect from common crops are given in table 3. Soils are listed in order in the left-hand column of this table. Opposite each soil name you will find the yields of crops that can be expected in average years under two levels of management.

SOILS OF THE COUNTY AS A WHOLE

A general idea of the soils is given in the section, Soil Associations. This section tells about the principal kinds of soils, where they occur, and how they are related. While reading this section, refer to the soil association map (fig. 3). The patterns shown on this map frequently indicate well-defined differences in type of farming, land use, and land use problems.

A newcomer to the county, especially if he considers buying land, will want to know about the climate; types and sizes of farms; principal farm products and how they are marketed; kinds and conditions of farm tenure; availability of water, roads, and railroads; and location of towns and population centers. Information about all these is in either the section, General Nature of the Area, or in the section, Agriculture.

This publication on the soil survey of Fluvanna County, Virginia, is a cooperative contribution from the—

SOIL CONSERVATION SERVICE

and the

VIRGINIA AGRICULTURAL EXPERIMENT STATION

Series 1947, No. 5 Issued March 1958

SOIL SURVEY OF FLUVANNA COUNTY, VIRGINIA[1] [2]

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

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[1] Report revised by R. C. Jurney, U. S. Department of Agriculture.

[2] Fieldwork for this survey was done under direction of the Division of Soil Survey while it was part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

THE climate of Fluvanna County is favorable for many crops. On most of the farms, however, few cash crops are grown, and most of the produce is fed on the farm. Corn, small grains, and hay—the principal crops—are usually grown on soils of the uplands. Some crops, however, are grown on the more fertile soils of the terraces and bottom lands along the larger streams. Tobacco is grown as a cash crop to some extent. Potatoes, vegetables, and tree fruits are grown mainly for home use. Livestock and livestock products are fairly important, and both dairy and beef cattle have increased in numbers since 1930.

Next to farming, lumbering is the most important occupation in the county. Several stone mills, canneries, and gristmills provide some employment.

To provide a basis for determining the best agricultural use of the land, this cooperative soil survey was made by the Virginia Agricul-

tural Experiment Station and the United States Department of Agriculture. Fieldwork was completed in 1947. Unless otherwise stated, all information in the report refers to conditions in the county at the time of the survey.

GENERAL NATURE OF THE AREA

LOCATION AND EXTENT

Fluvanna County lies wholly within the Piedmont Plateau of central Virginia at an elevation of 200 to 500 feet above sea level (fig. 1).

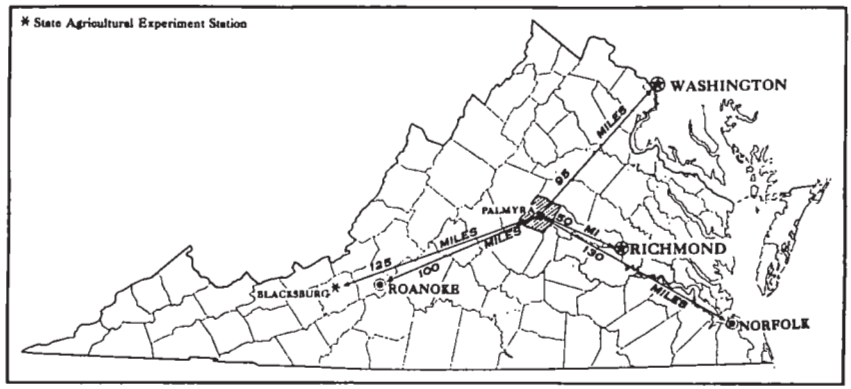

FIGURE 1.—Location of Fluvanna County in Virginia.

Its shape is roughly rectangular. Palmyra, the county seat, is centrally located in the county. It is about 50 miles northwest of Richmond and 95 miles southwest of Washington, D. C. The county is bounded on the south by the James River, which separates it from Buckingham and Cumberland Counties. On the west it is bounded by Albemarle County; on the north, by Louisa County; and on the east, by Goochland County. It is one of the smallest counties in the Piedmont section of Virginia. Its total area is 282 square miles, or 180,480 acres.

SETTLEMENT OF FLUVANNA COUNTY

The area that is now Fluvanna County was once a part of Henrico County, one of the original shires of the Virginia Colony.[3] Henrico County was divided in 1727, and the Fluvanna County area became a part of Goochland County. Goochland County, in turn, was divided in 1744. The Fluvanna County area then became a part of Albemarle County. Finally, in 1777, Albemarle County was divided, and Fluvanna County was established. In the same year, Palmyra became its county seat. The county was named for the Fluvanna River, the name given to the upper course of the James River in early days.

Indians of the Monacan Confederacy inhabited the area before it was settled by the white man (*1*).[4] One of the principal Indian

[3] Historical data from pamphlet, FLUVANNA COUNTY BECKONS.

[4] Italic numbers in parentheses refer to Literature Cited, p. 178.

towns, Rasawek, stood at the junction of the James and Rivanna Rivers. The first permanent white settlements were on the rich bottom lands of the James River; from there settlement rapidly progressed to the uplands. According to early records, the first patent in the county, granted to an Allen Howard in 1730, was for "400 acres on the James River, on both sides of the Rockfish Run at its mouth."

The James River bottom lands were, and still are, the most fertile soils of the county. Wealthy landowners established large plantations along the river and built fine homes, several of which still stand. Smaller farms, on which crops were grown mainly for home use, were scattered throughout the uplands.

By 1785 all of Fluvanna County was settled. The main tide of immigrants, mainly of English, Scottish, and Scotch-Irish descent (*1*), came from the older settlements in the eastern part of the colony. These Anglo-Saxon settlers were ancestors of most of the white inhabitants of the present day.

Many men from Fluvanna County fought in the Revolutionary War. Baron von Steuben used Bremo, a colonial plantation, as a training ground for the troops. None of the battles of the Civil War was fought within the county, but troops of both armies passed through several times.

The "Old Stage Road," one of the oldest roads in Virginia, entered the county near Columbia; it passed through Wilmington, Union Mills (where a woolen mill flourished before the Civil War), and Boyd Tavern. The "Three Chopt Road," frequently mentioned in history and fiction, crossed the county near the northern border.

In the earlier days, the James River Canal furnished the principal means of transporting farm products. Later a branch of the Chesapeake and Ohio Railway (see Transportation and Markets) was built on the old towpath of the canal. Columbia and Scottsville, important trading and shipping centers in the early days because they were located on the canal, are still the most important shipping points in the county, as they are now located on railroads.

POPULATION

Agriculture was disrupted by the Civil War. In the period immediately after the war, land values were very low and the population declined because large numbers of Negroes left the county. About 1920 there began an influx of former tenant farmers from southwestern Virginia, West Virginia, and western North Carolina, which kept the population at a constant level. The immigrants, who were attracted by the availability of cheap land, introduced new and better agricultural practices.

The county has no large or independent towns. In 1950 Palmyra, the county seat and largest town, had a population of 400. The villages and trading centers are supported mainly by agriculture. Lumbering is also important, especially if the center is located on a railroad. The trading center usually consists of a general store and of one or more dwellings.

The county is separated into four magisterial districts. These are the Columbia district, population 1,375; Cunningham district,

population, 1,845; Fork Union district, population 2,629; and Palmyra district, population, 1,272.

PHYSIOGRAPHY, RELIEF, AND DRAINAGE

Fluvanna County lies entirely within the Piedmont physiographic province (*2*). In Virginia this province lies between the Blue Ridge province on the west and the Coastal Plain province on the east.

The surface features of the county are those of a moderately high plateau dissected by numerous streams. Areas between the streams are fairly wide, and their relief is undulating to rolling. There are no mountains in the county. Land surfaces are of three general types: (1) Old undulating to rolling divides of the upland level; (2) flood plains along the more permanent streams; and (3) rolling to steep valley slopes produced by streams that have cut deep into the upland plateau. Entrenchment has been rapid along the James and Rivanna Rivers and along the lower courses of their major tributaries. As a result steep rocky bluffs, separated by V-shaped valleys, rise abruptly from the flood plains.

The generally smooth upland is about 500 feet above sea level. It slopes gently toward the Rivanna and James Rivers, and, near these streams, drops abruptly to the flood plains, which are 200 to 275 feet above sea level. The upland is most deeply dissected near these flood plains.

Fluvanna County is drained by the James River and its tributaries. The Rivanna River is the principal tributary within the county. It enters the northwestern part of the county and flows southeast. It drains the northwestern, west-central, and central parts of the county, and finally it empties into the James River near Columbia. The main tributaries of the Rivanna River are the Mechum, Ballenger, Cunningham, Raccoon, and Carysbrook Creeks.

The Hardware River, Rockfish Run, and Bremo and Byrd Creeks, all direct tributaries of the James River, drain other parts of the county. Larger tributaries of Byrd Creek are Kent Branch and Venable and Little Byrd Creeks (see fig. 2).

Except for areas along some of the wide level bottoms of the larger streams, areas along the smaller drainageways where level relief retards natural surface drainage, and small areas at the heads of drains, drainage is good throughout the county. The pattern of the drainage system is dendritic, or treelike, as the drainageways have dissected the various rock formations fairly uniformly.

CLIMATE

The climate of Fluvanna County is continental. The summers are warm and humid, and the winters are mild. The climate is not modified by the ocean or by mountains, so temperatures and precipitation are fairly uniform throughout the county. Temperatures rarely go above 100° F. or below 60° F. in summer. In winter the temperature is seldom above 70° F. Subzero temperatures are unusual. Table 1 gives climatic data for the county.

Spring and fall usually bring pleasant weather. In winter short cold spells occur, but the winters are usually mild and open. Temperatures are erratic in winter, however. They may drop suddenly

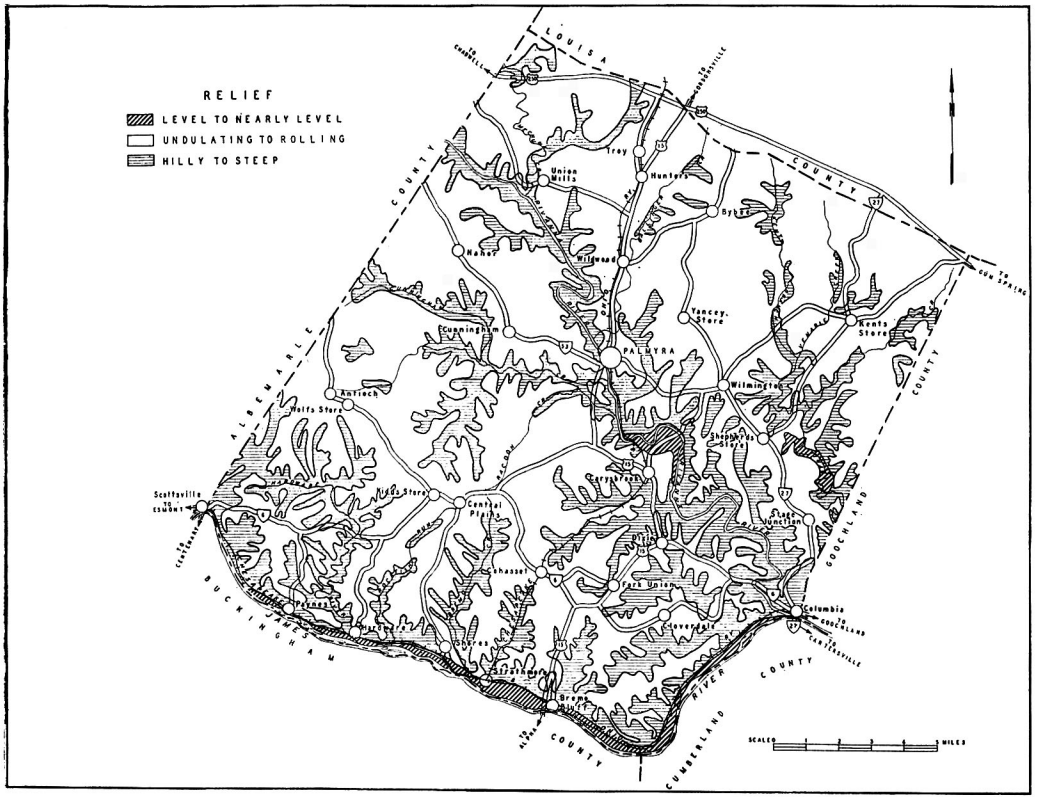

FIGURE 2.—Map of Fluvanna County showing surface relief, drainage system, and cultural features.

to below freezing, or they may rise suddenly so that the ground begins to thaw. Rapid changes in humidity are common.

Except for a few extremely cold days, outdoor work can be carried on throughout the winter. Winter cover crops ordinarily are little protected by snow, but a number of cover crops, such as alfalfa, clover, and small grains, and some vegetables such as parsnips, turnips, and kale, are grown on the well-drained, light-textured soils. On these soils the crops rarely winterkill. Legume cover crops or winter grains on poorly drained soils, however, may be injured by freezing weather. In some places these crops are endangered by freezes if they are grown on soils that have a heavy-textured surface layer.

Killing frost has occurred as late as May 15 and as early as October 5. The average growing season, however, is 186 days. It extends

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

[Elevation, 300 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Total for the driest year	Total for the wettest year	Average snowfall
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	38.0	76	−6	3.15	2.50	0.66	2.4
January	37.0	81	−15	3.35	3.62	9.41	4.2
February	37.5	84	−10	2.74	1.25	2.39	3.8
Winter	37.5	84	−15	9.24	7.37	12.46	10.4
March	46.6	93	4	3.59	1.91	1.67	1.6
April	55.3	97	16	3.47	3.38	10.19	.4
May	65.1	100	25	3.62	2.83	3.76	[3]
Spring	55.6	100	4	10.68	8.12	15.62	2.0
June	72.5	105	35	3.94	2.30	3.53	0
July	76.3	110	47	4.26	.91	8.52	0
August	74.9	106	44	4.53	2.29	5.78	0
Summer	74.5	110	35	12.73	5.50	17.83	0
September	68.9	107	30	2.97	.70	3.41	0
October	57.3	98	17	3.29	1.03	6.98	[3]
November	46.6	87	8	2.33	1.52	2.12	.2
Fall	57.6	107	8	8.59	3.25	12.51	.2
Year	56.3	110	−15	41.24	[4] 24.42	[5] 58.42	12.6

[1] Average temperature based on a 52-year record, through 1954; highest and lowest temperatures on a 52-year record, through 1952.

[2] Average precipitation based on a 56-year record, through 1954; wettest and driest years based on a 53-year record, through 1954; snowfall, based on a 52-year record, through 1952.

[3] Trace. [4] In 1930. [5] In 1937.

from April 17, the average date of the latest killing frost in spring, to October 20, the average date of the earliest frost in fall. This allows ample time for the common field crops to mature. It is unusual for crops to be injured by either spring or fall frosts. Occasionally, fruits and potatoes are injured in the spring, and sun-cured tobacco is sometimes injured by early fall frosts.

Pastures can usually be grazed from the last half of April to the first of December. Except in the most severe weather, farmers generally leave beef cattle in pasture during the winter. As a rule dairy cows are kept in barns during most of the winter and are turned out for only short periods.

No data are available that show local variations in temperature or precipitation. Local variations do exist, however. Apparently they are caused by relief (including direction of slope), and its effect on air drainage, and by differences in elevation.

Frosts often damage vegetation in the valleys or in low-lying areas, such as areas of Worsham, Lignum, Seneca, Starr, Orange, Wehadkee, and Congaree soils. Invariably crops on these lower positions are more seriously damaged by early frosts than crops grown on higher areas, and damage is especially severe from late spring frosts. Vegetation on the ridges and higher slopes, where the Tatum, Nason, Cecil, Appling, Lloyd, and Fluvanna soils occur, is little affected. Fruit trees grown on ridgetops or on northward-facing slopes are less frequently damaged than trees grown on lower areas or on southward-facing slopes.

Temperatures appear to be a little more severe along the James and Rivanna Rivers than elsewhere in the county. Snow remains on the ground longer in the deeper valleys than on ridges and more rolling areas.

Rainfall is fairly well distributed throughout the year. It is lowest in fall, when many of the crops mature and are harvested, and most abundant during the spring and summer, when moisture is most needed by the growing crops and pasture. Normally, prolonged dry or wet spells do not occur. Occasionally, however, a period of drought in summer or early fall will last long enough to damage crops and pasture and to lower yields, especially on shallow droughty soils such as the Manteo, Louisburg, and Wilkes.

Unless rainfall has been unusually heavy, pastures on well-drained upland soils or on terraces generally show a marked decrease in growth from the latter part of July to the early part of September. Satisfactory growth of crops such as corn, which need abundant soil moisture, depends upon a good supply of rainfall during July and the first part of August, especially on the more droughty soils.

The heaviest precipitation comes in spring and summer. Most of the creek bottoms are flooded at least once during that time. Occasionally the James and Rivanna Rivers reach flood stage, overflow their banks, and severely damage crops. In winter there is occasional light sleet or snow. Snow rarely remains on the ground more than 5 days. During the late fall and winter and in early spring, rains are usually slow and steady. Late in spring, during the summer, and early in fall, heavy downpours, showers, and thunderstorms are frequent. Prolonged wet or dry spells are not common.

Even though rainfall is abundant and well distributed during the

summer, the moisture supply may become very low in the well-drained soils, especially in the shallow soils of the uplands. This is the result mainly of prevailingly high temperatures that cause rapid loss of soil moisture through transpiration and evaporation. Moreover, surface runoff is rapid during the summer because rains occur as heavy downpours. Most of the well-drained soils of the uplands, therefore, may actually absorb and retain less moisture during the summer than during other seasons of the year. The soils differ in their capacity to absorb and retain moisture, so their moisture content varies greatly even where rainfall, runoff, and temperatures have all been identical. The slow, steady, prolonged rains usually come from the northeast—heavy showers, downpours, and thundershowers, usually from the southwest.

Wet spells during the growing season sometimes last long enough to injure crops, particularly on soils of the Orange, Chewacla, and Lignum series. Rain sometimes delays the work of preparing seedbeds and planting the crops, both in the spring and in the fall. This is most likely to happen on fine-textured soils such as the Hiwassee and the eroded phases of the Lloyd, Cecil, and Tatum soils, all of which are suitable for tillage over only a narrow range of moisture content. Short rainy spells in summer may delay other farmwork, such as harvesting small grains and cultivating corn.

The average humidity is comparatively high. Winds of high velocity are infrequent. Hailstorms and tornadoes are rare. When they do occur, they are not severe and affect only small areas. Winds from the northwest usually bring clear cool weather. Storms do little damage, although high winds and hailstorms have damaged crops locally.

WATER SUPPLY

The water supply of Fluvanna County is furnished by the main streams, numerous creeks, branches, intermittent drainageways, springs, and wells. Except during unusual periods of prolonged drought, the supply is adequate. Small streams, shallow wells, and springs near ridgetops are the first to fail during dry periods, but the deeper wells and the springs in the deeper valleys usually produce water at all times.

The wells are generally dug instead of drilled. Wells 20 to 40 feet deep provide a fairly reliable water supply. As a rule the springs that are used are near the farm dwellings. Little is done to protect the source of the water from contamination. Some of the springs receive drainage from nearby farm buildings.

Ground water is believed to be more abundant in the Wissahickon and the Columbia granite rock formations than elsewhere. These rocks have good water-bearing properties, because they normally have numerous joints in which water can collect. The rocks of both formations are so porous that they form natural filters. The water is soft and of excellent quality for most purposes.

The ground water is less abundant and the quality of the water is less favorable in the sections of the county that are underlain by hornblende gneiss and schist. Reliable springs are not so plentiful as in the other rock areas, and the spring water is generally hard. The hornblende gneiss and schist are apparently somewhat less por-

ous and have fewer joints and cracks than the Columbia granite and the Wissahickon rocks, and they are overlain to a larger extent by poorly and imperfectly drained soils.

VEGETATION

The principal native vegetation of Fluvanna County consisted of deciduous hardwoods mixed with some redcedar, hemlock, and scrub and shortleaf pine. When the early settlers began to clear the soils, they burned most of the timber; they used only a small part for farm buildings. As the best-quality trees grew on the most productive soils, much of the best timber was destroyed.

Little, if any, virgin timber remains in the county, although nearly 75 percent of the total county area is wooded. The forests are of three general types: (1) Cutover hardwood and hardwood-pine forests; (2) residual forest, or cutover forest that still consists partly of the original trees; and (3) pine forest that has seeded naturally on soils that had previously been cleared. A more detailed discussion of forests in Fluvanna County is given in the subsection, Forests in Fluvanna County.

Smaller vegetation on some of the better drained soils consisted of low-bush blueberry and huckleberry, mountain-laurel, greenbrier, and similar species. On poorly drained areas, the smaller vegetation was spicebush, blackhaw, blackberry, honeysuckle, greenbrier, and ground-cedar. Vegetation that grew beneath the forest in some areas also included teaberry, azalea, fern, alder, elder, chinquapin, partridge-berry, beggarslice, aster, violet, poison-ivy, Virginia-creeper, cinquefoil, wild grape, dangleberry, wild rose, witch-hazel, hazelnut, and native lespedeza.

INDUSTRIES

Next to agriculture, lumbering is the most important occupation in Fluvanna County. Many portable and semipermanent sawmills and several planing mills operate in different parts of the county.

An electric powerplant at Bremo Bluff employs a number of workers. Several stonemills operate in different sections of the county. A rubber plant, built in 1944 at Scottsville in Albemarle County, just over the county line, provides work for a few people living in Fluvanna County. Some part-time farmers work in this plant. Other farmers who work there have moved closer to Scottsville but still own their farms; they use income derived from work in the rubber plant to improve their farm buildings and, in some instances, to improve their soils.

There are several gristmills in the county and a number of canneries that process vegetables, mostly tomatoes. Many farmers grow small acreages of tomatoes and other vegetables for the canneries. A few feed and grain dealers are in business in trading centers.

TRANSPORTATION AND MARKETS

Two branches of the Chesapeake and Ohio Railway provide passenger and freight service in Fluvanna County. One branch crosses the southern part of the county and serves the towns of Scottsville, Strathmore, Bremo Bluff, and Columbia. This railroad, which fol-

lows closely the north shore line of the James River, was built on the towpath of the old James River Canal.

Another line runs southward through Troy, Wildwood, Palmyra, Carysbrook, and Cohasset.

Buses operate regularly over United States Highway No. 250 in the northern part of the county, over United States Highway No. 15, which bisects the county from north to south, and over State Highway No. 6 in the southern part.

United States Highways Nos. 250 and 15 and State Highways Nos. 6 and 27 are all paved. State secondary roads, some paved and the rest improved dirt or gravel, extend to all the communities in the county. According to the Federal census, 318 farms in Fluvanna County in 1950 were located on hard-surfaced roads, 145 on gravel, shell, or shale roads, and 394 on dirt or unimproved roads. All roads are well maintained during most of the year.

The close network of roads facilitates distribution and marketing of farm products. Milk and cream are collected daily and hauled by motortruck to Charlottesville. Lumber, ties, and pulpwood, the chief forest products, are shipped to processing centers by both rail and motortruck. Motortrucks are used increasingly for shipping forest and farm products. Chickens and eggs are hauled largely by motortruck to markets outside the county. The less important farm products are sold at local trading centers. Many supplies are purchased at these centers, but much of the farm equipment and some supplies are bought in Charlottesville.

FARM AND HOME IMPROVEMENTS AND SOCIAL FACILITIES

Churches and grade schools are well distributed over the county. School buses provide transportation for all rural pupils. High schools at Carysbrook and Palmyra serve the entire county. Fork Union Military Academy, a private preparatory school, is located at Fork Union.

All communities have rural mail delivery. Telephone service is available to all towns, most communities, and some farms. Since the Rural Electrification Administration was established, electricity has been available to most areas that have a permanent rural population. The Federal census reported that 115 farms had telephones in 1950, and that 553 farms had electricity. There were 201 farms that had running water brought in by electric pump.

Most of the farm homes are of frame construction and built from local lumber. Practically all of the barns, sheds, and other outbuildings are frame. Some of the farms along the James and Rivanna Rivers have better than average farm buildings, implements, work stock, and general improvements. These farms have large acreages of well-drained productive bottom lands.

SOILS OF FLUVANNA COUNTY

The purpose of this part of the report is to discuss some general characteristics that are common to most of the soils of the county and to call attention to some of the significant differences among the soils. A general discussion of soils can be found in the reference, Soils That Support Us (*4*).

PARENT MATERIALS

About 153,118 acres in Fluvanna County consists of soils formed from weathered products of the underlying rocks; about 2,844 acres consists of soils developed from local alluvial and colluvial materials deposited in depressions, at the heads of drainageways, or at the bases of slopes; and about 19,523 acres consists of soils formed from very friable alluvial material deposited on terraces and first bottoms.

The main rocks underlying the soils are granite, gneiss, acidic and basic schists, diabase, basic quartzite, and quartz monzonite. These rocks vary greatly in texture, structure, and chemical composition. Upon weathering they have produced materials from which a large number of different soil types and phases have formed. Also, as the result of differences in relief and drainage, three or four distinctly different kinds of soil have developed on each major type of rock.

SOIL LAYERS

Except for soils on hilly and steep uplands, and young deep soils on bottom lands, most of the soils of the county have three well-developed layers. These are the surface soil, subsoil, and substratum, or parent material. The soils on hilly and steep uplands, and the young soils formed from recent alluvial deposits, generally have only two layers—the surface soil and the substratum.

Thickness.—The soil layers vary in thickness. The surface layers range from about 5 to 16 inches in thickness. The subsoils range from a few inches to 60 inches or more, and the substratum, from a few inches to more than 50 feet. The deepest soils generally occupy river terraces or the smoother undulating uplands. The shallowest soils are on steep and hilly uplands underlain by schist. The deeper soils are generally more productive than the shallower ones. They hold up well under cultivation, respond well to good management, and are well suited to most of the crops grown in the area.

Color.—The surface soils are predominantly yellowish brown. Some are brownish yellow, grayish yellow, pale yellow, olive yellow, or brown. The subsoils are predominantly red, yellowish red, and yellowish brown. In some soils, however, the subsoils are reddish yellow, pale yellow, and brownish yellow. The parent materials are generally mingled or mottled with colors similar to those in the surface soil and subsoil layers. Poorly drained and somewhat poorly drained soils have mottlings in which various shades of gray predominate.

Texture.—The surface soils are mainly silt loam, sandy loam, or fine sandy loam. They range, however, from silty clay loam to loamy fine sand. The subsoils range from clay to loamy fine sand or fine sand, but clay and clay loam predominate.

Consistence.—The surface soils that have not been eroded are very friable. The subsoils are generally friable to firm when dry, and plastic when wet. Some, however, are hard when dry, and very plastic or sticky when wet. The substratum is generally more friable than the subsoil.

Structure.—The surface soils have a fine granular or crumb structure, and the subsoils are generally of medium blocky structure. In some places the substratum structure is similar to that of the subsoil, in others, its structure is weak platy or indistinct. In most of the soils

the structure of the surface soil and subsoil are favorable for plant growth.

DRAINAGE

The soils are poorly drained that have gray, brown, red, and yellow mottlings throughout the surface soil and subsoil. They occupy nearly level areas. The soils are wet most of the time. In many areas water stands on the surface during wet seasons, and in many places floods are frequent. Though the total acreage of wet land is fairly large, the areas are so small and scattered that installing artificial drainage is generally not warranted. Also, the subsoil is so nearly impervious in some places that it would be difficult or infeasible to drain the areas artificially.

These mottled soils are poorly aerated and can be tilled within only a narrow range of moisture conditions. It is difficult to use heavy farm machinery on them. Unless they are artificially drained, they are suitable only for permanent pasture, and on most farms they should be used for that purpose. Some areas, however, must be drained by open ditches before a good stand of permanent pasture can be established.

PRODUCTIVITY AND TILTH

In Fluvanna County many of the soils that have a yellowish color are fairly level. They have a pan at depths of 12 to 24 inches. Though they are only slightly eroded, their surface soil is leached and acid. As a result, productivity is not high and is difficult to maintain. During wet seasons many of the soils that have pans are too wet for crops. If the season is dry, many plants are severely injured—their roots are too near the surface, or the pan restricts the upward movement of moisture in the soil. The soils that have a reddish subsoil are more permeable and slightly more fertile than the soils in which the subsoil is yellowish. They can be improved and their productivity can be more easily maintained.

Except for the soils that are considerably eroded, most of the soils in the county are easy to work. Deep plowing in the fine-textured or severely eroded soils requires tractor power or use of heavy draft animals. The soils that have reddish subsoils are slightly more erosive than those that have yellowish subsoils. Nevertheless, they have more favorable structure and consistence for growing most of the usual crops. They are more permeable, slightly more fertile, and generally more productive.

Organic matter.—The soils of Fluvanna County are low in organic matter. They have developed under a forest cover, which contributes less organic matter to the soil than grass. Moreover, abundant rainfall and comparatively long summers cause organic matter to decompose rapidly and soluble material to leach out quickly. Even under mature forest, only a thin layer of forest litter and leaf mold lies on the surface, and only a small quantity of decayed organic matter is in the uppermost 2 inches of surface soil.

The uppermost inch or so of the surface soil in permanent pastures generally contains a small quantity of organic matter. A moderate amount has accumulated in the surface layer of the Starr soil, which occurs mainly on comparatively moist foot slopes. The amount of

organic matter in practically all the soils is small. Nevertheless, it influences plant growth very noticeably in areas where the forest litter and duff have remained in the plow layer after the forest has been cleared away. Good stands of pasture grasses can be established readily on newly cleared soils where the forest litter has been mixed with the surface soil.

If corn or another soil-depleting crop is grown year after year, the small supply of organic matter is soon exhausted unless it is regularly replenished.

Lime.—Most of the soils of Fluvanna County are so acid (or sour) that the common crops will not grow well unless lime is applied occasionally. The soils range from extremely acid to neutral (pH 3.8 to 7.1). Most of them are very strongly to strongly acid (pH 4.6 to 5.5), and some are medium acid (pH 5.6 to 6.0). A few of the soils are slightly acid (pH 6.1 to 6.5), and a very few are neutral (pH 6.6 to 7.3).

The surface layer of the soils in this county is generally slightly more acid than the subsoil and parent material, but the difference is not significant in many of the soils. The Lignum and Nason soils are the most acid in the county, and the Elbert and Orange soils, the least.

Nutrients.—Generally the soils are very low in most of the essential plant nutrients, but their supply of available potassium, phosphorus, and magnesium ranges from very poor to very good. Potassium and magnesium are the most abundant elements. Phosphorus and calcium are the least abundant in most of the soils tested. Some minor elements appear to be needed to improve crop production. Except for a few soils on bottom lands, terraces, and colluvial lands, nearly all of the soils are comparatively low in nitrogen.

RELIEF AND STONINESS

Relief and the presence of bedrock outcrops, loose stones, and gravel often determine the use made of the soils. Comparatively mild relief is one of the most favorable characteristics of the Fluvanna County soils. The acreage of good workable soils is extensive. Data assembled in 1949 show that 9.2 percent of the county is level to nearly level (0 to 2 percent slopes); 46.7 percent, undulating (2 to 8 percent slopes); 25.1 percent, rolling (8 to 15 percent slopes); 12.8 percent, hilly (15 to 25 percent slopes); and 6.0 percent, steep (25 to 45 percent slopes). The percentage of slope was not indicated for approximately 0.2 percent of the county.

Mainly because of their favorable relief, many of the soils have good to excellent workability and conservability, even under simple management. They therefore can be made productive by good management, if internal conditions are favorable.

Stoniness impedes or prevents cultivation in many areas. A few soils of the high river terraces contain rounded, waterworn cobblestones; and in many scattered upland areas, quartzite and quartz stones and pebbles are strewn over the surface or embedded in the surface soil. In other places bedrock outcrops occur. A few very steep rocky bluffs along some of the larger creeks and rivers are poorly suited, even to forest.

EROSION

In large part, the uplands and terraces of Fluvanna County are eroded. Sheet erosion is generally slight to moderate. A few gullies, ranging from shallow to deep, occur in some areas, but many gullies occur in others. The extent of erosion damage and the approximate percentage of the county affected are summarized below:

	Percent of county
No apparent erosion	0. 9
No removal, but accumulations of colluvial or alluvial materials	11. 3
Slight sheet erosion	30. 9
Moderate sheet erosion	38. 7
Moderate sheet erosion and a few shallow gullies	7. 5
Moderate sheet erosion and many shallow gullies	3. 8
Moderate sheet erosion and a few deep gullies	. 3
Moderate sheet erosion and many deep gullies	. 6
Severe sheet erosion	3. 2
Severe sheet erosion and a few shallow gullies	1. 0
Severe sheet erosion and many shallow gullies	. 4
Severe sheet erosion and a few deep gullies	. 3
Severe sheet erosion and many deep gullies	. 2
Unclassified (water, canal beds, mines and pits, and miscellaneous areas)	. 9
Total	100. 0

SIZE OF SOIL AREAS

The size and shape of the soil areas are largely determined by the dendritic pattern of rivers and creeks that make up the drainage system. In the southwestern part of the county, rivers have cut deep channels, drainageways are numerous, ridges are narrow, and slopes are steep. The soil areas are small compared with those areas in the northern part of the county near the head of the drainage system. Because of variation in slope, the continuity of many soil types is broken by slope phases. Few farms, even small ones, consist of fewer than three soil types or phases. Consequently, most farmers must adjust their plans for soil use to cover a complex pattern of soils. On most farms diverse soil uses and soil management practices are necessary.

SOIL SERIES AND THEIR RELATIONS

The Fluvanna County soils are grouped into 34 series and 6 miscellaneous land types. To show the relationship of one soil to another, the series have been grouped by topographic position, as follows: (1) Soils of uplands; (2) soils of colluvial lands; (3) soils of terraces; and (4) soils of bottom lands.

The uplands consist of materials derived directly from decayed underlying rock. Colluvial soils occur on colluvial slopes, or toe slopes, in the uplands. The colluvial soils are derived from materials washed down from the higher slopes. The soils near the heads of drainageways are derived to some extent from alluvium.

Terraces, in the physiographic sense, are water-made benchlike areas, bordered by stream bottoms on the one side and by steeper sloping uplands on the other. They are higher than the bottom lands and are generally not subject to flooding. The terraces are compara-

tively level or gently inclined. They are generally long and narrow. Bottom lands, derived from waterborne materials, consist of flood plains near streams. They are overflowed frequently.

Of the six miscellaneous land types mapped in the county, three consist of undifferentiated alluvial material; one of rough gullied land; one of stony land or rock outcrops; and one of excavated material used for railroad yards and building sites. These land types are: (1) Made land; (2) Mixed alluvial land, well drained; (3) Mixed alluvial land, poorly drained; (4) Riverwash; (5) Rough gullied land; and (6) Stony land.

SOILS OF UPLANDS

The soils of uplands occupy about 85 percent of Fluvanna County. They are members of the following series:

Lloyd	Orange	Bremo
Cecil	Durham	Louisburg
Madison	Colfax	Manteo
Tatum	Goldvein	Nason
Fluvanna	Helena	Wilkes
Appling	Lignum	
Vance	Zion	

Most of the soils used for farming are on uplands. The proportions of cropland and pasture are greater on terraces and bottom lands than on uplands, but the total area is not so large. Many different rock formations underlie the upland soils, but each kind of rock occurs in fairly large areas. Most of the rocks are acidic, but they range from very high in acidic elements, such as silicon and aluminum, to moderately high in basic elements, such as magnesium. Most of the upland soils are low in basic elements and in most of the essential plant nutrients. Because of differences in relief and drainage, three or four distinctly different soil series have developed from each kind of parent material.

The soils of the uplands are separated into four major groups, each group made up of soils that are similar in prominent characteristics. These groups are: (1) Soils with red subsoils, good drainage, and undulating relief; (2) soils with predominantly yellowish-red to yellowish-brown subsoils, moderately good drainage, and undulating relief; (3) soils with yellow or yellowish-brown subsoils, good to somewhat poor drainage, and predominantly undulating relief; and (4) soils with shallow incomplete profiles, excessive drainage, and predominantly rolling, hilly, and steep relief.

SOILS WITH RED SUBSOILS, GOOD DRAINAGE, AND UNDULATING RELIEF

The upland soils that have predominantly red subsoils, good drainage, and undulating relief are members of the following series:

Lloyd	Madison
Cecil	Tatum

These soils cover a total area of about 38,389 acres. They occupy ridgetops on the highest elevations of the uplands. The soils have predominantly undulating relief. Surface runoff is neither excessively slow nor excessively rapid, and drainage is good. They have the well-developed profiles typical of mature soils of uplands.

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Although derived from different parent materials, these soils are much alike in a number of major characteristics. Their color, depth, structure, consistence, permeability, and suitability are all similar. Their surface soils are yellowish brown, brownish yellow, or brown.

LLOYD SERIES

The Lloyd soils have developed from residual material of mixed hornblende schist and acidic schist. Like other soils of this group, they have red subsoils, their relief is predominantly undulating, and their drainage is good.

These soils occupy some of the highest upland ridges in the county. They are closely associated with soils of the Fluvanna, Orange, Bremo, and Elbert series. Generally they occur at slightly higher elevations than soils of any of the associated series.

The surface layer of the Lloyd soils is browner than that of the other soils of the uplands, and it contains a considerable quantity of organic matter. The Lloyd soils are very strongly acid to medium acid (pH 4.5 to 6.0)—not so acid as the other well-drained upland soils. Their pH is generally about 5.4 in areas where lime has not been applied.

The total extent of these soils is about 4,163 acres.

CECIL SERIES

The Cecil soils are similar to the Lloyd soils in topographic position, relief, drainage, structure, depth, and consistence. Their color is lighter and the texture of their surface layer is coarser than that of the Lloyd soils. They were derived from residual material weathered from granite and gneiss.

The Cecil soils do not have as much organic matter in the surface soil as the Lloyd soils, but they have more than the Appling and Durham soils with which they are associated. They are strongly to very strongly acid (pH 4.8 to 5.5) and are generally slightly more acid than the Lloyd soils. Though not so extensive as the Lloyd soils, the Cecil soils occupy an important place in the agriculture of the county. Their total area is about 2,397 acres.

MADISON SERIES

The Madison soils were derived from quartz muscovite schist that contains numerous very fine mica flakes and some garnets. They resemble the Lloyd and Cecil soils in most characteristics. Their surface soil is slightly browner and finer textured than the surface layer of the Cecil soils. Their color is slightly lighter and their texture slightly coarser than for the Lloyd soils. In some places, at depths of about 32 inches, the subsoil passes abruptly into partly disintegrated quartz muscovite schist and nearly solid rock is at depths of only 5 or 6 feet.

A larger quantity of mica flakes occurs throughout the entire profile of the Madison soils than occurs in either the Cecil or Lloyd soils. Also a great many more quartz stones and pebbles are scattered over the surface and mixed through the surface soil. The Madison soils are closely associated with the Louisa soils.

Field tests show that the Madison soils are generally very strongly acid (pH 5.0) throughout. They are slightly more acid than either the Lloyd or Cecil soils. The Madison soils have the smallest

acreage of any series in this group. They cover a total area of about 1,624 acres.

TATUM SERIES

The Tatum soils, though the least productive, are the most extensive of the soils of this group. Their total area covers about 30,205 acres. The soils were derived from light-colored, fine-grained acidic rocks, mainly quartz sericite schist. They are closely associated with the Nason, Worsham, Manteo, and Lignum soils.

The Tatum soils have a slightly lower content of organic matter than the Lloyd, Cecil, and Madison soils. Consequently, their surface soil is lighter colored. Their surface layer and subsoil are slightly thinner than in the Lloyd, Cecil, and Madison soils, and the Tatum soils are a little more acid than other soils in the group. They are generally very strongly acid, but they range from very strongly acid to strongly acid (pH 4.6 to 5.3). Their supply of most of the essential plant nutrients is low to fair.

SOILS WITH PREDOMINANTLY YELLOWISH-RED TO YELLOWISH-BROWN SUBSOILS, MODERATELY GOOD DRAINAGE, AND UNDULATING RELIEF

The soils that have predominantly yellowish-red to yellowish-brown subsoils, moderately good drainage, and undulating relief are members of the following series:

Fluvanna	Nason
Appling	Vance

The soils belonging to these series are fairly productive of many of the crops grown in the county. Covering a combined area of about 56,305 acres, they are the most extensive of the soils of uplands.

The soils of this group occur on upland ridges at slightly lower elevations than the Lloyd, Cecil, Madison, and Tatum soils with which they are closely associated. Their profiles are not quite so well developed as those of the associated soils, and generally the subsoil layer is thinner. All of the soils were derived from parent materials similar to those from which soils of the preceding group were formed.

The surface layer of soils of this group is pale yellow, light yellowish brown, or yellowish brown. The subsoil is yellowish red or reddish yellow. Mingled shades of red, yellow, and brown color the lower part of the subsoil in most places.

FLUVANNA SERIES

The parent material of the Fluvanna soils resembles that of the closely associated Lloyd soils, although Fluvanna fine sandy loams were derived partly from residuum from weathered granite. The profile of the Fluvanna soils is lighter colored throughout, the subsoil slightly more plastic, and the surface and subsoil layers slightly thinner, though in the Fluvanna soils the depth to bedrock varies from 4 to 25 feet or more. In places the surface layer is coarser textured than that of the Lloyd soils and contains less organic matter. The Fluvanna soils are slightly more acid and less fertile and productive than the Lloyd soils. Nevertheless, they are among the most desirable agricultural soils of the uplands. They are not so extensive as the Appling or Nason soils; their total area is about 3,981 acres.

APPLING SERIES

The Appling soils are closely associated with the Cecil soils. They have a thicker, lighter colored surface soil than the Cecil soils and a thinner, lighter colored subsoil that contains much less clay. The Appling soils were derived from residual material that weathered from granite, whereas the Fluvanna soils were derived mainly from residual material that weathered from hornblende schist. The Appling soils are very strongly acid throughout. Their total area is about 9,242 acres.

NASON SERIES

The Nason soils have a thicker, lighter colored surface soil than the Tatum soils with which they are closely associated. Their subsoils are thinner and lighter colored than those of the Tatum soils.

The parent material of the Nason soils (residual material from weathered sericite schist) is the same as that of the Tatum soils, but it differs from that of the Fluvanna and Appling soils. The Nason soils are a little lighter colored than the Fluvanna soils and finer textured than the Appling soils. The supply of plant nutrients in the Nason soils is low to very low. The Nason soils cover a total area of 42,681 acres.

VANCE SERIES

The Vance soil has formed from residual material derived from mixed acidic and basic rocks, chiefly granite and hornblende schist. It resembles the Appling soils, except for its slightly lighter colored surface soil and subsoil, firm heavy clay subsoil that is plastic when wet, and slow internal drainage. For the most part it occurs at some of the highest elevations within larger areas of Helena soils. Its position is transitional between that of the Colfax and Appling soils. The total area covers only about 401 acres.

SOILS WITH YELLOW OR YELLOWISH-BROWN SUBSOILS, GOOD TO SOMEWHAT POOR DRAINAGE, AND PREDOMINANTLY UNDULATING RELIEF

The soils of uplands that have yellow or yellowish-brown subsoils, good to somewhat poor drainage, and predominantly undulating relief are members of the following series:

Orange	Helena
Durham	Goldvein
Colfax	Zion
Lignum	

Except for the Goldvein and Zion soils, the soils in this group were derived from parent materials similar to those from which the Fluvanna, Appling, Nason, and Vance soils were formed.

The Goldvein soils were formed from residual material weathered from quartz monzonite—a light-colored, coarse-grained, acidic rock. The Zion soil was formed from weathered metapyroxenite—a dark-colored basic rock. The Goldvein soils are associated with the Nason, Lignum, and Worsham soils, and the Zion soil with the Orange, Elbert, and Fluvanna soils.

The soils of this group occur on nearly level low-lying upland ridges and undulating slopes. Generally they occupy lower lying areas than

the other soils of the uplands. Undulating relief is predominant, but in a few areas, the relief is rolling. Drainage is generally somewhat poor. The Durham soil, however, is well drained, and the Zion soil, moderately well drained.

Except for the Durham soil, all the soils of this group have a thin pan that contains gravel. Permeability of their subsoils to roots, moisture, and air ranges from moderate to very slow. These soils have a thicker, lighter colored surface soil and thinner, lighter colored subsoil than soils of the first and second groups.

ORANGE SERIES

The Orange soils were derived from residual materials weathered from hornblende schist, basic quartzite materials, or quartz monzonite. They are closely associated with Lloyd, Fluvanna, Bremo, and Elbert soils and in places with the Zion soil. They have a light color throughout, a very plastic subsoil when wet, and in places a gravelly pan. The structure of the subsoil is massive. Depth to bedrock ranges from 3 to 15 feet.

Orange soils are very low in organic matter. Field tests show them to be slightly less acid than the Lloyd and Fluvanna soils. The Orange soils are difficult to work, and their productivity is difficult to maintain. They cover a total area of 2,831 acres, not including the small acreage that occurs in complex with the Bremo soil.

DURHAM SERIES

The Durham soil is better drained throughout than other soils of this group. As mapped in this county, it is not quite so well drained as the Appling soils of the group immediately preceding. The Durham soil does not have the distinct pan in the subsoil that is typical of other soils of the group. A hard, slightly compact layer occurs on the top of the subsoil layer in some places and immediately above the parent material in others.

The soil originated from granitic material slightly coarser in texture than that from which the Cecil, Appling, and Colfax soils were formed. According to field tests, the soil is very strongly acid to strongly acid. In most places it has a pH of 4.5 to 5.0. The total area covers only about 205 acres.

COLFAX SERIES

The Colfax soil originated from granitic rock material similar to that from which the Cecil, Appling, and Durham soils have formed. In some places, however, the parent material includes some local colluvium and, in others, residue from basic rock. The soil differs from the Cecil, Appling, and Durham soils chiefly in having poorer drainage and lighter color, a brittle pan, and, in places, a very thin lower subsoil layer that is plastic when wet. Gray, brown, and yellow mottlings occur at depths below 8 to 16 inches. The soil resembles the Helena soils more than the other soils in the group. It does not have the very plastic layer in the subsoil, however, and it was derived chiefly from granitic materials, whereas the parent material of the Helena soils is mixed with basic rocks. The total area covered by the Colfax soil is only about 671 acres.

GOLDVEIN SERIES

The Goldvein soils differ from the other soils of the group mainly in having gravel throughout the surface soil and subsoil and in originating from a different parent material. A pan that contains cemented fine gravel occurs at depths of 10 to 18 inches. In places a thin plastic layer occurs immediately above the parent material.

The Goldvein soils are associated with the Nason, Lignum, and Worsham soils. They have formed from material that weathered from light-colored acidic rock, mainly coarse-grained quartz monzonite. They occur on ridgetops at about the same elevation as the Nason and Lignum soils. In color they resemble the Lignum, Helena, and gritty Appling soils. The Goldvein soils are extremely to very strongly acid throughout (pH of 3.8 to 4.0). Their total area is only about 306 acres.

HELENA SERIES

The Helena soils were derived from parent material that is different from that of other soils in the group. The soils have formed from weathered acidic and basic rock mixed, chiefly granite and hornblende schist. They resemble the Vance soil in parent material, but they have a lighter colored surface soil and a yellowish, more plastic subsoil. Their subsoil is highly mottled, and a pan layer occurs at the top of the densest part of the subsoil.

The soils are similar to the Orange soils, but their surface soil is coarser textured and they were derived from mixed granitic and basic rock material. The content of clay and the consistence are variable in the Helena soils, but generally the subsoil is comparatively thick and very plastic. Acidity ranges from very strong to medium. In most places the soils are strongly acid (pH 5.1 to 5.5). Their total area covers about 1,845 acres.

LIGNUM SERIES

The Lignum soils are closely associated with the Tatum, Nason, and Manteo soils, and they have formed from similar schist parent rock. They differ from the Tatum and Nason soils mainly in having lighter colored surface soil and subsoil layers; a brittle pan in the upper part of the subsoil; and gray, brown, and yellow mottlings in the lower part of the subsoil. In places the lower part of the surface soil is faintly mottled. The Lignum soils have developed from parent material different from that of the Helena, Goldvein, Zion, and Orange soils, and they have a friable subsoil in most places. They have a heavier textured surface soil and subsoil than the Durham soil and are somewhat poorly drained. The Lignum soils are very strongly to extremely acid, but the pH is generally about 4.8. Their total area covers about 2,341 acres.

ZION SERIES

The Zion soil is slightly darker in color than any of the other soils of this group. Its parent material is different from that of the other soils of the uplands, and it has a layer of mineral concretions at depths of 8 to 18 inches. The Zion soil has developed from residual material derived from dark-colored, fine-grained, basic rock, principally

metapyroxenite, that has a high content of iron and manganese. It occupies low-lying undulating upland areas and is closely associated with the Orange and Fluvanna soils.

The soil resembles the gravelly subsoil phase of Orange silt loam but differs in having a browner surface soil, a less plastic subsoil, and a darker colored mineral-concretion layer. In many places angular stone fragments and large pebbles are strewn over the surface and mixed throughout the surface soil. The soil is moderately well drained and is fairly productive of most crops. According to field test, the soil in most places is strongly acid (pH 5.4), but it ranges from very strongly to slightly acid (pH 4.8 to 6.5). Judged by its color, the soil contains more organic matter than the other soils of the group. The total area is only about 182 acres.

SOILS WITH SHALLOW INCOMPLETE PROFILES, EXCESSIVE DRAINAGE, AND PREDOMINANTLY ROLLING, HILLY, AND STEEP RELIEF

Soils that have shallow incomplete profiles, excessive drainage, and generally rolling, hilly, or steep relief are members of the following series:

Bremo
Louisburg
Louisa
Manteo
Wilkes

The soils of these series are closely associated with the soils of the preceding three groups, and they have formed from similar parent materials. They are the least desirable agricultural soils of the county. Their total area is about 48,277 acres.

Relief is generally hilly to steep in these soils, but some areas are rolling. The soils have shallow AC profiles. Depth to bedrock in most of the soils is less than 30 inches. Coarse gravel and schist fragments occur on the surface and are mixed throughout the surface layer. In some places the cropped areas consist mainly of rock fragments mixed with only a little soil.

Surface runoff is generally medium to very rapid in these soils. Except for the Wilkes soils, internal drainage is medium to rapid, but it is medium to slow in the Wilkes soils. The soils are generally strongly acid throughout, but they range from extremely acid in the Manteo soils to medium acid in the Bremo soils (pH 4.2 to 5.6).

BREMO SERIES

The Bremo soils are the most fertile and productive in this group. Generally they occupy narrow ridgetops and have rolling hilly relief. They occur in close association with the Lloyd, Fluvanna, and Orange soils and originated from essentially the same parent material. In most places the profile is not developed, and the surface soil directly overlies the parent material. Depth to the nearly solid bedrock rarely exceeds 30 inches. In a few places the depth is not more than 8 inches. A few bedrock outcrops occur on the steeper areas, and in some areas loose, hard, blocky stones are strewn over the surface.

The Bremo soils are not so acid as other soils of the group. They range from medium acid to strongly acid. Most field tests show the soils to be in the upper limits of the strongly acid range (pH about 5.4). The total area is 5,113 acres, not including the small acreages that occur in complex with the Orange soil and with Manteo soils.

LOUISBURG SERIES

The Louisburg soils are closely associated with the Cecil, Appling, and Durham soils and have essentially the same parent material. Their relief is generally rolling to hilly, but a considerable area is steep, and a very small part is undulating. Compared to the Cecil and Appling soils, the profile of the Louisburg soils is shallow and incomplete.

The Louisburg soils differ from the Bremo soils mainly in having a different parent material and in having lighter colored and coarser textured surface layers and subsoils. The Louisburg soils also contain less organic matter, are deeper to bedrock, and are slightly more acid. Their total area is about 12,845 acres.

LOUISA SERIES

The Louisa soils occur mainly on hilly and steep uplands. They are closely associated with the Madison soils and were derived from similar parent material. They differ mainly in their lack of a B horizon.

The Louisa soils differ from the Louisburg, Bremo, and Manteo soils mainly in their parent material. They have a loam surface soil, where that of the Louisburg soils is sandy loam. The Louisa soils are slightly browner than the Louisburg soils. They are slightly more acid than the Bremo soils, and their surface soil is not quite so brown. They are slightly less acid than the Manteo soils but are slightly browner and contain more organic matter. Their total area is only 873 acres.

MANTEO SERIES

The Manteo soils are the most extensive of the soils of this upland group, but they are the least favorable for agriculture. They have formed from material weathered from slate and sericite schist. The Manteo soils are closely associated with the Tatum, Nason, and Lignum soils.

The surface layer of the Manteo soils is not quite so brown as that of other members in the group, the soil layers are slightly shallower, less organic matter has accumulated, and the soils are more strongly acid. In many places numerous schist particles occur throughout the profile. The total area of the Manteo soils is about 27,820 acres, not including the small acreage that occurs in complex with Bremo soils.

WILKES SERIES

The Wilkes soils mapped in Fluvanna County are made up of complexes of soils of the Louisburg and Bremo series. They have characteristics similar to soils of both of these series. Their total area is about 1,626 acres.

SOILS OF COLLUVIAL LANDS

The soils of the colluvial lands consist of the following series:

Starr
Seneca
Worsham
Elbert

The material from which these soils have formed generally consists of local alluvium and colluvium derived from uplands. Most of the soils occupy depressions at the bases of slopes and around the heads of drainageways, but some occur on upland flats. The main differences among the soils result from differences in parent material, although relief and position are factors that bring about poor drainage in the Worsham and Elbert soils. The area of this group of soils is 6,151 acres.

STARR SERIES

The Starr soil is generally closely associated with the Lloyd soils. It has formed from material washed from the Lloyd soils and deposited near the heads of drainageways and at the bases of slopes. The Starr soil is one of the most favorable soils in the county for most of the common crops. It ranges from medium acid (pH 6.0), to very strongly acid (pH 5.0), but in most places it is medium acid (pH about 5.6). The total area is only about 520 acres.

SENECA SERIES

The Seneca soils are closely associated with the Appling, Nason, Tatum, Fluvanna, and Louisburg soils. They have developed from material washed from these soils and deposited at the heads of intermittent drainageways and at the bases of upland slopes. Compared to the Starr soil, the Seneca soils contain less organic matter and are lighter in color and coarser in texture in many places. The Seneca soils have moderately slow internal drainage and a mottled, fine-textured layer in the lower part of the subsoil. They are more acid than the Starr soil, being very strongly acid to extremely acid (pH below 5.0). The Seneca soils occupy small areas scattered thoughout the southeastern part of the county. Their total extent is only about 898 acres.

WORSHAM SERIES

The Worsham soils are poorly drained. They occupy some of the lower slopes that receive seepage water from higher upland areas. In most places the soils have formed from colluvial material. In some they have formed from colluvial and local alluvial materials mixed with residual material from the underlying rock, which may be granite, gneiss, schist, or slate.

The Worsham soils are associated mainly with the Colfax, Lignum, Nason, and Appling soils. They are more poorly drained than the Seneca soils or the associated Colfax, Lignum, Nason, or Appling soils and are mottled throughout with gray, yellow, and brown. As a rule they are strongly acid (pH 5.1 to 5.5), but some areas are medium acid to very strongly acid. The total area of the Worsham soils is about 4,314 acres.

ELBERT SERIES

Except that it was derived from a different parent material, has more clay in the subsoil, and is less acid, the Elbert soil resembles the Worsham soils. The Elbert soil is closely associated with the Orange, Bremo, Lloyd, and Fluvanna soils. It has developed from local alluvial and colluvial materials derived from these associated soils. Generally the Elbert soil has a heavier textured surface soil and subsoil than the Worsham soils, but it is not so acid as the Worsham soils

that are associated only with Colfax, Appling, and Lignum soils. The Elbert soil is strongly acid to neutral. In most places a plastic claypan layer occurs in the subsoil. The total area is only 419 acres.

SOILS OF TERRACES

Many terraces, or benches, occur along most of the large rivers and creeks in Fluvanna County. Soils on these terraces belong to the following series:

Hiwassee	Altavista
Masada	Augusta
Wickham	Roanoke

The soils of the above series have formed from alluvial deposits consisting of sand, silt, clay, and rock fragments. The deposits have washed from uplands comprised of many different soils and underlain by many different kinds of rock. In some places the deposits are mainly sand or silt; in others they consist of rock fragments and clay; and in still others they are comprised of many different mixtures of sand, silt, clay, and rock fragments.

Some of the terraces consist of remnants of old flood plains. They are about a quarter of a mile, or a little more, from the present streams. The soils on these remnants, or old high terraces, belong to the Hiwassee and Masada series. They occupy ridges 50 to 300 feet above the stream beds and are not subject to overflow. The profiles of these soils are mature and resemble the profiles of many of the soils of the uplands. The Hiwassee soils of the high terraces are well drained to somewhat excessively drained, and the Masada soil is well drained to moderately well drained.

Soils on the lower terraces near streams are members of the Wickham, Altavista, Augusta, and Roanoke series. Generally they are not subject to floods, but some areas are inundated when floods are high. In many places seepage water from higher lying terraces and uplands stands on these soils if the season is wet. The Wickham soil is well drained to moderately well drained; the Altavista, moderately well drained; the Augusta, somewhat poorly drained; and the Roanoke, poorly drained.

The total area of the terrace soils is about 3,831 acres.

HIWASSEE SERIES

The Hiwassee soils are the reddest of the soils on terraces, and they contain the most clay. Generally they occur on comparatively high terraces where they are not subject to overflow. They are associated with the Masada soil. The Hiwassee soils have formed from old alluvium composed mainly of silt, clay, and rock fragments. This alluvium was derived from upland soils, such as the Lloyd, that have red subsoils. In most places the Hiwassee soils are deep. Their depth is as much as 50 feet to beds of gravel and larger rock fragments. Few rock fragments or pieces of gravel occur on the surface or in the profile.

The content of organic matter in the surface layer of these soils is moderate. The soils are medium to strongly acid, but are generally in the upper part of the strongly acid range (pH about 5.4). The total area of the Hiwassee soils is about 2,410 acres.

MASADA SERIES

The Masada soil is lighter in color than the Hiwassee soils. It resembles both the Durham soil of the uplands and the Altavista soils of the low terraces. The soil has formed from old alluvium, composed chiefly of sand but containing a small amount of silt and clay. This old alluvial material was probably washed from coarse-textured Appling, Durham, Cecil, and associated soils of the uplands.

Generally the Masada soil occupies slightly lower positions than the Hiwassee soils. Its surface runoff is medium to slow. Internal drainage is generally medium, but it is slow in the lower part of the profile. As a rule gray, yellow, red, and white mottlings occur below a depth of 24 inches. The soil is lower in organic matter than the Hiwassee soils. It is generally very strongly acid (pH a little lower than 5.0). The total area of Masada soils is only about 483 acres.

WICKHAM SERIES

The Wickham soil occupies low terraces along many of the streams. It has formed from sand, silt, and clay washed from Cecil, Appling, Madison, Tatum, Nason, and other soils of the uplands. The soil is closely associated with the Altavista, Augusta, and Roanoke soils. It has good to moderately good drainage and is one of the best soils in the county for most crops. The Wickham soil is deep to beds of gravel and cobblestones in most places. The soil ranges from slightly acid to strongly acid, but in most places it is medium acid. The total area is only 352 acres.

ALTAVISTA SERIES

The Altavista soil has formed from material similar to that from which the Wickham soil developed. It is closely associated with the Wickham soil and with the Augusta and Roanoke soils. The soil differs from the Wickham soil mainly in having only moderately good drainage, a generally lighter colored surface soil, and mottling in the lower part of the subsoil and in the parent material. The soil is more acid throughout than the Wickham soil. It is not an extensive soil, as it covers an area of only 264 acres.

AUGUSTA SERIES

The Augusta soil has formed from alluvial parent material similar to that from which the Altavista soil originated, but it is slightly lighter in color than the Altavista soil. It is somewhat poorly drained and, in most places, mottlings of gray, brown, and yellow occur at depths of 8 to 16 inches. Generally the soil receives seepage water and local wash from higher terraces and uplands. A thin moderately plastic lower layer occurs in some places. The soil is slightly more acid than the Altavista soil. It is very poorly suited to many crops. The total area is only 168 acres.

ROANOKE SERIES

The Roanoke soil is light colored and poorly drained. It occupies some of the lowest terraces. The soil is closely associated with the Augusta, Altavista, and Wickham soils of the low terraces and with the Masada and Hiwassee soils of the high terraces. It resembles

both the Worsham soils of the colluvial lands and the Wehadkee soil of the bottom lands.

The parent material of the Roanoke soil consists of sand, silt, and clay washed from Cecil, Appling, Lloyd, Tatum, Nason, and other associated soils of the uplands. The parent material is predominantly gray and in most places is coarser textured and less plastic at depths below 40 inches.

The soil, because of its position on low terraces, receives local wash and seepage water from higher lying soils. It is strongly acid in most places and is slightly more acid than the Wickham or Altavista soils. The total area of this soil is only 154 acres.

SOILS OF BOTTOM LANDS

The soils of bottom lands have formed from the most recent alluvial deposits. They occupy nearly level areas only a few feet higher in elevation than the normal level of the adjacent streams. Consequently, they are subject to overflow during heavy rains. The soils of bottom lands belong to the following series:

Buncombe	Chewacla
Congaree	Wehadkee

These soils are comprised of sand, silt, clay, and rock fragments that have washed from many different soils of the uplands. The main differences among the soils have been caused by differences in drainage or slight differences in relief, although differences in parent material have been a factor in some places. The Buncombe soil is excessively drained; the Congaree soils, well drained; the Chewacla soil, somewhat poorly drained; and the Wehadkee soil, poorly drained. The total area of these soils of bottom lands is about 7,551 acres.

BUNCOMBE SERIES

The Buncombe soil is developing from some of the most recent alluvial materials, mainly sand. Most of the soil is near streambanks, where frequent floods deposit the coarser textured sediments that make up most of the parent material. The soil is loose, open, and porous throughout. Profile layers are only faintly evident. Drainage is excessive, and the soil is entirely free of mottling. The soil is very strongly acid throughout (pH 4.5 to 5.0). Except for melons, few crops can grow on it successfully. The total area of the Buncombe soil is only 437 acres.

CONGAREE SERIES

The Congaree soils are the brownest, deepest, and most productive of the soils of bottom lands. They are associated with the Chewacla and Wahadkee soils. These soils are sometimes overflowed by adjacent streams. They are well drained and in most places occupy slightly higher positions than the other soils of the bottom lands. The parent material of the Congaree soils is alluvium derived from Cecil, Appling, Tatum, Nason, Lloyd, and associated soils of the uplands. Organic-matter content is comparatively high in these soils. The soils are generally medium acid (pH 5.1 to 5.6). These soils cover a total area of about 3,953 acres.

CHEWACLA SERIES

The Chewacla soil differs from the Congaree soils mainly in being somewhat poorly drained. It is mottled yellow, red, white, and gray below depths of 8 to 16 inches. The surface soil resembles the surface layer of the Congaree soils in color. The color of the subsoil is similar to that of the Wehadkee soil. The texture of the surface soil is predominantly silt loam, and that of the subsoil ranges from silt loam through fine sandy loam to silty clay loam. The soil is medium acid to strongly acid. The total area covers about 1,521 acres.

WEHADKEE SERIES

The Wehadkee soil is poorly drained. It has formed on first bottoms from alluvial parent material similar to that from which the Congaree and Chewacla soils were formed. The soil resembles the Worsham soils of the colluvial lands. It is mottled throughout with shades of brown, yellow, gray, and white. The soil is slightly acid to strongly acid, according to field tests, but is generally medium acid. The total area covers about 1,640 acres.

SOIL TYPES AND PHASES

In the following pages, the soil types and phases and other mapping units of Fluvanna County are described in detail and their agricultural relations are discussed. Their distribution is shown on the soil map accompanying this report. The approximate acreage and proportionate extent of the soils mapped are given in table 2.

The soils are placed in 17 groups. The groups are distinguished on the soil map by various colors. The colors vary according to physical characteristics common to the soils of each group and according to management requirements.

TABLE 2.—*Approximate acreage and proportionate extent of the soils mapped in Fluvanna County, Va.*

Type of soil	Acres	Percent
Altavista silt loam, undulating phase	264	0. 1
Appling fine sandy loam:		
Eroded rolling phase	289	. 2
Rolling phase	1, 149	. 6
Undulating phase	2, 859	1. 6
Appling gritty fine sandy loam:		
Rolling phase	153	. 1
Undulating phase	805	. 4
Appling sandy loam:		
Eroded rolling phase	173	. 1
Rolling phase	1, 229	. 7
Undulating phase	2, 585	1. 4
Augusta fine sandy loam	168	. 1
Bremo silt loam:		
Hilly phase	2, 188	1. 2
Rolling phase	2, 217	1. 2
Undulating phase	708	. 4
Buncombe loamy fine sand	437	. 2

TABLE 2.—*Approximate acreage and proportionate extent of the soils mapped in Fluvanna County, Va.*—Continued

Type of soil	Acres	Percent
Cecil clay loam:		
Eroded rolling phase	256	.1
Eroded undulating phase	414	.2
Cecil fine sandy loam, undulating phase	612	.3
Cecil sandy loam:		
Rolling phase	269	.1
Undulating phase	846	.5
Chewacla silt loam	1,521	.8
Colfax sandy loam	671	.4
Congaree fine sandy loam	1,768	1.0
Congaree silt loam	2,185	1.2
Durham fine sandy loam, undulating phase	205	.1
Elbert silt loam	419	.2
Fluvanna fine sandy loam:		
Rolling phase	104	.1
Undulating phase	339	.2
Fluvanna silt loam:		
Eroded rolling phase	199	.1
Rolling phase	994	.6
Undulating phase	2,345	1.3
Goldvein gritty silt loam, undulating and rolling phases	306	.2
Helena fine sandy loam:		
Eroded rolling phase	187	.1
Rolling phase	227	.1
Undulating phase	1,431	.8
Hiwassee clay loam:		
Eroded rolling phase	259	.1
Eroded undulating phase	239	.1
Hiwassee cobbly fine sandy loam, undulating light-colored phase	154	.1
Hiwassee fine sandy loam:		
Rolling light-colored phase	422	.2
Undulating light-colored phase	741	.4
Hiwassee silt loam:		
Rolling phase	122	.1
Undulating phase	473	.3
Lignum loam, undulating phase	458	.3
Lignum silt loam, undulating phase	1,883	1.0
Lloyd silt loam:		
Rolling phase	407	.2
Undulating phase	2,460	1.4
Lloyd silty clay loam:		
Eroded rolling phase	503	.3
Eroded undulating phase	793	.4
Louisa loam:		
Hilly and steep phases	661	.4
Rolling phase	212	.1
Louisburg sandy loam:		
Eroded rolling and hilly phases	2,901	1.6
Eroded steep phase	3,198	1.8
Rolling and hilly phases	6,746	3.7
Made land	138	.1
Madison loam:		
Rolling phase	568	.3
Undulating phase	1,056	.6
Manteo-Bremo silt loams:		
Hilly phases	457	.3
Rolling phases	252	.1

TABLE 2.—*Approximate acreage and proportionate extent of the soils mapped in Fluvanna County, Va.*—Continued

Type of soil	Acres	Percent
Manteo silt loam:		
Hilly phase	12, 188	6. 8
Rolling phase	8, 429	4. 7
Steep phase	6, 220	3. 4
Undulating phase	983	. 5
Masada fine sandy loam, undulating phase	483	. 3
Mixed alluvial land:		
Poorly drained	4, 911	2. 7
Well drained	2, 672	1. 5
Nason loam:		
Eroded rolling phase	195	. 1
Rolling phase	1, 741	1. 0
Undulating phase	2, 941	1. 6
Nason silt loam:		
Eroded rolling phase	1, 253	. 7
Eroded undulating phase	244	. 1
Rolling phase	16, 963	9. 5
Undulating phase	19, 344	10. 8
Orange-Bremo silt loams, undulating phases	513	. 3
Orange silt loam:		
Gravelly subsoil phase	567	. 3
Undulating phase	2, 264	1. 3
Riverwash	558	. 3
Roanoke silt loam	154	. 1
Rough gullied land	103	. 1
Seneca fine sandy loam	270	. 1
Seneca silt loam	628	. 3
Starr loam	520	. 3
Stony land	441	. 2
Tatum loam, undulating phase	382	. 2
Tatum silt loam:		
Rolling phase	1, 629	. 9
Undulating phase	24, 144	13. 5
Tatum silty clay loam:		
Eroded rolling phase	1, 697	. 9
Eroded undulating phase	2, 353	1. 3
Vance fine sandy loam, undulating phase	401	. 2
Wehadkee silt loam	1, 640	. 9
Wickham loam, undulating phase	352	. 2
Wilkes sandy loam:		
Hilly and steep phases	1, 200	. 7
Rolling phase	426	. 2
Worsham sandy loam	1, 470	. 8
Worsham silt loam	2, 844	1. 6
Zion silt loam, undulating phase	182	. 1
Total mapping units	178, 930	99. 1
Other acreage [1]	1, 550	. 9
Total area	180, 480	100. 0

[1] Other acreage in the county includes the following: Water area, 559 acres, or about 0.379 percent; canal bed, 42 acres, or about 0.02 percent; mines and pits, 2 acres, or about 0.001 percent; and miscellaneous, 947 acres, or about 0.5 percent.

Altavista silt loam, undulating phase (2 to 8 percent slopes) (Aa).—This moderately well drained soil generally occupies low stream terraces. Some of the lower lying areas are flooded when water is extremely high. The soil is closely associated with Hiwassee, Wickham, Augusta, and Roanoke soils. It has developed from alluvial deposits of sand, silt, and clay washed from areas of Cecil, Lloyd, Tatum, Nason, and associated soils of the Piedmont plateau.

Profile in a cultivated area:

0 to 10 inches, brown to light yellowish-brown very friable silt loam; somewhat lighter in color when dry.
10 to 26 inches, yellowish-brown to yellowish-red friable to firm silty clay loam to clay loam.
26 to 36 inches, mottled yellowish-brown, brown, and gray friable to firm clay to clay loam; plastic when wet.
36 inches +, highly mottled fine sandy clay in which there are strata of sandy material; contains a few rounded stones and pebbles that become more numerous with depth.

Texture, depth, and color of the surface soil and subsoil vary somewhat from place to place. Along the Rivanna River north of Carysbrook, the surface soil is brown heavy silt loam, and the subsoil, yellowish-brown heavy clay. Here the organic-matter content is high and the soil is generally more productive than other areas of Altavista silt loam, undulating phase. Along Mechum Creek a few areas occur that have a fine sandy loam surface soil and clay loam subsoil.

In most places the undulating phase of Altavista silt loam is very strongly acid throughout. It has a fair supply of organic matter, but fertility is generally low. The surface soil is moderately permeable to roots, moisture, and air, and the subsoil is moderately to slowly permeable. Surface runoff is slow to medium, and internal drainage, medium to slow. Water-holding capacity is high.

Use and management (A–5 [5]).—Altavista silt loam, undulating phase, is easy to work and conserve. Under usual management productivity is low to medium, but under good management it is high. This soil ranges widely in suitability. It is good to excellent for corn, hay, and pasture, and fair to good for many small grains and truck crops. Alfalfa can be grown, but the soil is not well suited to it because internal drainage is unfavorable. Good stands can be obtained, but they die out within a few years.

About 52 percent of this soil is in forest, and 25 percent in pasture. About 21 percent is tilled, and 2 percent is idle. The tilled areas are planted chiefly to corn, small grains, and hay, which are usually grown in a 2- to 4-year rotation.

Appling fine sandy loam, undulating phase (2 to 8 percent slopes) (Ad).—This well drained to moderately well drained upland soil generally occupies very gently undulating to undulating ridgetops. It occurs chiefly in the southeastern part of the county. Locally it is called gray sandy land. It is one of the most extensive soils derived from weathered granitic material in the county. The soil is closely associated with Cecil, Durham, Louisburg, and Colfax soils.

[5] Management group to which soil belongs.

Profile in a cultivated area:

0 to 12 inches, pale-yellow to yellowish-brown very friable fine sandy loam.
12 to 16 inches, yellowish-brown to yellowish-red firm clay loam; moderate medium blocky structure; contains a few fine mica flakes and small quartz pebbles.
16 to 24 inches, yellowish-red firm to very firm clay to clay loam; moderate medium blocky structure; in places slightly plastic when wet; contains some small mica flakes and quartz pebbles.
24 to 35 inches, predominantly yellowish-red friable clay to clay loam soil material mottled with shades of brown and yellow; contains numerous small mica flakes and quartz particles that increase in quantity with depth.

In wooded areas there is a thin layer of forest litter on this soil. Color, thickness, and texture of the surface soil and subsoil vary greatly in the soil, as do the number of quartz pebbles and stones. On the higher, narrower ridgetops, where relief is more nearly rolling, small areas have a red subsoil similar to that of the Cecil soils. In places, where Appling fine sandy loam, undulating phase, grades to areas of Colfax soil or is associated with Vance and Helena soils, it is slightly lighter in color, its subsoil is finer textured, and it is not so well drained as the typical soil. Quartz pebbles and stones occur in small numbers in most areas. In some places there are enough to interfere with tillage. The location of such areas is shown on the soil map by symbols.

The undulating phase of Appling fine sandy loam is very strongly acid throughout. It has a low to moderate content of organic matter, and fertility is comparatively low. Permeability to roots, moisture, and air is moderately rapid in the surface soil, and moderate in the subsoil. Both surface runoff and internal drainage are medium. Water-holding capacity is moderate.

Mapped with the undulating phase is approximately 43 acres of Appling fine sandy loam, severely eroded undulating phase. This included soil differs mainly in having a thinner surface layer because of erosion. In places erosion has removed all the original surface soil, and in these the subsoil is now the plow layer. In these places tilth is poor, tillage difficult, and productivity generally low. On about 3 acres of this included soil, a few shallow gullies occur, and on about 12 acres, shallow gullies are numerous.

Use and management (A–5).—The supply of organic matter is low to moderate in Appling fine sandy loam, undulating phase, but the permeability is favorable, and excellent tilth can be maintained. The soil is easy to work and fairly easy to conserve. It responds well to good management and retains improvements comparatively well. It is well suited to many crops, and yields are high under good management.

About 66 percent of this soil is in forest, and 26 percent is tilled. The small remaining acreage is pastured or idle. The principal crops are corn, small grains, and hay, usually grown in 3- to 5-year rotations. Some small areas are planted to air-cured tobacco. Most of the forests are cut over. Generally the pastures consist of mixed wild grasses and weeds.

Appling fine sandy loam, rolling phase (8 to 15 percent slopes) (Ac).—The rolling phase resembles the undulating phase of Appling fine sandy loam. Its slopes are much stronger, however; the soil is slightly shallower and somewhat more eroded; and generally it con-

tains a slightly greater quantity of loose stones and pebbles. The rolling phase occupies slopes that extend from undissected upland ridgetops. It is closely associated with the undulating phase of Appling fine sandy loam and with Cecil, Colfax, and Durham soils. Variations are similar to those in Appling fine sandy loam, undulating phase.

Surface runoff is medium to rapid. Internal drainage is good.

On some of the stronger slopes, small acreages that resemble the Louisburg soils are included with this mapping unit. About 9 acres of Appling fine sandy loam, hilly phase, is also mapped with the rolling phase. This included hilly phase differs mainly in having slopes of 15 to 25 percent.

Use and management (A–8).—The use suitability and management needs of Appling fine sandy loam, rolling phase, differ from those of the undulating phase mainly because of the stronger slopes. Because of these slopes, runoff is medium to rapid; consequently, the rolling phase stores less water for plants than the undulating phase, and crops are subject to more damage during dry periods. Moreover, the slopes are more susceptible to erosion, and the use of heavier types of farm machinery is more difficult.

About 76 percent of Appling fine sandy loam, rolling phase, is in forest, 15 percent is tilled, 5 percent is pastured, and 4 percent is idle. Generally, cropped and pastured areas are managed in a way similar to cropped and pastured areas of the undulating phase, although a few farmers till on the contour, stripcrop, and use longer rotations. Yields obtained under usual management are somewhat smaller than on the undulating phase.

Appling fine sandy loam, eroded rolling phase (8 to 15 percent slopes) (Ab).—This soil has lost a large part of its original surface layer through erosion. In about 29 acres, where the surface soil is only moderately sheet eroded, a few to many deep gullies have developed. In others, nearly all the surface soil has been lost and there are a few to many shallow gullies.

To plow depth, the soil is pale-yellow to yellowish-brown very friable to friable fine sandy loam, or reddish-yellow to brownish-yellow friable clay loam.

With the eroded rolling phase is included about 17 acres of Appling fine sandy loam, eroded hilly phase. This included hilly soil differs mainly in having very strong (15 to 25 percent) slopes. A few to many shallow gullies and a few deep ones occur in the eroded hilly areas.

Use and management (B–2).—Erosion in Appling fine sandy loam, eroded rolling phase, greatly reduces its suitability for use, especially for tilled crops (pl. 3, *B*). Fertility and productivity are very low in the deeply gullied areas, and it is almost impossible to use heavy farm machinery. In places the structure of the plow layer has been impaired because the clay loam or clay subsoil has been mixed with the remaining sandy surface soil. This mixing has reduced the suitability and productivity of the soil more than any other cause. The soil is difficult to work and to conserve, and it is difficult to improve for crops.

About 56 percent of Appling fine sandy loam, eroded rolling phase,

is in forest, 29 percent is tilled, and 15 percent is idle. Cropped or pastured areas are run down, and little is being done to improve them. Yields of crops and pasture are comparatively low. This soil is best used for permanent close-growing grasses and legumes, mainly in permanent pasture. Good management is necessary to obtain satisfactory growth of pasture plants.

Appling sandy loam, undulating phase (2 to 8 percent slopes) (Ak).—This soil is commonly called gray sandy land. Except that its texture is coarser and in most places its surface soil is lighter colored and slightly thicker, it is essentially the same in profile characteristics as Appling fine sandy loam, undulating phase. In places the subsoil layer is thinner also. The soil was derived from material weathered from granite coarser grained than that from which the Appling fine sandy loam soils were derived, and it contains more quartz pebbles and stones.

This soil occurs on undissected upland ridgetops. It is associated with other Appling soils and with Cecil, Colfax, Durham, and Louisburg soils. Surface runoff is medium; internal drainage is medium to rapid. The water-holding capacity is moderate to moderately low.

Use and management (A–5).—Appling sandy loam, undulating phase, is one of the most desirable soils in the county for many crops, although it is low in organic matter and in most plant nutrients. It is sandy, loose, open, easy to work, fairly easy to conserve, and moderately productive if well managed. Drought causes slightly more injury to crops on this soil than to crops on Appling fine sandy loam, undulating phase, and the effects of good management do not last so long.

About 65 percent of the soil is in forest and 23 percent is cultivated. Approximately 6 percent is idle, and 6 percent is pastured.

Appling sandy loam, rolling phase (8 to 15 percent slopes) (Ah).—This phase differs from Appling sandy loam, undulating phase, mainly in having stronger slopes and thinner profile layers. Also in many places considerably more quartz pebbles and stones occur throughout the profile. This phase is associated with the same soils as the undulating phase and was derived from similar parent material. Both surface runoff and internal drainage are medium to rapid.

Mapped with this soil is about 64 acres of Appling sandy loam, hilly phase. This included soil has very strong (15 to 25 percent) slopes. Differences in the two soils arise from differences in slope.

Use and management (A–8).—Appling sandy loam, rolling phase, is generally suited to crops similar to those grown on Appling fine sandy loam, rolling phase. It leaches more rapidly, however, and does not retain moisture and plant nutrients so well. It must therefore have slightly heavier and more frequent applications of lime, commercial fertilizer, and barnyard manure or other organic matter. Planting and tilling on the contour and stripcropping to conserve plant nutrients and moisture are among the most important management practices to build up and maintain productivity. Pasture also needs slightly heavier and more frequent applications of lime, commercial fertilizer, and manure than pastures on Appling fine sandy loam, rolling phase.

About 72 percent of this soil is in forest, 17 percent is tilled, 8 percent is idle, and 3 percent is pastured.

Appling sandy loam, eroded rolling phase (8 to 15 percent slopes) (Ag).—This soil is similar to Appling fine sandy loam, eroded rolling phase, in most respects. To plow depth the soil is pale-yellow to light yellowish-brown very friable or friable sandy loam, or reddish-yellow to brownish-yellow friable clay loam, the texture depending on the amount of surface soil lost through erosion. Many quartz pebbles and stone fragments occur on the surface and in the surface soil.

Mapped with this eroded rolling phase is about 60 acres of Appling sandy loam, eroded hilly phase, which differs mainly in having stronger slopes of 15 to 30 percent. Some deep gullies occur in these hilly areas.

Use and management (B–2).—Appling sandy loam, eroded rolling phase, is best suited to permanent close-growing grasses and legumes, mainly in permanent pasture. Pastures must be well managed to produce satisfactory grazing.

About 75 percent of this soil is in forest, 14 percent is cultivated, and 11 percent is idle.

Appling gritty fine sandy loam, undulating phase (2 to 8 percent slopes) (Af).—This well drained to somewhat excessively drained soil occurs on undissected upland ridges in the east-central part of the county just south of Wilmington. It is commonly called white gravelly land or gritty land. In most of its physical characteristics, the soil is similar to the other Appling soils. It differs mainly in having more quartz grit or gravel both on the surface soil and throughout the profile. The soil has developed from weathered products of coarse-grained granite.

Appling gritty fine sandy loam, undulating phase, is closely associated with the Louisburg, Worsham, and Colfax soils. The area occupied by these associated soils is bordered on the northeast by areas of Lloyd, Fluvanna, and Orange soils and on the south by other Appling soils. Moderate sheet erosion has occurred on approximately 522 acres of the undulating phase of Appling gritty fine sandy loam. A few shallow gullies occur in about 8 acres.

Profile in a cultivated area:

0 to 10 inches, light yellowish-brown very friable gritty fine sandy loam; contains numerous small white and brownish angular quartz pebbles; topmost 2-inch layer in wooded areas darker in color.

10 to 15 inches, light yellowish-brown, faintly mingled with shades of yellow and reddish brown, gritty friable light clay loam; slightly hard and compact when dry.

15 to 26 inches, predominantly reddish-yellow friable to firm heavy clay splotched with purplish red and brown; contains much less grit than horizon above.

26 to 40 inches, mingled reddish-yellow, purplish-red, pale-yellow, and white light clay mixed with many small quartz pebbles and other material from weathered granite.

Loose quartz stones and some granite outcrops occur in places. In some places the subsoil contains very little clay. In areas on sharp ridgetops, the subsoil is red like that of the Cecil soils. In several places the soil to a depth of about 20 inches has been removed to serve as roadbuilding material.

The undulating phase of Appling gritty fine sandy loam is very strongly acid throughout. Its organic-matter content is very low, and the content of plant nutrients is low. Permeability to roots, moisture, and air is rapid in the surface soil and moderate to rapid in the subsoil. Both surface runoff and internal drainage are generally medium to rapid, although in some places internal drainage is slow in the lower part of the subsoil. The water-holding capacity is moderately low.

Use and management (A–5).—The high content of gritty quartz material, very low content of organic matter, and low supply of plant nutrients make Appling gritty fine sandy loam, undulating phase, much less productive of most crops than the finer textured Appling soils. The loose open surface soil and upper subsoil absorb water readily, but they allow it to leach out rapidly. Tilth is fairly good, but the grit on the surface makes growth of some crops difficult. Yields of most crops are comparatively low, especially in the drier seasons. The soil is easy to work and generally easy to conserve.

About 66 percent of this soil is in forest, 24 percent is cultivated, 9 percent is pastured, and 1 percent is idle. The tilled areas are planted mainly to corn, small grains, and hay. A few small patches are planted to sun-cured tobacco. At one time the cultivated areas were used to grow bright tobacco intensively. Generally, crop rotations, fertilization, and other management practices are similar to those for Appling fine sandy loam, undulating phase, but this soil is somewhat less productive for most crops.

Under the usual management, pasture is generally poor. The soil is so gritty and droughty that it is difficult to maintain a good permanent pasture sod. The pastures should be grazed more lightly than pastures on other Appling soils.

Appling gritty fine sandy loam, rolling phase (8 to 15 percent slopes) (Ae).—Except for stronger slopes and slightly shallower depth to weathered rock, this soil is practically identical to Appling gritty fine sandy loam, undulating phase. It is slightly more eroded, however.

Generally, this soil is closely associated with the undulating phase and with Louisburg and Worsham soils. It occupies rolling upland ridges immediately south of Wilmington. Except for some places in the lower part of the subsoil where internal drainage is slow, both surface runoff and internal drainage are medium to rapid.

Use and management (A–8).—Largely because of its stronger slope, the rolling phase of Appling gritty fine sandy loam is more difficult to work and to conserve than the undulating phase. About 79 percent of it is in forest, 17 percent is cleared, 3 percent is pastured, and 1 percent is idle. The trees on the forested land are mainly hardwoods. They include white, red, and chestnut oaks; hickory; blackgum; and dogwood. Some of the areas were formerly cleared and cropped but are now growing up to scrub pine.

In cropped and pastured areas, care is necessary to control runoff and to prevent loss of soil by erosion. Stripcropping, contour cultivation, and long crop rotations are good practices for this rolling phase, in addition to the management suggested for the undulating phase. Manure should be applied to pastures on this soil, and grazing should be carefully regulated.

Augusta fine sandy loam (2 to 8 percent slopes) (Al).—This is not an extensive soil. It is light colored and somewhat poorly drained. The soil occupies low-lying terraces along some of the larger streams. It occurs mainly along Byrd Creek and along the Rivanna River near Grays Mill and Carysbrook. The soil was derived from alluvium composed of sand, silt, and clay washed from soils of the uplands. It is closely associated with the Altavista, Wickham, and Roanoke soils and with the light-colored phases of the Hiwassee soils. Relief is undulating, and the gradient of most slopes is about 4 percent.

In many places this soil receives surface runoff from slightly higher lying areas of Altavista, Wickham, and Hiwassee soils. Approximately 14 acres is moderately sheet eroded, and about 4 acres has a few shallow gullies.

Profile in a forested area:

0 to 2 inches, grayish-brown very friable fine sandy loam to silt loam.
2 to 8 inches, light yellowish-brown to brown very friable fine sandy loam to silt loam, in places faintly mottled with gray in the lower part.
8 to 20 inches, moderately to highly mottled brownish-yellow, gray, yellow, and yellowish-red firm to friable clay loam or silty clay loam.
20 to 30 inches, highly mottled red, yellow, reddish-brown, brownish-yellow, and gray friable sandy clay loam; contains considerable sand and gravel in lower part.

The most striking variations in this soil occur in the color, texture, and thickness of the various horizons. The surface soil ranges from grayish-brown to brown and from very fine sandy loam to heavy silt loam. Mottling generally occurs only in horizons below the surface layer, but in some places there are faint mottles in the lower part of the surface soil. The subsurface soil and subsoil range in texture from fine sandy clay to clay. Mottling ranges from faint to prominent, and the mottles are more numerous in some places than in others.

Augusta fine sandy loam is very strongly acid throughout. It has a low to moderate content of organic matter and is low in plant nutrients. The surface soil is moderately permeable to roots, moisture, and air, but the subsoil is slowly permeable. Surface runoff is slow to medium, and internal drainage is slow. The water-holding capacity is moderately low to low.

Use and management (A–10).—This is one of the least desirable soils of Fluvanna County for most crops. Its range of suitability is narrow, as it is unsuited to alfalfa and similar crops. The compact pan layer in the subsoil impedes drainage. Consequently the soil is extremely wet if the season is rainy, and it becomes hard to very hard during dry periods. The pan layer also prevents plant roots from penetrating and keeps them near the surface. As a result, crops suffer severely during dry periods.

The surface soil is generally free of stones and gravel. With reasonable care, good tilth can be maintained. The soil is fairly easy to work and easy to conserve, but mainly because of the unfavorable subsoil it does not produce well, even under good management.

Approximately 42 percent of this soil is in pasture, and 31 percent is tilled. About 16 percent is in forest, and 11 percent is idle. The tilled land is used chiefly to grow corn and hay in 3- to 4-year rotations. Small grains are planted in some areas, but yields are generally low.

Average yields of corn and hay are somewhat higher in areas where

management is better than ordinary. High average yields are difficult to obtain, however, because the soil is leached, alternately too wet or too dry, somewhat poorly drained, and low in lime and essential plant nutrients.

Bremo silt loam, undulating phase (2 to 8 percent slopes) (Bc).—This is a brown soil that, in nearly all areas, is shallow to bedrock. It has formed from weathered materials derived chiefly from hornblende schist and hornblende gneiss. It occurs mainly on low-lying ridgetops in the south-central part of the county and is closely associated with the Lloyd, Fluvanna, Orange, and Elbert soils. Most of it occurs in fairly small scattered areas, but a few forested areas are comparatively large. One such area is located about a mile south of Grays Mill, and another lies west of Byrd Creek.

About half of this soil is moderately sheet eroded. A few shallow to deep gullies have formed in about 13 acres.

Profile in a cultivated area:

0 to 7 inches, brown very friable light silt loam that is soft when dry; contains many small yellowish-brown, brownish-yellow, and black schist fragments.

7 to 12 inches, predominantly yellowish-brown very friable silt loam to silty clay loam soil material, mixed with many yellowish-brown, brownish yellow, black, and greenish partly weathered schist fragments.

12 to 20 inches, partly disintegrated schist fragments similar in color to those in layer above; underlain by almost solid rock.

A small to large number of schist stones lie on the surface of this soil. A very thin reddish silty clay subsoil has developed in areas that are underlain by rock that is finer textured and harder than the hornblende schist that underlies most of the soil. In a few places the subsoil is firm, thin, and yellowish brown and resembles the subsoil of Orange silt loam, undulating phase. The surface soil in these areas is loam that is generally a shade lighter in color than the surface layer of the silt loam areas.

In most places the profile of Bremo silt loam, undulating phase, is strongly acid throughout, but in some areas it is medium acid in the lower part. The soil is fairly well supplied to well supplied with organic matter and is medium in fertility. Permeability to roots, moisture, and air is moderate. Both surface runoff and internal drainage are medium. Because of the shallow depth to bedrock, water-holding capacity is low.

Use and management (A–11).—This soil is fairly easy to work. Many areas are sheet eroded, and shallow gullies have formed in some places, but the soil is fairly easy to conserve under cultivation. Productivity is medium to low. The soil is not so well suited to most crops as the associated Lloyd and Fluvanna soils, although it is well suited to wheat if well managed.

About 76 percent of Bremo silt loam, undulating phase, is in forest, 14 percent is tilled, 7 percent is pastured, and 3 percent is idle. The forest is mainly hardwoods, principally oak and hickory. Some areas that once were cleared and cultivated are now growing up to trees.

Bremo silt loam, rolling phase (8 to 15 percent slopes) (Bb).—The rolling phase of Bremo silt loam is the most extensive of the Bremo soils in Fluvanna County. It occurs in the same general locality as the undulating phase. It has stronger slopes and a larger content of

gravel and stone throughout. It is a little shallower to bedrock than the undulating phase.

Variations in the rolling and undulating phases of Bremo silt loam are similar. Most of this rolling phase is moderately sheet eroded, but erosion is severe on about 54 acres. A few shallow to deep gullies occur in about a third of this soil, and deep gullies are numerous in about 4 acres. Good tilth is difficult to maintain in areas that are severely sheet eroded because the clay subsoil and weathered schist are mixed together in the plow layer when the soil is tilled.

Surface runoff is rapid. As a result the soil does not absorb water so well as the undulating phase, and in many places crops are more affected by short dry spells.

Use and management (B–4).—Because of its stronger slope and associated unfavorable characteristics, this soil is not so well suited to crops and pasture as Bremo silt loam, undulating phase, and it is more difficult to work and conserve. It is generally best suited to permanent pasture.

About 83 percent of the soil is in forest, 11 percent is cultivated, 5 percent is idle, and 1 percent is pastured. Management of most of the cropped areas is generally similar to that of the undulating phase and of the associated Fluvanna and Lloyd soils. Yields of most crops are slightly lower, however, than on the undulating phase.

Bremo silt loam, hilly phase (15 to 25 percent slopes) (Ba).—The hilly phase of Bremo silt loam has steeper slopes and generally shallower depth to bedrock than the undulating phase. Although slopes are typically 15 to 25 percent, in about 209 acres the slope is slightly more than 25 percent. About 25 acres is severely sheet eroded, and many deep gullies occur in about 10 acres.

Surface runoff is rapid to very rapid on this soil. Internal drainage is medium, and the water-holding capacity is low to very low.

Use and management (B–4).—Because of its shallow depth and strong slopes, this soil is not well suited to tilled crops. Under good management, however, it is suitable for permanent pasture. It absorbs less rainwater and is more droughty than either the undulating phase or the rolling phase. Consequently it does not produce such good pasture. To improve pastures on this soil, the management suggested for Bremo silt loam, rolling phase, should be practiced, and more intensively than on the rolling phase.

The best use for the eroded soil is forest. If it is used for pasture, it will need heavy applications of manure or other organic matter and should be seeded with a good grass mixture.

About 84 percent of the hilly phase of Bremo silt loam is in forest, and 10 percent is cropped. Approximately 5 percent is pastured, and 1 percent is idle.

Buncombe loamy fine sand (0 to 2 percent slopes) (Bd).—This brown very sandy soil occurs on first bottoms along streams, mainly along the James and Rivanna Rivers. It is level to nearly level. The soil has formed near the streambanks and in sharp bends of creeks, chiefly from fine sandy material deposited by swift-flowing water. Even at low flood stage it is frequently overflowed and new sandy material is deposited by the floodwaters. No distinct soil layers have

developed in many places, and in these the profile consists of strata of brown and yellow loamy fine sand.

This soil is associated with the Congaree and Chewacla soils of the bottom lands. The acreage, compared to that of the associated soils, is small.

Profile in a cultivated area:

0 to 14 inches, brown loose loamy fine sand.
14 to 30 inches, yellowish-brown to brownish-yellow loose loamy fine sand.
30 to 45 inches, predominantly brownish yellow loamy fine sand or fine sand mottled or splotched with pale yellow, yellowish brown, and reddish brown; contains many brown, yellowish, and white rounded pebbles and waterworn stones.
45 inches +, beds of gravel and stone.

Noticeable variations occur in this soil. They consist mainly of differences in the depth of the profile to beds of gravel and stone and in the color and texture of the various layers of sandy material. In some places depth to gravel and stone is much less than in others. The surface soil is light brown in some places, but in a few areas it is dark brown. A few very small rocky bars occur in places along the edges of creeks and rivers.

Buncombe loamy fine sand is very strongly acid throughout. It has a low to very low content of organic matter, although in a few areas the content is moderate. The supply of essential plant nutrients is generally low. Permeability to roots, moisture, and air is very rapid. Drainage is excessive. Surface runoff is slow to very slow, but internal drainage is very rapid, and the water-holding capacity is low.

Use and management (A–2).—Because this soil is so loose and open, it tends to be droughty. It is easy to work, but only fairly easy to conserve, as plant nutrients leach out rapidly. The range of suitability is fairly narrow, and productivity is low. Some crops are damaged or ruined by periodic floods.

About 44 percent of the soil is in forest, 30 percent is tilled, 23 percent is idle, and 3 percent is pastured. Corn is the principal crop, but small grains and hay are grown to a lesser extent. Yields are comparatively low under common management, and pasture is poor compared to that on the Congaree soils. Liming and frequent applications of small amounts of fertilizer are necessary if desirable pasture plants are to be grown.

Cecil fine sandy loam, undulating phase (2 to 8 percent slopes) (Cc).—This well-drained soil of the uplands is characterized by its light-colored surface soil and red subsoil (pl. 1, *A*). It is commonly called gray sandy land with red clay subsoil. Generally it occurs on undulating ridgetops between drainageways. It has formed from material weathered from granite and gneiss—material similar to that underlying the Appling soils with which it is closely associated. It is also closely associated with Colfax sandy loam and in a few places with the Madison soils.

Areas of this soil are comparatively small and are fairly well scattered. A few large areas occur in the northeastern part. Moderate sheet erosion occurs on approximately 413 acres, and a few shallow gullies occur in about 10 acres.

Profile in a cultivated area:

0 to 7 inches, brownish-yellow very friable fine sandy loam, stained slightly darker in the upper 2 inches; in wooded areas has a layer of dark-gray forest litter ¼ to ¾ inch thick.
7 to 10 inches, yellowish-red to red firm heavy clay loam; slightly hard to hard when dry; contains some small mica flakes.
10 to 28 inches, red, firm clay; strong medium to coarse blocky structure; hard when dry, slightly plastic when wet; contains numerous small mica flakes.
28 to 34 inches, predominantly red, mingled with shades of yellow and brown, friable clay intermixed with partly decomposed granitic material, mostly mica flakes and very small quartz and feldspar particles; crushes easily to a weak fine granular mass.

The profile characteristics of this soil vary less than those of any other soil of the uplands. A few slight variations occur in the texture and thickness of the surface soil, and there are a few variations in the character of the parent material. The surface soil ranges in texture from loam to sandy loam, and in thickness from 6 to 8 inches. In the northern part of the county, where the soil is associated with the Madison soils, the parent material contains some weathered mica schist. Where the soil grades to Appling soils, it is a little lighter in color than elsewhere. In most places small quartz pebbles and stones are strewn over the surface and mixed with the surface soil.

Cecil fine sandy loam, undulating phase, is strongly to very strongly acid throughout. It generally is low in organic matter and in most of the essential plant nutrients. Permeability to roots, moisture, and air is moderately rapid in the surface soil and moderate in the subsoil. Both surface runoff and internal drainage are medium. The water-holding capacity is moderate.

Use and management (A–4).—Cecil fine sandy loam, undulating phase, ranges widely in suitability but is well suited to many crops. It is easy to work. Conservability is good, and good tilth is comparatively easy to maintain. Although fertility is generally low, the soil responds readily to good management. Under a high level of management, this is one of the most productive soils in the county.

Corn, small grains, and hay are the leading crops grown. Few areas are tilled on the contour, and none are stripcropped. The soil is best suited to small grains, hay, and corn. It is not so well suited to vegetables and tobacco. Under suitable management, alfalfa produces well, and, if feasible, it should be seeded on this soil rather than on associated soils.

About 74 percent of this soil is in forest, 21 percent is cultivated, 3 percent is idle, and 2 percent is pastured. Most of the forests have been cut over, and some areas have been burned over.

Cecil sandy loam, undulating phase (2 to 8 percent slopes) (Ce).—This soil has a coarser textured surface soil than Cecil fine sandy loam, undulating phase, and its parent material is a coarser grained granitic rock. The soil contains considerably more quartz gravel and stone than Cecil fine sandy loam, undulating phase. The coarser textured surface soil absorbs rainwater more readily and is slightly more droughty because it is more porous.

Moderate sheet erosion has occurred on approximately 632 acres, and there are a few to many shallow gullies on about 44 acres.

This phase is more extensive than Cecil fine sandy loam, undulating

phase. It occupies smaller individual areas, however, and occurs on narrower ridgetops. Most of it occurs in the east-central and southeastern parts.

Mapped with Cecil sandy loam, undulating phase, are a few areas of Cecil soil in which the surface soil is a gravelly sandy loam. Considerable gravel is mixed throughout the profile in this included soil. These included areas are too small to map separately as Cecil gravelly sandy loam, undulating phase.

Use and management (A–4).—Mainly because of its coarser texture, Cecil sandy loam, undulating phase, is not so well suited to most crops as Cecil fine sandy loam, undulating phase. More intensive management is needed to maintain its productivity. The moisture-holding capacity is lower, and measures to control leaching are greatly needed. The soil is easy to work, to conserve, and to keep in good tilth.

About 68 percent of this soil is in forest, 27 percent is cultivated, 3 percent is pastured, and 2 percent is idle. The principal crops are corn, small grains, and hay. Although common management is similar to that for Cecil fine sandy loam, undulating phase, yields of most crops are slightly lower.

Cecil sandy loam, rolling phase (8 to 25 percent slopes) (Cd).—Except for its stronger slopes and slightly thinner surface layer, this soil resembles the undulating phase of Cecil sandy loam. It has developed from similar parent material.

This soil is closely associated with other Cecil soils and with the Appling, Louisburg, and Colfax soils. It is not so extensive as Cecil fine sandy loam, undulating phase, or Cecil sandy loam, undulating phase. Surface runoff is medium to rapid, and internal drainage is medium.

Mapped with this soil are about 98 acres of Cecil fine sandy loam, rolling phase; 18 acres of Cecil sandy loam, hilly phase; and 74 acres of Cecil fine sandy loam, hilly phase. The hilly phases have steeper slopes and thinner surface soil than Cecil sandy loam, rolling phase, and are shallower to bedrock. All of the hilly areas are moderately sheet eroded and contain a few shallow and a few deep gullies.

Use and management (A–7).—Because of its stronger slopes, Cecil sandy loam, rolling phase, is not so well suited to tilled crops or pasture as the undulating phase. It is more difficult to work and conserve, and high productivity is more difficult to maintain. Most of the included hilly land is too steep for row crops and is not well suited to pasture.

About 60 percent of this soil is in forest, 15 percent is tilled, 14 percent is idle, and 11 percent is pastured. Management commonly used for crops and pasture is similar to that for the undulating phase, but yields are somewhat lower.

Cecil clay loam, eroded undulating phase (2 to 8 percent slopes) (Cb).—This soil has lost all or nearly all of its surface layer and, in places, part of its subsoil through accelerated erosion. Most areas are comparatively small and are widely scattered among areas of other Cecil soils.

The plow layer is generally yellowish-red to red friable clay loam. In other respects the profile is similar to that of Cecil fine sandy

loam, undulating phase. A few shallow to deep gullies have formed in about 52 acres. Surface runoff is medium to rapid, and internal drainage is medium to slow.

Use and management (A–6).—Mainly because of erosion, this soil is not so productive as the uneroded undulating phases of other Cecil soils. The soil has fair to poor workability. It is only fairly easy to conserve under cultivation. When the soil is plowed, the clay subsoil is mixed with the remaining surface soil. Good tilth is therefore difficult to maintain. Control of water and erosion is difficult. In the small gullied areas, it is not feasible to use heavy farm machinery. In spite of the risk of erosion and the unfavorable workability in some areas, this is one of the better soils of the uplands. It responds well to good management and retains improvements for a long time.

About 43 percent of this soil is cultivated, 39 percent is in forest, 11 percent is idle, and 7 percent is pastured.

Under similar management this eroded soil produces considerably lower yields than Cecil fine sandy loam, undulating phase, and its range of suitability is not so wide. Nevertheless, it is well suited to many of the crops commonly grown. As much of this phase as possible should be kept in pasture most of the time or planted to close-growing field crops. The gullied areas can be pastured.

Cecil clay loam, eroded rolling phase (8 to 25 percent slopes) (Ca).—Except that it has stronger slopes and is a little more eroded and slightly shallower to bedrock, this phase resembles Cecil clay loam, eroded undulating phase. It is closely associated with the other Cecil soils and with Appling, Louisburg, and Colfax soils. It is somewhat less extensive than the eroded undulating phase, and areas are small and widely scattered. Surface runoff is rapid to very rapid, and internal drainage is medium to slow.

Mapped with this rolling phase is about 85 acres of Cecil clay loam, eroded hilly phase, which has stronger slopes. In approximately 51 acres of the included soil, a few shallow to deep gullies occur; there are many deep gullies in about 11 acres. In the included soil the depth to weathered rock varies markedly from place to place.

Use and management (A–9).—Because of the rapid to very rapid surface runoff, the moisture supply is less favorable for plants than that of the undulating phases of Cecil fine sandy loam and Cecil sandy loam, which have slower runoff. Tilth is poor, and workability is fair to poor. Soil material and plant nutrients are difficult to conserve, and productivity is low.

About 40 percent of this soil is in forest, and 28 percent is cultivated. Approximately 16 percent is pastured, and 16 percent is idle.

Chewacla silt loam (0 to 2 percent slopes) (Cf).—This brown somewhat poorly drained soil was derived from sand, silt, and clay that washed from soils of the uplands. It occurs on bottom lands along many of the larger streams. Areas are generally small and widely scattered; the larger ones occur along the James and Rivanna Rivers. The soil is closely associated with Congaree and Wehadkee soils. It occurs at lower altitudes than the Congaree soils and at higher altitudes than the Wehadkee soil. The soil is more likely to be

flooded than the Congaree soils. It is free of stones and pebbles in most places.

Profile characteristics:

0 to 9 inches, brown very friable silt loam, light brown when dry.
9 to 16 inches, mottled brown, light-gray, and yellowish-red very friable to friable silt loam; weak fine granular structure; contains many small mica flakes.
16 to 40 inches, highly mottled, yellow, yellowish-red, brownish-yellow, and light-gray friable fine sandy loam to silty clay loam; moderate thin platy structure; contains small mica flakes and black mineral film.
40 inches +, very highly mottled, white, brownish-yellow, and pale-yellow fine sandy loam to clay loam soil material; contains numerous mica flakes in some places but none in others.

The profile varies greatly in color, texture, consistence, thickness of layers, and depth to the water table. The texture of the surface soil ranges from heavy silt loam to fine sandy loam, and that of the subsoil from fine sandy clay to clay. In places the subsoil is sticky and plastic when wet and hard when dry. In these areas the subsoil is composed largely of material derived from basic rock. In other areas it consists of slick, highly micaceous friable loam or silt loam. In places where the soil is heavier in texture, the soil material appears to be derived from upland soils that are underlain by basic rock. Such areas are associated with areas of Congaree silt loam and occur on the wider bottoms along the James and Rivanna Rivers.

The soil varies most in color, texture, and consistence in small areas along the smaller streams. In such places, furthermore, the depth to gravel and cobblestones varies more than in the larger areas. In many places, small patches of a poorly drained soil similar to Wehadkee silt loam occur. These are included mainly because they are too small to be mapped separately.

This soil is generally medium to strongly acid. Its content of organic matter is comparatively high, and its fertility is medium to high. Permeability to roots, moisture, and air is moderate to slow in the surface soil and slow in the subsoil. Both surface runoff and internal drainage are slow. The water-holding capacity is moderate.

Use and management (B–1).—Because of its slow internal drainage, Chewacla silt loam does not readily absorb the runoff from adjacent slopes. It remains wet much of the time, and the range of moisture over which it can be cultivated and cropped is narrow. Workability is fair. The soil is easy to conserve, and tilth is fairly easy to maintain. The soil retains plant nutrients well and can be built up to a fairly high productivity. It is not affected greatly by droughts.

About 35 percent of Chewacla silt loam is tilled, 33 percent is in forest, 23 percent is idle, and 9 percent is pastured. The more extensive areas along the larger streams are generally cropped or pastured. Many areas along the smaller streams are in forest, and some are idle. If the season is wet, the water table is high in the subsoil. In places such crops as alfalfa and tobacco are likely to drown out, and in many places crops are likely to be damaged by floods.

Mainly because of somewhat poor drainage and the risk of floods, this soil is best suited to pasture, corn, and some hay crops. It is poorly suited to small grains, tobacco, and alfalfa, and to potatoes and many other vegetable crops. Under the usual management,

average yields are somewhat smaller than on the associated Congaree soils.

Colfax sandy loam (2 to 8 percent slopes) (Cg).—This light-colored soil has a brittle pan layer that occurs in the lower part of the subsoil. The soil is somewhat poorly drained. It occurs at the bases of slopes, around the heads of drainageways, and on upland flats. The individual areas are small and widely scattered among the associated soils.

Most of this soil had formed from light-colored weathered granitic material. In places, however, particularly at the foot of slopes and at the heads of drainageways, it has developed from colluvial material washed or sloughed from the adjacent slopes.

Colfax sandy loam is closely associated with Appling, Durham, and Worsham soils in some areas, and with Helena, Vance, Appling, and Worsham soils in others. It resembles Helena fine sandy loam, undulating phase, in many respects; the main difference is that it does not have the plastic pan in the subsoil that is characteristic of the Helena soil. Generally, slopes are less than 6 percent.

Profile in a cultivated area:

0 to 10 inches, grayish-brown to brownish-yellow very friable sandy loam; pale yellow and soft when dry; a few to many quartz pebbles occur on the surface and throughout this layer; in wooded areas the topmost 2 inches is dark grayish brown.

10 to 14 inches, brownish-yellow faintly mottled friable sandy loam; contains some small quartz pebbles and stones.

14 to 18 inches, mottled gray, yellowish-brown, and white weakly to strongly cemented gravelly sandy loam to fine sandy loam pan layer; very hard when dry, friable when moist.

18 to 26 inches, predominantly yellowish-brown friable light clay loam mottled with shades of brown and gray; weak fine blocky structure; hard when dry; slightly plastic and sticky when wet.

26 to 50 inches, highly mottled yellowish brown, yellow, very pale yellow, and white firm heavy clay loam; hard when dry, plastic when wet; contains many small mica flakes.

50 to 60 inches, mottled yellowish-brown and gray very friable light clay loam soil material, high in mica; in lower part decomposed granite occurs that easily crushes to a soft fine-textured mass.

The principal variations in this soil are in texture and thickness of the surface soil and subsoil. The pan layer ranges from a few inches to 12 inches in thickness. In places it contains only a few quartz pebbles. The plastic layer underneath the pan may be thin or in places entirely absent. Texture of the surface soil ranges from sandy loam to loam. On approximately 23 acres, material has accumulated that has recently washed from the surrounding slopes; here the surface soil is much browner and thicker than is typical of Colfax sandy loam. Wet spots, too small to outline on the soil map but indicated on the map by symbols, occur in some areas.

Colfax sandy loam is very strongly acid throughout. It is low in organic matter and essential plant nutrients. Permeability to roots, moisture, and air is moderately rapid in the surface soil and moderately slow to slow in the subsoil. Surface runoff is medium to slow in this soil. In many places the soil receives the runoff from adjacent slopes. Internal drainage is slow, especially in the lower part of the subsoil. The water-holding capacity is low.

Use and management (A–10).—Colfax sandy loam is generally not

desirable for crops or pasture. The compact pan layer restricts the movement of air and water and the penetration of plant roots. Especially during wet seasons, the soil is very wet above the pan, but it dries quickly when the season is dry. As the roots of many plants remain near the surface, the plants are greatly affected by dry seasons. Water that penetrates the pan during wet seasons may never become available for plants because the pan will not permit it to rise within reach of the plant roots. The surface soil is permeable, however, and good tilth can be maintained by using reasonable care. In many areas heavy farm machinery cannot be used during wet seasons because it mires or bogs down readily. Nevertheless, workability is fair to good. Fertility is low to medium, but productivity is only medium, even under good management, because the subsoil is so unfavorable for crops.

About 70 percent of this soil is in forest, 23 percent is cultivated, 5 percent is idle, and 2 percent is pastured. On cultivated areas the main crops are corn, small grains, and hay.

Management of Colfax sandy loam is the same, as a rule, as that for Appling fine sandy loam, undulating phase. Because of the unfavorable subsoil and the somewhat poor drainage, the soil has a narrower range of suitability than the Appling soil, which is well drained. It is not suitable for alfalfa and other deep-rooted crops. Small grains do not yield well, especially in wet seasons. Corn produces fairly well, but yields are much less than normal in either wet or dry seasons. This soil is best suited to hay and permanent pasture, and these two uses should be given preference when a program of use and management is prepared.

Congaree silt loam (0 to 2 percent slopes) (Ck).—This brown, deep, well-drained soil occurs on level to nearly level first bottoms along many of the larger streams. It has developed from recent alluvial material derived from uplands that are underlain by granite, gneiss, schist, and basic igneous rocks.

The soil is associated mainly with the Chewacla and Wehadkee soils, but it is browner, better drained, deeper, and more productive. Although it occupies slightly higher positions than the associated soils, it is subject to periodic flooding. The slopes are generally about 2 percent.

Profile characteristics:

0 to 14 inches, brown very friable light silt loam that is soft when dry; contains many very small mica flakes.

14 to 50 inches, brown very friable to friable heavy silt loam, slightly lighter in color and finer in texture than layer above; many small mica flakes.

50 to 60 inches, brown very friable loam to fine sandy loam; contains brown lighter sandy material, small quartz pebbles and cobblestones, and many fine mica flakes.

The profile is free of stones.

In places the texture of the surface soil is loam instead of silt loam. In other places depth to beds of gravel and cobblestones is less than is usual for this soil.

Congaree silt loam is medium to very strongly acid. It has a comparatively high content of organic matter and plant nutrients. Permeability to roots, moisture, and air is moderate. Surface runoff is slow, internal drainage is medium, and the water-holding capacity is high.

A few small patches of a brown, friable, higher lying soil are mapped with the Congaree soil because the areas are too small to be mapped separately. The profile of this included soil is more highly developed than that of typical Congaree silt loam.

Use and management (A–2).—Because of its high content of organic matter, good drainage, level relief, and good tilth, Congaree silt loam is one of the most fertile and productive soils in the county. Its fertility, however, has been seriously depleted by cultivation. The high content of organic matter and low-lying position cause the soil to be less suited to crops than many of the upland soils. Erosion control is not a problem, but new soil material may be washed down onto the soil by floods.

Approximately 59 percent of Congaree silt loam is tilled, 20 percent is in forest, 12 percent is idle, and 9 percent is pastured. The soil has been cultivated more than most of the other soils of the county. Corn has always been the principal crop. In recent years, however, hay acreage has increased, and some small grains have been grown. The soil is well suited to corn and hay, but small grains tend to lodge, and yields are generally low. Crop yields are greatly reduced by floods in some years.

Congaree fine sandy loam (0 to 2 percent slopes) (Ch).—Except for its texture, this soil resembles Congaree silt loam. Its surface soil is fine sandy loam, and its subsoil is fine sandy loam to sandy clay loam. The soil occurs on level to nearly level first bottoms similar to those occupied by Congaree silt loam. It is associated with Congaree silt loam and with the Chewacla and Wehadkee soils.

Congaree fine sandy loam is medium to strongly acid throughout. Its content of organic matter is slightly lower, and plant nutrients leach out more rapidly than in Congaree silt loam. Surface runoff is slow to very slow, and internal drainage is medium to somewhat rapid. The water-holding capacity is high.

Use and management (A–2).—Workability and conservability are excellent in Congaree fine sandy loam, and productivity is high for most of the usual crops. The fine sandy loam texture makes good tilth easy to maintain. The soil can be cultivated under a wider range of moisture than Congaree silt loam. Mainly because of its lighter texture, it is better suited to vegetables.

About 40 percent of this soil is in forest, 37 percent is cultivated, 17 percent is idle, and 6 percent is pastured. Corn and hay are the main crops, but vegetables are grown to some extent. Yields are generally slightly lower than on Congaree silt loam under similar management.

Durham fine sandy loam, undulating phase (2 to 8 percent slopes) (Da).—This light-colored soil, commonly called white sandy land, has formed from weathered products of light-colored, coarse-grained to medium-grained granite and gneiss. It is not an extensive soil. It occurs in small widely scattered areas on ridges in the uplands and in shallow depressions around drainage heads. The soil is associated with Cecil, Appling, Colfax, and Worsham soils. Generally it occupies positions slightly lower than those occupied by the Appling soils, but slightly higher than those occupied by the Colfax soil.

Durham fine sandy loam, undulating phase, resembles Colfax sandy loam, but it is better drained and has no pan layer.

Profile in a cultivated area:

0 to 10 inches, pale-yellow very friable fine sandy loam; weak fine granular structure; white when dry; contains a few quartz pebbles and stones; in forested areas the topmost 1 or 2 inches stained brownish gray by organic matter.

10 to 14 inches, light yellowish-brown very friable heavy fine sandy loam; weak fine granular structure; slightly hard when dry; faint mottlings of gray and brown.

14 to 30 inches, yellowish-brown friable sandy clay loam; very weak fine blocky structure; slightly hard when dry and faintly mottled in lower part; contains a few small mica flakes.

30 to 52 inches, mottled yellowish-brown, pale-yellow, and white very friable fine sandy loam soil material; hard when dry; contains some fine mica flakes; grades to soft disintegrated granitic rock.

This soil varies somewhat from place to place in the texture, color, and thickness of the various profile layers. The texture of the surface soil ranges from fine sandy loam to sandy loam. Locally, small areas occur that have, 25 to 30 inches below the surface, a yellowish-red subsoil that resembles the subsoil of the Appling soils. In some places the soil is somewhat shallower than normal and is similar to the Louisburg soils in profile characteristics. In others the lower part of the subsoil is highly mottled and is hard when dry. In about 10 acres, the slopes are stronger than is typical for this soil and range from about 8 to 15 percent.

Durham fine sandy loam, undulating phase, is strongly to very strongly acid. It is highly leached and low in organic matter and natural fertility. Permeability to roots, moisture, and air is moderately rapid to rapid in the surface soil and moderate to moderately rapid in the subsoil. Surface runoff is slow to medium. Internal drainage is medium to rapid in the upper horizons of the profile, but slow in the lower part. The water-holding capacity is moderately low.

Use and management (A–5).—Durham fine sandy loam, undulating phase, is one of the most desirable soils in the county for tobacco and vegetables. It is easy to work and conserve. It responds readily to good management. Tilth is excellent, and erosion control is simple. As the surface layer is porous, this soil can be cultivated under a wide range of moisture. Because of the low natural fertility, however, the soil needs frequent applications of manure, commercial fertilizer, and lime to keep it productive. Except for tobacco and vegetables, it is fair to poor for crops and pasture.

Approximately 41 percent of this soil is cultivated, 37 percent is in forest, 13 percent is idle, and 9 percent is pastured. Where the soil is cropped, its management is similar to that of Appling fine sandy loam, undulating phase, but yields of most crops are slightly lower. Pasture management has been very poor, and pastures are grown up mostly to broomsedge and weeds.

Elbert silt loam (0 to 8 percent slopes) (Ea).—This poorly drained soil, often referred to as wet land, occurs on widely scattered areas, chiefly in the northeastern part of the county. It is associated with the Orange, Fluvanna, and Lloyd soils. Elbert silt loam has formed on level uplands from material weathered from basic schist and basic

quartzite. Around drainage heads and along drainageways, it has developed from local colluvial and alluvial materials. In ponded areas the native vegetation differs greatly from that of the surrounding uplands and consists of water-tolerant trees and grasses.

Profile in a cultivated area:

0 to 9 inches, faintly mottled light brownish-gray and reddish-yellow friable to firm heavy silt loam; in forested areas, the color is brownish gray to a depth of about 2 inches.

9 to 17 inches, mottled-gray and yellowish-brown very firm light clay; plastic when wet.

17 to 35 inches, highly mottled firm clay that is mostly gray but contains some yellowish brown; very plastic when wet.

35 to 48 inches, highly mingled and mottled yellowish-brown, olive-gray, and gray very friable clay loam to silt loam soil material, mainly weathered basic rock.

Texture of the surface soil ranges from loam to light silty clay loam. In places along drainageways the soil is deeper than is typical of Elbert silt loam and is somewhat gravelly. Also the surface soil is darker and the subsoil not so plastic and sticky. Areas closely associated with the Orange soils on level uplands are slightly heavier in texture than is typical, and the color is slightly lighter throughout the profile.

Except for the parent material, which is neutral to medium acid, the profile of Elbert silt loam ranges from slightly to very strongly acid in all horizons. The soil is fairly high in organic matter, and fertility is fair. The surface soil is slowly permeable to roots, moisture, and air. The subsoil is very slowly permeable. Both surface runoff and internal drainage are very slow in this soil. Water becomes ponded on some of the level areas during wet seasons. The water table is high in the soil most of the time. A few areas along drainageways are flooded during hard rains.

Use and management (B–5).—Elbert silt loam is easy to conserve and is not susceptible to erosion, but it is too wet for row crops unless it is drained. The range of moisture under which the soil can be cultivated is narrow.

About 81 percent of this soil is in forest, 9 percent is pastured, 5 percent is tilled, and 5 percent is idle. The principal crop is corn, which is seldom fertilized, limed, or otherwise managed properly. Many crop failures occur, and yields are extremely low even in the best seasons. The idle land is growing up to trees, wild grasses, and broomsedge.

The best use for this soil is permanent pasture, but pasture management is generally poor. Herbage is undesirable—it consists chiefly of bulrush, dooryardgrass, broomsedge, redtop, narrowleaf plantain, red clover, stickweed, buttercup, hopclover, yarrow, sedgenutgrass, chess, and cinquefoil.

Fluvanna silt loam, undulating phase (2 to 8 percent slopes) (Fe).—This comparatively deep soil of uplands resembles the Appling and Nason soils in color. It occurs in the northeastern part of the county and is associated with Lloyd, Orange, Bremo, and Elbert soils. The soil was derived mainly from weathered hornblende schist. In most areas the surface soil is silt loam and the subsoil is clay.

About 43 acres is severely sheet eroded. In about 172 acres there are a few shallow to deep gullies. Of the soils derived from mixed

basic and acidic rocks in Fluvanna County, this is one of the most extensive, and most areas are fairly large.

Profile in a cultivated area:

0 to 3 inches, yellowish-brown very friable silt loam.
3 to 7 inches, light yellowish-brown friable silt loam; weak fine granular structure.
7 to 10 inches, yellowish-brown friable silty clay loam; weak fine blocky structure; slightly plastic when wet; contains some black mineral film and concretions and a few quartz pebbles.
10 to 30 inches, predominantly yellowish red friable clay mingled in lower part with shades of yellow and red; moderate medium blocky structure; hard when dry; plastic to very plastic when wet; contains some black mineral concretions.
30 to 40 inches, highly mingled red, yellowish-red, and yellow friable clay loam to light clay soil material that grades to disintegrated hornblende schist; contains some black mineral matter.

Variations, mainly in the color and consistence of the subsoil, occur in a few places. In some places there is a thin brownish-yellow layer in the subsoil resembling that in the subsoil of the Orange soils. In a few areas, the subsoil is more reddish than is typical of this soil. In areas closely associated with Orange silt loam, gravelly subsoil phase, and Zion silt loam, undulating phase, small yellow and black rounded concretions, 1/16 to 1/4 inch across, occur on the surface and throughout the upper horizons. The soil is mixed with Nason, Tatum, and Appling soils. In places some stones and pebbles are strewn over the surface and mixed through the upper part of the profile.

Fluvanna silt loam, undulating phase, is medium to strongly acid throughout, but in most places it is approximately medium acid. The lower part of the subsoil and the parent material are not quite so acid as the rest of the profile. The color of the soil indicates that its organic-matter content is slightly higher than that of the Appling soils. The soil is moderately permeable to roots, moisture, and air. Except in the more nearly level areas, where internal drainage is slow, both surface runoff and internal drainage are medium. The water-holding capacity is moderate.

Use and management (A–5).—Fluvanna silt loam, undulating phase, is one of the best agricultural soils of the uplands. It occurs in fairly broad undulating areas and is fairly easy to work and conserve. It contains a moderate supply of organic matter. Natural fertility is medium. Good tilth can be maintained easily, though not so readily as in the Appling or other sandy soils. The soil is fair to good for crops. The supply of available moisture is favorable for most crops, and many different kinds can be grown successfully. The soil is moderately well suited to such crops as alfalfa, but it is not so well suited as the Lloyd soils.

About 70 percent of this soil is in forest, 20 percent is cultivated, 6 percent is pastured, and 4 percent is idle. Corn, small grains, and hay are the principal crops. Under management similar to that of the Appling soils, the soil is slightly better suited to most crops, especially to corn and hay, than the Appling soils. Pasture, however, is generally grazed too closely or otherwise managed improperly, and in most places its productivity is low.

Fluvanna silt loam, rolling phase (8 to 15 percent slopes) (Fd).—Although this soil resembles the undulating phase, it has stronger

slopes and slightly thinner profile layers. In places it is shallower to bedrock. Sheet erosion is slight to moderate on this soil. A few shallow gullies occur in about 127 acres.

The soil is moderately permeable. Surface runoff is medium to rapid, and internal drainage is medium. The water-holding capacity is moderately low.

Included with this soil as mapped is about 17 acres of hilly soil having slopes of 15 to 25 percent.

Use and management (A–8).—The surface soil of Fluvanna silt loam, rolling phase, is generally very friable, and good tilth is easy to maintain. Mainly because of its strong slopes, the soil is not so well suited to row crops as the undulating phase and yields are slightly smaller. Great care is necessary to control runoff and erosion. In some places the use of heavy farm machinery is difficult. In spite of its susceptibility to erosion, the soil responds well to good management, and it retains the effects well. About 77 percent of the soil is in forest, 20 percent is tilled, 2 percent is pastured, and 1 percent is idle.

Fluvanna silt loam, eroded rolling phase (8 to 15 percent slopes) (Fc).—Accelerated erosion has removed a large part of the surface soil of this phase. Otherwise, it resembles Fluvanna silt loam, rolling phase. The quantity of surface soil that has been lost varies considerably from place to place. Erosion is only moderate in some areas, but in some small areas it is severe. In some tilled areas, the subsoil is mixed with the surface soil and the plow layer is yellowish-red silty clay loam. In these areas the desirable granular structure has been destroyed and good tilth is difficult to maintain. Gullies occur on most of this soil—some wide and shallow, others narrow and fairly deep. The eroded rolling phase is closely associated with the other Fluvanna soils in the northeastern part of the county and with Bremo and Lloyd soils.

The content of organic matter is very low in this phase. Surface runoff is rapid, and internal drainage is medium. The water-holding capacity is low.

Mapped with the eroded rolling phase is approximately 6 acres of Fluvanna silt loam, eroded hilly phase. This included soil differs mainly in having stronger (15 to 25 percent) slopes.

Use and management (B–2).—Because of strong slopes and erosion, Fluvanna silt loam, eroded rolling phase, is difficult to work and to conserve. Areas that have been cropped or pastured are run down. Pasture is poor, and yields of most crops are low. About 75 percent of the soil is in forest, 19 percent is cleared, 5 percent is idle, and 1 percent is pastured.

Fluvanna fine sandy loam, undulating phase (2 to 8 percent slopes) (Fb).—This soil has a coarser texture throughout than that of the undulating phase of Fluvanna silt loam. It was derived from mixed weathered basic schist and granite. The soil resembles the associated Appling soils except that the surface soil is slightly darker colored and finer textured. In many places the subsoil is more friable than that of either the Appling or Nason soils.

Most of this soil occurs along the boundary of areas underlain by hornblende schist or adjacent to areas underlain by granite. It is closely associated with the Bremo, Lloyd, Orange, and Appling soils.

Generally the soil occurs on fairly broad upland ridgetops and ridge slopes in the east-central part of the county, southwest of Grays Mill. The individual areas range in size from a few to as much as 20 acres. Shallow gullies have formed in about 14 acres.

Profile in a cultivated area:

0 to 8 inches, yellowish-brown to light yellowish-brown very friable fine sandy loam.
8 to 11 inches, yellowish-brown to reddish-yellow friable fine sandy clay loam to clay loam; weak fine blocky structure.
11 to 28 inches, yellowish-red friable clay; moderate medium blocky structure; slightly plastic when wet; red, yellow, and reddish-brown minglings and black mineral film in lower part.
28 to 42 inches, mingled red, yellowish-red, and yellow friable clay loam to sandy clay loam soil material; contains many yellowish, greenish, and black particles of weathered hornblende schist.

The major variations in this soil are in texture, thickness of profile layers, and consistence of the subsoil. In some places the surface soil is light loam, but in others it is very fine sandy loam. In places the subsoil consists of firm clay that is moderately plastic when wet. In others it is reddish-yellow friable clay that contains a thin mottled or brownish-yellow firm to very firm heavy clay loam or clay layer. Locally fine quartz stones and pebbles occur on the surface and in the surface soil.

Fluvanna fine sandy loam, undulating phase, is strongly acid throughout; the lower part of the subsoil and the parent material are less acid. The soil is a little more strongly acid than Fluvanna silt loam, undulating phase. The content of organic matter is low to moderate, and fertility is low. Permeability to roots, moisture, and air is moderate. Both surface runoff and internal drainage are medium. The water-holding capacity is moderate to moderately high.

Use and management (A–5).—This soil is similar in use suitability to Fluvanna silt loam, undulating phase, but yields of most crops are slightly lower. The soil is sandier and more porous so that good tilth is easier to maintain. It absorbs more rainwater but is more susceptible to erosion. About 88 percent is in forest, 10 percent is tilled, and the rest is idle or pastured.

Fluvanna fine sandy loam, rolling phase (8 to 15 percent slopes) (Fa).—Because of its stronger slopes and more rapid surface runoff, this phase has a greater problem of erosion control than the undulating phase of Fluvanna fine sandy loam. In some places the profile layers are thinner than in the undulating phase, and in others the soil grades to the more shallow Bremo soils. This soil is closely associated with Fluvanna fine sandy loam, undulating phase, but it is much less extensive and occurs in comparatively, small, widely scattered areas. About 75 acres is moderately sheet eroded. Both deep and shallow gullies occur in places.

Use and management (A–8).—Because of its strong relief and erosion, Fluvanna fine sandy loam, rolling phase, is not so well suited to most crops as the undulating phase. It is only fairly easy to work and to conserve. It is fair to poor for crops, but fair to good for pasture. The most strongly rolling and most severely eroded areas are not suited to tillage.

About 92 percent of this soil is in forest, 6 percent is cultivated,

and 2 percent is idle. Under common management yields of most crops are slightly lower than on the undulating phase.

Goldvein gritty silt loam, undulating and rolling phases (2 to 15 percent slopes) (Ga).—A gravelly pan layer in the subsoil characterizes these light-colored somewhat poorly drained upland soils. The soils were derived from material weathered from a coarse-grained rock that resembles granite but is believed to be quartz monzonite. In many respects the soils resemble the undulating and rolling phases of Appling gritty fine sandy loam. Soils of this complex are closely associated with Nason, Lignum, and Worsham soils. These are not extensive soils—about 186 acres is in the undulating phase and about 120 acres in the rolling phase.

Profile in a forested area:

0 to 1 inch, dark-gray very friable gritty silt loam to loam; contains moderate quantity of organic matter.
1 to 11 inches, pale-yellow very friable gritty loam to silt loam.
11 to 14 inches, light yellowish-brown friable light clay loam, faintly mottled with gray and reddish brown in lower part; contains many small brown and white quartz pebbles.
14 to 21 inches, predominantly yellowish red brittle pan layer, which is about 75 percent small quartz pebbles and 25 percent light-colored clay and clay loam soil material; mottled or mingled with very pale brown and light yellowish brown.
21 to 31 inches, layer similar to the one above in all respects except that the content of clay and clay loam is greater.

The most important variations in these soils are in texture of the surface soil and in depth to the pan. The surface soils range from gritty silt loam to gritty fine sandy loam, but locally areas of gravelly loam and fine sandy loam occur. Depth to the pan is uniform in the undulating areas but ranges from 10 to 20 inches in the rolling areas. In a few places the pan is thin or absent. Wet spots occur here and there in nearly level places; these are shown on the soil map by symbols.

The soils are extremely acid throughout. They have a low to very low content of organic matter and a low level of fertility. They are moderately permeable to roots, moisture, and air in the surface layers, and they are slowly permeable in the subsoils. Surface runoff is slow to medium; internal drainage is slow, especially in the lower layers of the profiles. The water-holding capacity is moderately low.

Where Goldvein gritty silt loam, undulating and rolling phases, adjoins the Nason soils, small areas of the Nason soils are included in the mapping unit.

Use and management (A–10).—The undulating and rolling phases of Goldvein gritty silt loam are easy to till because of their comparatively smooth relief. Nearly everywhere the soils are easy to conserve when tilled. Productivity is very low to fair. Because of the pan in the subsoil, the low supply of organic matter, low fertility, and somewhat poor drainage, the soils are not suited to a wide variety of crops and are poor to only fair for pasture and forest.

Except for a few acres, all of the complex is in forest. Corn and hay are grown in places, and some areas are pastured. Forests consist of white, scarlet, chestnut, red, and black oaks, several species of hickory, and some scrub and shortleaf pines. Shrubs consist mainly

of huckleberry and blueberry. Present management of this soil centers around forestry.

Helena fine sandy loam, undulating phase (2 to 8 percent slopes) (Hc).—This somewhat poorly drained soil is commonly called pipe clay land. The subsoil contains a layer of firm clay which is very plastic when wet and extremely hard when dry. The underlying rock is weathered mixed granite and basic rock. The soil occupies undissected undulating uplands in which slopes are generally about 4 percent. The most extensive areas occur in the northeastern part of the county. The soil is closely associated with the Vance, Appling, Colfax, and Worsham soils. Approximately 913 acres is moderately sheet eroded, and a few shallow gullies occur in about 148 acres.

Profile in a cultivated area:

0 to 9 inches, light yellowish-brown to olive-yellow very friable fine sandy loam; weak fine granular structure; grayish brown, light brownish gray, or white when dry.

9 to 13 inches, mingled yellowish-brown and olive-yellow friable light clay loam; moderate medium blocky structure.

13 to 16 inches, mottled light-gray and reddish-yellow compact clay containing a large number of small quartz pebbles; plastic when wet; very hard when dry.

16 to 27 inches, mottled yellow, olive-yellow, reddish-yellow, and gray firm clay; moderate very coarse blocky to massive structure; very plastic when wet; extremely hard when dry.

27 to 39 inches, highly mottled olive-yellow and light-gray clay to clay loam, mixed with sandy material, over coarse material consisting of mixed weathered basic rock and granite.

This soil varies greatly from place to place, especially in the texture, consistence, and thickness of its profile layers. The surface soil ranges from loam to sandy loam. In some small areas, the subsoil is comparatively thin, and in some the claypan is lacking. The parent material is not uniform in composition. It is predominantly weathered basic rock in some places and predominantly weathered granite in others. On the stronger slopes the soil is generally shallower to bedrock than on the milder slopes.

The soil ranges from medium to very strongly acid, but in most places the surface soil is more acid than the subsoil. The content of organic matter and essential plant nutrients is low. The surface soil is moderately permeable to roots, water, and air, but the subsoil is slowly to very slowly permeable. Surface runoff is medium to slow. Internal drainage is medium in the surface soil and slow to very slow in the subsoil. The water-holding capacity is moderate, but the clay subsoil affects the moisture supply so that there is usually either too much or too little moisture for crops.

Use and management (A–10).—Helena fine sandy loam, undulating phase, is low in productivity. The pan restricts internal drainage, and the moisture range over which the soil can be tilled is narrow. If the season is wet, the soil is too wet for most crops. If it is dry, the soil becomes very dry and hard. Nevertheless, good tilth is comparatively easy to maintain. The soil has a narrow range of suitability, but it is not well suited to alfalfa or other deep-rooted crops. The stronger slopes erode easily, but in most places the gentler slopes can be conserved without difficulty.

About 69 percent of this soil is in forest, 19 percent is tilled, and 6 percent each is idle or pastured. The most common crops are corn, small grains, and hay. Generally in the areas used for pasture the soil is run down. As a rule management is poor. Most of the pastures are not grazed or clipped properly, and fertilizer and lime are used on only a small part.

Helena fine sandy loam, rolling phase (8 to 15 percent slopes) (Hb).—This phase has stronger slopes (generally about 10 percent) than Helena fine sandy loam, undulating phase, and a thinner subsoil layer, which in most places is not so firm or plastic. It is also more susceptible to erosion. The rolling phase is closely associated with the undulating phase and with Appling, Vance, Worsham, and Colfax soils.

Variations are similar to those in the undulating phase. Most of the soil is moderately sheet eroded. A few shallow gullies have formed in about 119 acres.

Surface runoff is rapid. Internal drainage is medium in the surface soil and slow to very slow in the subsoil. The water-holding capacity is moderately low.

Use and management (B–2).—This soil is difficult to work and to conserve. Its strong slopes make it less suitable for crops and pasture than the undulating phase. If used for row crops, the soil in many areas will become more eroded and less productive. The natural fertility is low.

About 64 percent of the soil is in forest, 23 percent is tilled, 12 percent is idle, and 1 percent is pastured. Management is similar to that suggested for Helena fine sandy loam, undulating phase, except that the practices should be applied more intensively.

Helena fine sandy loam, eroded rolling phase (8 to 15 percent slopes) (Ha).—This phase is severely eroded in most places. Except for erosion, however, it resembles Helena fine sandy loam, rolling phase, and it is associated with the same soils in the northeastern part of the county. The predominant slope is 8 to 15 percent, but approximately 30 percent of the soil has 2 to 8 percent slopes.

The surface soil in most places has eroded to the extent that implements used in ordinary tillage penetrate the subsoil. From 2 to 5 inches of the original surface layer remains in some areas, but in others most or all of it has been eroded away. A few shallow to deep gullies have formed in about 95 acres, and many shallow to deep gullies in approximately 79 acres. Heavy farm machinery cannot be moved over the deeply gullied areas. The soil is highly susceptible to further erosion.

The plow layer is yellowish-brown to olive-yellow friable heavy fine sandy loam to light clay loam.

Surface runoff is rapid in this soil, but internal drainage is slow to very slow. The water-holding capacity is low.

Use and management (B–2).—Largely because of strong slopes, dense subsoil, and erosion, Helena fine sandy loam, eroded rolling phase, is poorly suited to tilled crops. The soil is very difficult to cultivate or to traverse with machinery. It is low in organic matter and plant nutrients, and productivity is difficult to build up and maintain. Under ordinary management the soil is not well suited to

pasture. Pine trees grow on it fairly well but not so well as on soils that have more favorable physical qualities.

About 64 percent of this soil is in forest, 20 percent is tilled, 10 percent is idle, and 6 percent is pastured. Where such use does not conflict with plans for general farm management, the soil can best be used for forest. It can be pastured where necessary, however, under the same management as is suggested for Helena fine sandy loam, rolling phase.

Hiwassee silt loam, undulating phase (2 to 8 percent slopes) (HI).—This dark-colored, well-drained soil is one of the reddest soils in the county. Locally it is called red clay land or push land. It has formed on moderately high to high stream terraces. It has developed from alluvium consisting of sand, silt, and clay derived chiefly from areas of Cecil, Lloyd, and other fine-textured soils of the uplands.

This is not an extensive soil. It occurs in small widely scattered areas, principally along the James, Rivanna, and Hardware Rivers and near Byrd Creek. It is closely associated with Wickham, Masada, Augusta, and Roanoke soils, but it occupies higher elevations on stream terraces than any of its associates. Most of the slopes are approximately 4 percent.

The soil is moderately sheet eroded; from 2 to 5 inches of the surface soil has been removed in places. In some areas a small part of the subsoil is turned up when the land is plowed.

Profile in a cultivated area:

0 to 7 inches, brown very friable silt loam; weak fine granular structure.
7 to 10 inches, yellowish-red friable light silty clay loam; weak medium blocky structure; slightly plastic and sticky when wet; contains a few quartz pebbles.
10 to 70 inches, red friable clay; moderate medium blocky structure; slightly plastic and sticky when wet and hard when dry; crushes easily to a fine granular mass; black mineral film forms on cleavage planes.
70 to 74 inches, mingled red, brownish-yellow, and yellowish-red friable silty clay loam to light clay soil material; weak fine blocky structure; crushes easily to a fine granular mass; contains some small mica flakes and blue, white, and brownish quartz particles that are more numerous in lower part of layer.

The main variations are in the color, texture, and consistence of the soil layers and in depth of the profile. The surface soil ranges from light-brown very friable loam to dark reddish-brown friable heavy silt loam. The subsoil ranges from red friable clay to dark-red firm clay and silty clay. In thickness the subsoil generally ranges from 5 to 6 feet, but in places it is as much as 14 feet. Depth of the soil to bedrock material ranges from a few feet to as much as 50 feet.

In most places Hiwassee silt loam, undulating phase, is strongly acid throughout, but it ranges from medium to very strongly acid. It has a comparatively high content of organic matter and medium fertility. Permeability to moisture, roots, and air is moderate. Both surface runoff and internal drainage are medium, and the water-holding capacity is high.

Use and management (A–1).—Hiwassee silt loam, undulating phase, is one of the most productive soils in the county. It is moderately easy to work, but it does not shed from the plow readily and can be cultivated under only a comparatively narrow range of moisture. Conservability is good. The soil is well suited to corn, small grains,

and hay, including alfalfa. In fact, it is one of the best alfalfa soils in the county. It is not suited to sun-cured or bright tobacco or to many vegetable crops. About 56 percent of the soil is under cultivation, 23 percent is in forest, 12 percent is pastured, and 9 percent is idle.

Hiwassee silt loam, rolling phase (8 to 15 percent slopes) (Hk).—This phase has stronger slopes and shallower depth than the undulating phase of Hiwassee silt loam; also it is a little more eroded and has a few more stones and pebbles on the surface and in the parent material. In other respects the two soils are similar. The rolling phase occurs in the same general areas as the undulating phase but is not nearly so extensive.

Included with the rolling phase as mapped is about 30 acres of Hiwassee silt loam, hilly phase, which has stronger slopes of 15 to 25 percent. Also included is about 5 acres in which slopes are greater than 25 percent.

Hiwassee silt loam, rolling phase, has medium to rapid surface runoff and medium internal drainage. The water-holding capacity is moderate.

Use and management (A–7).—Because of the strong slopes in this soil, runoff control is a problem, and minor difficulties are encountered in using heavy farm machinery. Great care is required to reduce surface runoff and control erosion. Under proper management, however, productivity can be maintained at a high level for most crops grown.

About 73 percent of this soil is in forest, and 27 percent is cultivated. Generally management of crops is similar to that of Hiwassee silt loam, undulating phase, but this rolling phase is not so well suited to row crops, and yields of most crops are slightly lower.

Hiwassee clay loam, eroded undulating phase (2 to 8 percent slopes) (He).—Except that it has lost a large part, or all, of its original surface soil through erosion, and in some places part of its subsoil, this soil is similar to Hiwassee silt loam, undulating phase. A few shallow gullies have formed in about 7 acres. In the less eroded areas, ordinary tillage implements penetrate a few inches into the subsoil. In the more severely eroded areas, tillage is mainly in the subsoil. This is not an extensive soil. It occurs in small widely scattered tracts, principally in the same general area as Hiwassee silt loam, undulating phase.

To plow depth, the soil is yellowish-red to red friable light silty clay loam.

Surface runoff is medium to rapid, and internal drainage is medium. The soil has a moderately low water-holding capacity.

Use and management (A–6).—Mainly because it is so eroded, Hiwassee clay loam, eroded undulating phase, is more difficult to cultivate, conserve, and maintain in good tilth than Hiwassee silt loam, undulating phase. Its productivity is greatly reduced, because tillage is generally in the heavy clay subsoil. Tilth is poor because of erosion. Good seedbeds are difficult to prepare, and stands of many crops are poor, especially in drier seasons.

The soil is not suited to so many crops as Hiwassee silt loam, undulating phase, and the range of moisture under which it can be cultivated is narrower. Under careful management, however, high

productivity can be maintained for many crops. The soil is best suited to hay, but corn and small grains can be grown if the soil is well managed. The soil is not so well suited to tobacco and vegetables as Hiwassee silt loam, undulating phase.

About 59 percent of this soil is tilled, 30 percent is in forest, and 8 percent is idle. Approximately 3 percent is pastured.

Hiwassee clay loam, eroded rolling phase (8 to 15 percent slopes) (Hd).—This soil has stronger slopes, shallower depth to bedrock, and a greater degree of sheet erosion than Hiwassee silt loam, undulating phase, but is similar in other respects. In about 49 acres, a few shallow gullies occur, and in approximately 20 acres, a few to many deep ones have formed.

This is not an extensive soil. It occurs in the same general localities as Hiwassee silt loam, undulating phase, and Hiwassee clay loam, eroded undulating phase.

The plow layer of Hiwassee clay loam, eroded rolling phase, is yellowish-red to red friable light silty clay loam.

Surface runoff is rapid in this soil, and internal drainage is medium. The water-holding capacity is low.

About 14 acres of a hilly soil in which slopes are 15 to 25 percent is mapped with the eroded rolling phase. In this included soil, a few to many deep gullies have formed.

Use and management (A–9).—Because of its strong slopes and severe erosion, Hiwassee clay loam, eroded rolling phase, is not so well suited to crops as the eroded undulating phase. Workability is poor, and soil material and good tilth are difficult to maintain. If used intensively for row crops, the soil will deteriorate rapidly because of erosion.

About 53 percent of this soil is in forest, 35 percent is cultivated, 11 percent is pastured, and 1 percent is idle. Management is generally poor, and the soil is low in productivity. Yields of most crops are less than on the eroded undulating phase. The soil is suited to crops only if good management is practiced intensively.

Hiwassee fine sandy loam, undulating light-colored phase (2 to 8 percent slopes) (Hh).—This well-drained soil has a deeper, lighter colored, and coarser textured surface soil and a somewhat lighter colored subsoil than Hiwassee silt loam, undulating phase. In color it resembles Cecil fine sandy loam, undulating phase. Unlike the Cecil soil, however, it has developed from sand, silt, and clay alluvium, 2 to 25 feet thick, that was derived mainly from the Cecil, Tatum, Appling, Durham, and other coarser textured soils of the uplands.

The soil occupies high terrace positions that are not subject to overflow. The greater part lies along the James River 2 miles south of Fort Union and near Carysbrook, along the Rivanna River. Small scattered areas are along the Hardware River and Byrd Creek. Most of the soil occurs in association with the Masada, Augusta, and Roanoke soils of the terraces and with the Appling, Cecil, and Louisburg soils of the uplands.

The slope in most areas is about 4 percent. About 516 acres is moderately sheet eroded. About 2 acres has a few shallow gullies, and there are a few deep ones in about 4 acres.

Profile in a forested area:

0 to 2 inches, yellowish-brown very friable very fine sandy loam to fine sandy loam; weak fine granular structure; uppermost 1-inch layer predominantly dark gray forest litter, mainly partly decomposed oak leaves and twigs.
2 to 12 inches, yellowish-brown very friable loam to fine sandy loam; weak fine granular structure; yellow when dry.
12 to 15 inches, red friable heavy clay loam; weak fine blocky structure.
15 to 58 inches, red friable heavy clay loam to clay; moderate medium blocky structure; slightly sticky and plastic when wet.
58 to 78 inches, red, very faintly mingled with lighter shades of red and reddish brown, very friable sandy clay loam material grading into partly decomposed quartz gravel and strata of coarse sandy material.

A few small rounded stones are strewn over the surface and in places are embedded in the surface soil.

Instead of fine sandy loam, the texture of the surface soil in some areas is loam to sandy loam. Slight variations occur in the thickness of the various horizons and in the depth of the soil over alluvial material. The color of the surface soil in some areas ranges from brownish yellow to brown and the color of the subsoil from dark red to yellowish red.

Hiwassee fine sandy loam, undulating light-colored phase, is generally strongly acid throughout, although in some places the lower horizons are less acid. The content of organic matter is low to fair, and fertility is low. Permeability in the surface soil is moderate to moderately rapid, and in the subsoil it is moderate. Both surface runoff and internal drainage are medium. The water-holding capacity is moderate.

Use and management (A–4).—The unbroken relief, deep fine sandy loam surface soil, and excellent tilth make this soil easy to work. It is comparatively easy to conserve and responds well to good management. Productivity can be maintained at a high level for a wide variety of crops. The soil is lower in organic matter and in most plant nutrients than Hiwassee silt loam, undulating phase, and more intensive measures are necessary to build up its fertility and to maintain productivity. The soil is easier to work, however, and it can be cultivated under a much wider range of moisture.

In use suitability the soil is about the same as Cecil fine sandy loam, undulating phase. It is well suited to tobacco and small grains and to potatoes and other vegetables. It is not so well suited to corn and to alfalfa and many other hay crops as Hiwassee silt loam, undulating phase. Alfalfa grows well, but the stands are not so lasting as those on the other Hiwassee soils and on Wickham loam, undulating phase.

About 47 percent of the soil is in forest, 43 percent is cultivated, 7 percent is pastured, and 3 percent is idle. Some of the forested areas are along the James River north of Bremo Bluff.

Hiwassee fine sandy loam, rolling light-colored phase (8 to 15 percent slopes) (Hg).—This phase has stronger slopes, shallower depth to bedrock, and in places a slightly greater quantity of loose stones on the surface and in the profile than the undulating light-colored phase, but is similar in other ways. It is not an extensive soil. Most of it is associated with the undulating light-colored phase.

Approximately 333 acres is moderately sheet eroded, and about 49

acres, severely sheet eroded. A few to many shallow gullies occur in about 66 acres. Variations in color, texture, and depth are similar to those of the undulating light-colored phase.

The surface runoff on Hiwassee fine sandy loam, rolling light-colored phase, is greater than on the undulating light-colored phase. The soil absorbs less rainwater under similar management.

Mapped with the rolling light-colored phase is about 3 acres of Hiwassee fine sandy loam, hilly light-colored phase. This soil differs mainly in having stronger slopes that range from 15 to 25 percent.

Use and management (A–7).—Hiwassee fine sandy loam, rolling light-colored phase, is not so well suited to most crops, especially to row crops, as the undulating light-colored phase. The risk of erosion is greater, and conservability more difficult. Workability is fair, but it is difficult to use heavy farm machinery on the soil.

About 46 percent of this soil is in forest, 40 percent is tilled, and 7 percent each is pastured or idle. Generally management is similar to that for the undulating light-colored phase, but yields of most crops are somewhat lower.

Hiwassee cobbly fine sandy loam, undulating light-colored phase (2 to 10 percent slopes) (Hf).—This soil consists of areas of Hiwassee fine sandy loam in which numerous rounded quartz and quartzite cobblestones, as large as 8 inches in diameter, occur on the surface and throughout the soil profile. In other respects the soil resembles Hiwassee fine sandy loam, undulating light-colored phase. Most of its milder slopes are about 6 percent in gradient, but in a little less than half of the total area the slopes range from 8 to 10 percent. Practically all of the soil occurs on high stream terraces along the James River about 2 miles south of Fork Union.

Both surface runoff and internal drainage are medium in this soil. Nearly all of it is moderately sheet eroded. A few shallow gullies occur in about 7 acres.

This phase, as mapped, includes a few small areas of Masada cobbly fine sandy loam, undulating phase. The Masada soil differs in having a lighter color and coarser texture, shallower depth to bedrock, and a slightly greater quantity of cobblestones.

Use and management (B–3).—The cobblestones cause Hiwassee cobbly fine sandy loam, undulating light-colored phase, to be poorly suited to tillage. The soil is suited to pasture, however, though not so well suited as the Hiwassee soils that do not contain stones.

About 77 percent of the soil is in forest, and 23 percent is cultivated. Corn and hay are grown on the cultivated areas.

Management is generally poor. A small amount of fertilizer is used, chiefly for corn, but only a few cropped areas have been limed. The soil is best used for pasture, but pastures are only poor to fair unless management is good.

Lignum silt loam, undulating phase (2 to 8 percent slopes) (Lb).—This soil has a mottled gray and yellowish pan in the subsoil. It is a light-colored soil, somewhat poorly drained. The soil occupies toe and drain-head slopes. Areas are small and widely scattered, mostly in the north-central part of the county. The soil is closely associated with Nason, Tatum, and Worsham soils. Most of it lies between areas of Nason and Worsham soils near the heads of drainageways.

The parent material is mainly sericite schist, but this is mixed in places with weathered basic rock.

Profile in a cultivated area:

0 to 9 inches, light yellowish-brown very friable silt loam; weak fine granular structure; pale yellow and slightly hard when dry.
9 to 16 inches, yellowish-brown friable to firm silty clay loam to clay; weak fine blocky structure.
16 to 20 inches, mottled yellowish-brown and gray compacted clay loam to silty clay loam pan containing many small quartz pebbles; very hard when dry and slightly plastic when wet.
20 to 24 inches, mottled yellowish-brown and gray friable clay to silty clay; weak to moderate medium blocky structure; slightly plastic to plastic when wet.
24 to 40 inches, mottled yellowish-brown and light-gray friable clay loam soil material and partly decomposed yellowish-brown and light-gray schist particles that crush easily.

In most areas many quartz fragments and other stones are strewn over the surface.

The texture of the surface soil ranges from heavy silt loam to light loam, and that of the subsoil, from light clay loam to heavy clay. In places there is no pan layer; in others the pan is as much as 12 inches thick. In places the pan is free of gravel. In some areas, weathered basic rock occurs in the parent material.

Lignum silt loam, undulating phase, is very strongly acid throughout. It is low in organic matter and essential plant nutrients. Permeability to roots, moisture, and air is moderate in the surface soil, but it is slow in the subsoil because of the pan layer. Surface runoff is medium, and internal drainage is slow. Wet spots occur in some places. The water-holding capacity is moderate.

Included with this soil as mapped is about 17 acres of Lignum silt loam, nearly level phase. The nearly level phase differs from the undulating phase mainly in occupying slopes that do not exceed 2 percent, or nearly level upland areas, and in being not quite so well drained.

Use and management (A–10).—Lignum silt loam, undulating phase, is fairly easy to work. It can be cultivated under only a narrow range of moisture, however, because the surface soil is hard when dry and the subsoil drains slowly. Conservability is good. Because of the low content of organic matter, lime, and plant nutrients, the soil is not highly productive of most crops. Unfavorable moisture conditions caused by the pan layer in the profile affect productivity to some extent. If the season is wet, the soil is too wet for many crops, and the roots remain near the surface. If the season is dry, the soil dries out rapidly, and crops may lack sufficient moisture.

Lignum silt loam, undulating phase, has a medium range of suitability. Clover, lespedeza, and grasses do well, but the soil is not well suited to alfalfa and tobacco. About 71 percent of the soil is in forest, 18 percent is tilled, 6 percent is idle, and 5 percent is pastured.

The areas of this soil are so small that management is usually similar to that of the undulating phase of Nason silt loam or the undulating phase of Tatum silt loam. Yields are generally lower than yields obtained on the Nason and Tatum silt loams, however.

Lignum loam, undulating phase (2 to 8 percent slopes) (La).—This soil has a slightly coarser surface soil and a lighter textured, more

friable subsoil than Lignum silt loam, undulating phase. The soil originated from weathered quartz sericite schist, mixed in places with basic rock. It occurs on foot slopes and slopes around drainage heads and is associated with Nason and Worsham soils. Areas are widely scattered in the north-central part of the county and over all of the areas where Nason and Tatum soils occur. Surface runoff is medium, and internal drainage, slow.

Use and management (A–10).—This soil has fair workability and good conservability, but low productivity. Its range of suitability is medium. It is suited to crops similar to those grown on Lignum silt loam, undulating phase. About 70 percent of the soil is in forest, 24 percent is cultivated, and 6 percent is idle.

Lloyd silt loam, undulating phase (2 to 8 percent slopes) (Ld).—This dark well-drained soil is commonly called red clay land. It is the reddest of the upland soils. It was derived mainly from weathered hornblende schist and hornblende gneiss. In places the parent material is mixed with acidic schist.

This is a fairly extensive soil. The larger areas occur in the northeastern part of the county, northeast and southeast of Kents Store. Generally the soil occurs on comparatively high, broad ridgetops and on gentle ridge slopes. It is closely associated with Fluvanna, Bremo, Orange, and Madison soils, but in many places it is bordered by Tatum and Cecil soils. The soil occupies higher positions than any of the closely associated soils. Most of its slopes are approximately 4 percent. A few shallow and some deep gullies have formed on about 56 acres. Small bedrock outcrops occur in places, and in small local areas the soil is so shallow that the subsoil is exposed if the land is plowed.

The natural vegetation consists mainly of oaks and other hardwoods, which include some of the best tall-growing trees in the county.

Profile in a forested area:

0 to 7 inches, brown very friable silt loam; weak fine granular structure; uppermost 1-inch layer consists of dark-gray forest litter, mostly oak leaves and twigs.

7 to 10 inches, yellowish-red friable light silty clay loam; medium fine blocky structure.

10 to 36 inches, red firm clay; moderate medium to coarse blocky structure; sticky and slightly plastic when wet and hard when dry; contains some black mineral film.

36 to 52 inches, red firm clay soil material mingled with yellow and purplish red; lower part grades to yellow, black, green, and red partly decomposed basic schist materials.

In the surface soil, color and texture range from light yellowish-brown loam to dark reddish-brown heavy silt loam. Depth to bedrock ranges from a few feet to as much as 20 feet, but the shallower areas are not extensive. About half of the soil is loam, but the loam areas are mapped with the silt loam because the soils are similar in nearly all other characteristics.

Most of Lloyd silt loam, undulating phase, is medium acid; it ranges, however, from medium to very strongly acid. The lower horizons are less acid. The soil has a comparatively high content of organic matter. It is moderately permeable to roots, water, and air. Both surface runoff and internal drainage are medium. The water-holding capacity is moderate.

Use and management (A–1).—Lloyd silt loam, undulating phase, is one of the most desirable soils in the county for most crops and it responds readily to good management. It is easy to conserve and to traverse with heavy farm machinery. Its supply of plant nutrients is comparatively high. Although the range of moisture favorable for tillage is slightly narrower than in soils of lighter texture, this soil can be maintained in good tilth fairly easily if management is good.

The soil is well suited to corn, small grains, alfalfa, clover, and other hay crops, and to many vegetables. Alfalfa grows well if well managed. The stands, usually grown on small acreages, are more lasting than on most of the other soils of the uplands.

About 80 percent of this soil is in forest, and 15 percent is cultivated. The rest is pastured or idle.

Lloyd silt loam, rolling phase (8 to 15 percent slopes) (Lc).—Except that its slopes are generally about 12 percent and depth to bedrock is slightly less, this soil resembles the undulating phase. Also it is slightly more eroded and has more rock outcrops and loose stones and gravel.

This soil is closely associated with the undulating phase of Lloyd silt loam and with Fluvanna, Orange, and Bremo soils. Generally it occurs on slopes adjacent to undulating ridgetops. Its acreage is small, compared to that of the undulating phase. Except that small shallow areas are more numerous, variations are similar to those of the undulating phase. Surface runoff is rapid on this rolling phase; internal drainage is medium.

About 191 acres of Lloyd loam, rolling phase, is mapped with this soil.

Use and management (A–7).—The use suitability and management needs of Lloyd silt loam, rolling phase, differ from those of the undulating phase mainly because of its stronger relief. Because of the strong relief and consequent rapid runoff, this soil retains less water for plants than the undulating phase. Also it is more susceptible to erosion when tilled, and tillage is more difficult with heavy farm machinery.

About 79 percent of this soil is in forest, and 17 percent is cultivated. The rest is about equally divided between pasture and idle land. Cropped areas are comparatively small. Management is similar to that of the undulating phase, but in most seasons, yields are slightly smaller.

Lloyd silty clay loam, eroded undulating phase (2 to 8 percent slopes) (Lf).—This phase has lost most, or all, of its surface soil and, in some places, part of its subsoil through erosion. The soil is not so extensive as the undulating phase, but it is more extensive than the rolling phase. Most of the soil occurs in the same general areas as the other Lloyd soils, and it is associated with the same soils.

To plow depth the soil is brownish-red to yellowish-red or red friable silty clay loam. The rest of the profile resembles that of Lloyd silt loam, undulating phase.

In about 48 acres a few shallow gullies have formed. In about 4 acres there are a few deep ones. Surface runoff is more rapid than for Lloyd silt loam, undulating phase, and the capacity of the soil to absorb and store water is lower.

Use and management (A–6).—Lloyd silty clay loam, eroded undulating phase, is a desirable soil for many crops. Because of severe erosion, however, it is more difficult to work, conserve, and keep in good tilth than Lloyd silt loam, undulating phase. Preparing seedbeds and plowing and cultivating are all more difficult because the plow layer consists largely of the heavy clay subsoil. The structure and water-holding capacity of the soil have become impaired, and crops are affected seriously by dry spells. The content of organic matter is much lower than that of Lloyd silt loam, undulating phase.

About 45 percent of this soil is in forest, 40 percent is tilled, 11 percent is idle, and 4 percent is pastured. Under good management most crops grow well on this soil. Because of erosion the soil is not well suited to so wide a variety of crops as Lloyd silt loam, undulating phase. It is best suited to corn, small grains, and hay. Alfalfa grows well if properly managed. Yields of most crops, however, are slightly lower than on the undulating phase of Lloyd silt loam under similar management.

Lloyd silty clay loam, eroded rolling phase (8 to 15 percent slopes) (Le).—This soil has stronger slopes and slightly shallower depth to bedrock than the eroded undulating phase. Sheet erosion is slightly more severe, and, in about 241 acres, shallow or deep gullies occur.

This soil is associated with the undulating and rolling phases of Lloyd silt loam and with Bremo, Fluvanna, Madison, and Orange soils. It is slightly more extensive than Lloyd silt loam, rolling phase, and somewhat less extensive than Lloyd silty clay loam, eroded undulating phase. Most areas occur in the same general area as the other Lloyd soils.

Use and management (A–9).—Because of its eroded strong slopes, Lloyd silty clay loam, eroded rolling phase, is not so well suited to crops and pasture as Lloyd silt loam, rolling phase, or Lloyd silty clay loam, eroded undulating phase. About 50 percent is in forest, 27 percent is cultivated, 18 percent is idle, and 5 percent is pastured. The principal crops are corn, small grains, and hay.

Common management practices, including crop rotations, are similar to those for Lloyd silt loam, undulating phase, but yields of most crops are considerably smaller.

Louisa loam, rolling phase (8 to 15 percent slopes) (Lh).—This very shallow, somewhat excessively drained soil of the uplands was derived from material weathered from quartz muscovite schist. Small mica flakes are numerous in its profile. Generally the soil occupies narrow ridgetops and adjacent mild slopes and is associated with Madison, Cecil, and Bremo soils.

This is not an extensive soil; it occurs in small widely scattered areas, mostly in the extreme eastern part of the county along the Goochland County line.

Profile in a forested area:

0 to 7 inches, brown very friable loam; light yellowish brown when dry; contains many quartz stones, pebbles, and small mica flakes; ½-inch layer of black forest litter, mostly partly decomposed oak leaves and twigs, on top.

7 to 15 inches, dark yellowish-brown friable silt loam soil material mixed with a large quantity of brown, green, and yellow soft quartz muscovite schist particles; small mica flakes numerous; overlies disintegrated schist.

The surface soil of Louisa loam, rolling phase, ranges from silt loam to fine sandy loam in texture, and from light yellowish brown to dark brown in color. In a few places, a thin subsoil layer has developed. The number of quartz pebbles and stones varies from place to place, and the content of mica varies somewhat, especially in the surface soil. Depth to nearly solid bedrock ranges from a few inches to as much as 36 inches. In most places the depth is about 18 inches.

Louisa loam, rolling phase, is very strongly acid throughout. In forested areas it has a fair to moderate content of organic matter. The fertility of the soil is low. Permeability to roots, water, and air is moderate in the surface soil and moderately rapid in the lower layers. Surface runoff is medium to rapid, and internal drainage is rapid. The water-holding capacity is low.

Mapped with the rolling phase of Louisa loam is about 4 acres of Louisa loam, undulating phase. This undulating phase differs mainly in having smoother relief in which slopes are 2 to 8 percent.

Use and management (B–4).—Louisa loam, rolling phase, has a narrow range of suitability. It is only fairly easy to work and is difficult to conserve under cultivation. It is low in productivity. It is poorly suited to tilled crops and poorly to only fairly well suited to pasture.

About 92 percent of the soil is in forest, and nearly all the rest is in pasture. The forest consists mainly of hardwoods—white, black, chestnut, and red oaks, hickory, blackgum, dogwood, and maple. The timber growth is fairly good. Under common management the carrying capacity of pasture is low.

Louisa loam, hilly and steep phases (15 to 25+ percent slopes) (Lg).—These phases have much stronger slopes than the rolling phase. In many places they are also slightly shallower to bedrock. Their acreage is about three times as large as that of the rolling phase. These hilly and steep phases occur on slopes that extend from narrow ridgetops; in approximately 346 acres, slopes are 15 to 25 percent, and in about 315 acres, they exceed 25 percent.

Surface runoff is rapid to very rapid on these soils. Internal drainage is rapid, and the water-holding capacity is low to very low. The lower parts of long slopes receive and absorb more moisture than other areas of these soils because they receive the water that drains from the higher positions.

Use and management (C–1).—Because of their shallow profiles and hilly to steep relief, these phases are more poorly suited to crops than the rolling phase of Louisa loam. If well managed, however, the hilly areas are suitable for pasture. The hilly and steep phases are very difficult to work and conserve, and high productivity is difficult to maintain if they are cropped. They are poor to fair for pasture and fair to good for forest. About 98 percent of these phases is in forest, and the rest is in pasture.

Louisburg sandy loam, rolling and hilly phases (8 to 25 percent slopes) (Lm).—These light-colored somewhat excessively drained

shallow soils of uplands are often called gray sandy land. They have formed from weathered products of granite or gneiss. The soils are fairly extensive. Individual areas are widely scattered over that part of the county underlain by granitic rock. The soils are closely associated with Cecil, Appling, Wilkes, Worsham, and Durham soils. Most areas occur on very narrow ridgetops and on slopes that extend from ridgetops. About 2,207 acres is rolling (8 to 15 percent slopes), and 4,128 acres is hilly (15 to 25 percent slopes). About 80 percent of the total area is moderately sheet eroded.

Natural vegetation in wooded areas consists of many species of oak, of hickory, poplar, dogwood, maple, and ash, and of associated hardwoods.

Profile characteristics:

0 to 5 inches, grayish-brown very friable sandy loam; topmost inch dark grayish brown; contains some very small quartz pebbles.
5 to 8 inches, yellowish-brown very friable sandy loam; contains a few quartz pebbles and small mica flakes.
8 to 18 inches, predominantly reddish-yellow very friable sandy loam material mingled with yellowish red; contains many small quartz pebbles.
18 to 30 inches, highly mingled reddish-yellow, yellowish-red, and white partly decomposed granitic rock; contains many mica flakes.

The most noticeable variations in the profile are those in texture, color, and depth. The surface soil ranges in texture from fine sandy loam to coarse sandy loam and in color from grayish brown through brownish yellow to brown. Depth to fairly hard rock ranges from about 6 inches to as much as 40 inches at the base of slopes in uneroded areas. In places a 2- to 6-inch subsoil layer has developed in the more level areas.

The rolling and hilly phases of Louisburg sandy loam are very strongly acid throughout, but the upper profile horizons in wooded areas are not quite so acid. Organic-matter content and fertility are low. Permeability to roots, water, and air is rapid. The soil leaches rapidly, as surface runoff is medium to rapid and internal drainage is rapid. The water-holding capacity is low.

About 411 acres of Louisburg sandy loam, undulating phase, is mapped with the rolling and hilly phases. This included soil differs mainly in having surface relief that is not so steep (2 to 8 percent slopes) and in being a little deeper to bedrock. It has a thin subsoil layer in places.

Use and management (B–4).—Strong to very strong slopes and shallow depth to bedrock make the rolling and hilly phases of Louisburg sandy loam poorly suited to row crops. Workability and conservability are poor. Productivity is low and in most areas is difficult to build up and maintain. Under intensive management, however, the soils are fairly well suited to pasture.

Except for the included undulating phase, the soils are best used for permanent pasture. The undulating areas are fairly well suited to tobacco, grain, and vegetables if good management is practiced.

About 80 percent of these phases is in forest, 10 percent is cropped, and 5 percent each is pastured and idle. Corn, small grains, and hay are the principal field crops. Yields of most crops are considerably lower than on the Appling soils.

On a few farms, where areas in pasture have received heavy appli-

cations of commercial fertilizer and manure and have otherwise been properly managed, the pastures are satisfactory.

Louisburg sandy loam, eroded rolling and hilly phases (8 to 25 percent slopes) (Lk).—These eroded phases occur in the same general areas as other Louisburg soils that are closely associated with members of the Appling, Cecil, and Worsham series. From 2 to 5 inches of the surface soil has been removed in some places, and in some places part of the subsoil.

The plow layer is grayish-brown or yellowish-brown to reddish-yellow very friable sandy loam. In most areas shallow or deep gullies occur. In some there is a very close network of gullies. About 434 acres has rolling relief (8 to 15 percent slopes), and about 2,467 acres is hilly (15 to 25 percent slopes). Except for erosion variations within the profiles are similar to those in Louisburg sandy loam, rolling and hilly phases.

Surface runoff is rapid to very rapid, and internal drainage is rapid in these eroded rolling and hilly phases of Louisburg sandy loam. The soils do not retain moisture nearly so well as the uneroded rolling and hilly phases. The water-holding capacity is low to very low.

Use and management (C–1).—The severely eroded strong to very strong slopes and shallow depth to bedrock cause Louisburg sandy loam, eroded rolling and hilly phases, to be poorly suited to crops and pasture. These phases are best suited to forest, but they are not so well suited as the uneroded rolling and hilly phases. The rolling areas that are not too severely eroded are suitable for pasture if well managed.

About 88 percent of these phases is in forest, 6 percent is cultivated, 5 percent is idle, and 1 percent is pastured. Little of the land is used for row crops.

On many areas scrub pines have grown up. Most of the wooded areas, however, are covered by poplars and hardwoods, chiefly oak, maple, hickory, and dogwood. Timber grows more slowly on these soils than on the uneroded rolling and hilly phases.

Louisburg sandy loam, eroded steep phase (25 to 40 percent slopes) (Ll).—The eroded steep phase of Louisburg sandy loam is similar to the eroded rolling and hilly phases, but it is steeper, a little shallower to bedrock, and less severely sheet eroded. Shallow to deep gullies occur in about 70 percent of the eroded steep phase.

This soil is associated with the other Louisburg soils and with Cecil, Appling, and Worsham soils. It is comparatively extensive. The areas occur chiefly along large rivers and creeks where the land has been deeply dissected by streams.

Surface runoff is very rapid in this soil. Internal drainage is rapid, and the water-holding capacity is low to very low.

Use and management (C–1).—Mainly because of its steep slopes and shallow depth, this soil is not suited to crops. Except under very intensive management, it is poorly suited to pasture. Although tree growth has been retarded on the more eroded areas, the soil is well suited to forest, and some of the best long-bodied trees in the county grow on it. Trees are of the same species as those that grow on the rolling and hilly phases of Louisburg sandy loam.

About 93 percent of this soil is in forest, 4 percent is idle, 2 percent is tilled, and 1 percent is pastured.

Made land (M).—This mapping unit is made up mostly of areas that have been built up artificially, mainly to be used for railroad yards or building sites. South of Wilmington are a few areas that consist of land from which the gravelly surface soil has been removed to be used for roadbuilding. A few of these desurfaced areas have been plowed and planted to crops.

Madison loam, undulating phase (2 to 8 percent slopes) (Mb).—This well-drained soil has a dark-colored surface layer and a red subsoil. It has developed on uplands from material weathered from quartz muscovite schist. It occurs on ridgetops and on gentle ridge slopes in the northeastern part of the county. It is closely associated with Louisa and Lloyd soils.

The soil resembles the Tatum and Cecil soils, but its surface soil and subsoil are slightly darker than those of the Tatum and Cecil soils or of the Louisa and Lloyd soils. Its texture is finer than that of the sandy Cecil soils. Fine mica flakes are conspicuous in the surface soil and subsoil, and the parent material is highly micaceous. In places quartz pebbles and stones are more numerous on the surface and in the surface soil than is usual in the Cecil or Tatum soils.

Profile in a cultivated area:

0 to 8 inches, yellowish-brown to brown very friable loam to silt loam; weak fine granular structure; pale brown when dry; very small mica flakes numerous.

8 to 13 inches, predominantly yellowish red friable clay loam to silty clay loam; moderate medium blocky structure; small mica flakes numerous.

13 to 31 inches, red friable clay; moderate medium blocky structure; hard when dry; small mica flakes numerous.

31 to 38 inches, mottled red and reddish-yellow very friable slick soil material mixed with quartz muscovite schist; contains a few small brown garnets.

Variations in the profile consist mainly of differences in surface soil and subsoil thickness. In some places on narrow ridgetops and near the edge of slopes that break sharply, the subsoil is underlain at about 30 inches by fairly hard, partly disintegrated schist. In other places depth to weathered schist is as much as 54 inches. The texture of the surface soil ranges from loam to silty clay loam. In some places stones and pebbles are numerous enough to interfere materially with tillage. Such areas are shown on the soil map by symbols.

Madison loam, undulating phase, is very strongly acid throughout. The content of organic matter and of most essential plant nutrients is generally low. Permeability to roots, moisture, and air is moderate. Both surface runoff and internal drainage are medium, and the water-holding capacity is moderate.

Because the area is too small to map separately, about 35 acres of Grover loam, undulating phase, is mapped with the undulating phase of Madison loam. The Grover soil differs mainly in having a lighter color throughout and in containing less clay. It has a yellowish-brown to brownish-yellow surface soil and yellowish-brown to yellowish-red subsoil. The Grover soil occurs in close association with the Madison soils.

Use and management (A–4).—Madison loam, undulating phase, is easy to work, fairly easy to conserve when planted to row crops, and moderately productive. In most places good tilth can be maintained easily. The soil retains the effects of good management well. It is

well suited to alfalfa and other crops, small grains, and corn. Vegetables and tobacco can be grown, but yields and quality are comparatively low. The principal crops are corn, small grains, and hay.

About 82 percent of this soil is in forest, 8 percent is cultivated, 7 percent is idle, and 3 percent is pastured.

Madison loam, rolling phase (8 to 15 percent slopes) (Ma).—The rolling phase of Madison loam resembles the undulating phase except that it has stronger slopes and is slightly shallower to bedrock. It is less extensive than the undulating phase but occurs in the same general area. It is closely associated with the other Madison soils and with the Louisa and Cecil soils.

The surface layer of the rolling phase ranges in texture from loam to silty clay loam. Thickness of the subsoil varies from place to place, but in most places the subsoil layer is slightly thinner than that of the undulating phase.

Surface runoff is rapid and internal drainage is medium. About 64 acres has been severely sheet eroded, and in about 69 acres gullies that are mostly shallow have formed.

Mapped with this soil is about 77 acres of Grover loam, rolling phase, and about 7 acres of Grover loam, hilly phase. These included soils differ from the Madison soil mainly in having a lighter colored surface soil and subsoil and less clay in the subsoil.

Use and management (A–7).—The rolling phase of Madison loam is more difficult to work and to conserve than the undulating phase, and productivity is more difficult to maintain. Surface runoff is higher. In dry seasons crops are damaged more by lack of moisture. The soil is suited to crops similar to those grown on the undulating phase, but it is not so well suited to row crops such as corn and tobacco.

About 88 percent of the rolling phase is in forest, and 10 percent is cultivated. About 1 percent each is idle or in pasture.

Manteo silt loam, undulating phase (2 to 8 percent slopes) (Mh).—This very shallow light-colored soil has formed from material weathered from slate and sericite schist. It occurs on narrow upland ridges and is closely associated with the Nason and Tatum soils. The individual areas are generally small and widely scattered over the north-central and northwestern parts of the county. A large area occurs approximately one-half mile south of Carysbrook.

Profile description:

0 to 7 inches, yellowish-brown very friable silt loam, 10 to 20 percent consists of small platy schist fragments.

7 to 15 inches, predominantly yellowish-red friable silt loam soil material mixed with partly weathered brown, pink, yellow, and reddish-yellow small platy schist or slate fragments that make up about 75 percent of the layer.

The soil varies mainly in color, depth over bedrock, and quantity of schist and slate particles. In some places the subsoil layer is only 2 to 4 inches thick, and in other places schist and slate particles are on the surface and the soil is not more than 5 or 6 inches deep over fairly hard rock. In the area a half mile south of Carysbrook, the soil is very dark brown and overlies slate. It occurs on slightly broader ridges and is a little deeper over bedrock than elsewhere. A few shallow gullies have formed on about 6 acres.

Manteo silt loam, undulating phase, is extremely acid throughout. The content of organic matter is low, and the plant-nutrient content is very low. Permeability to roots, moisture, and air is moderate in the surface soil and rapid in the subsoil. Both surface runoff and internal drainage are medium to rapid. Water-holding capacity is low.

Use and management (A–11).—Manteo silt loam, undulating phase, is poorly suited to most crops because of its shallow depth, low water-holding capacity, and low fertility. During wet seasons a great deal of water runs off, and in dry seasons it is one of the first soils to dry out and become droughty. The soil does not respond to fertilizer so well as deeper soils. Good tilth is hard to maintain in some areas because of the particles of shale in the surface soil. Deep plowing, which breaks up the schist and slate particles, seems to increase the water-holding capacity and productivity.

About 81 percent of this soil is in forest, 15 percent is tilled, 3 percent is idle, and 1 percent is pastured. Small grains and hay, especially lespedeza, are the best suited crops. The soil is not suited to such crops as alfalfa, and corn yields are very low in most years.

Manteo silt loam, rolling phase (8 to 15 percent slopes) (Mf).—This soil resembles the undulating phase except that it has stronger relief and is shallower (pl. 1, *B*). As a rule the soil occupies slopes that extend downward from ridgetops. In places, however, it occurs on rolling hilltops. It is closely associated with the undulating phase and with Nason and Tatum soils. The acreage is many times as great as that of the undulating phase. Most of the soil is widely scattered over the western and northern parts of the county where the larger streams have cut deep into the land. Surface runoff is rapid, and internal drainage is medium to rapid.

Shallow or deep gullies have formed in about 95 of the 119 acres that is severely sheet eroded. The soil in these eroded areas is very shallow. Large numbers of schist and slate fragments are scattered over the surface and throughout the soil profile.

Use and management (B–4).—Strong relief and shallow depth make the rolling phase of Manteo silt loam difficult to work and to conserve. Productivity is low. The soil is not suited to tilled crops and is poor to only fair for pasture and forest. The best use for the cleared areas is pasture. Forested areas should remain in forest, since it is doubtful that any of them would be suitable for pasture. About 84 percent of the soil is in forest, 10 percent is cultivated, 4 percent is idle, and 2 percent is pastured.

Manteo silt loam, hilly phase (15 to 25 percent slopes) (Me).—This is the most extensive Manteo soil in the county. It differs from the rolling and undulating phases mainly in having stronger slopes. In most places it has no subsoil, and numerous slate and schist particles occur on the surface and in the soil profile. In many places bedrock is within 4 to 5 inches of the surface.

Surface runoff is very rapid, and internal drainage is medium to rapid. About 145 acres is severely sheet eroded, and shallow to deep gullies have formed in much of the soil. A few to many deep gullies occur in about 179 acres that is moderately sheet eroded.

Use and management (C–1).—Manteo silt loam, hilly phase, is poorly suited to crops and pasture. It has strong slopes and shallow depth to bedrock and is susceptible to erosion. Its moisture-holding capacity and natural fertility are very low, and it is extremely acid.

About 85 percent of this soil is in forest, 8 percent is cultivated, 4 percent is idle, and 3 percent is pastured. Crop yields are very low, and pasture is poor. On areas that are not severely eroded, fair pasture can be established if proper management is practiced.

Manteo silt loam, steep phase (25 to 50 percent slopes) (Mg).—Except that the slopes are stronger and the profile is slightly shallower, this comparatively extensive soil is similar to Manteo silt loam, hilly phase. It is closely associated with the other Manteo soils. In areas that occur on sharp ridgetops, slate and schist are exposed in many places. At the base of the longer slopes, the soil is considerably deeper than elsewhere.

Surface runoff is very rapid on this soil, and internal drainage is medium to rapid. Many deep gullies occur in about 24 acres.

Use and management (C–1).—Because of the steep slopes and shallow profile, workability is very poor. The soil is difficult to conserve if cultivated or pastured. Productivity is very low, and the range of suitability is very narrow.

About 95 percent of the soil is in forest, 2 percent is cultivated, 2 percent is pastured, and 1 percent is idle. Crop yields are extremely low, and pasture is poor, even in favorable seasons.

This soil is best used for forest. Hardwoods are the principal trees on areas that have not been completely cleared. Scrub pines predominate on soil that was once cleared and cropped or pastured but has since been abandoned.

Manteo-Bremo silt loams, rolling phases (8 to 15 percent slopes) (Md).—Areas of the two soils that make up this complex are generally so small and intricately associated that they cannot be separated on a map of the scale used. A few areas are large enough to map separately, but it is not feasible to do so. The total acreage is not large.

The soils occupy ridgetops and adjacent slopes that have gentle to strong relief. They occur mainly around Palmyra and along Raccoon Creek, where they occupy parallel bands that extend in a northeast-southwest direction.

The parent material of the Manteo soil consists of weathered material from acidic schist, and that of the Bremo soil of weathered material from basic schist. The Manteo soil makes up the larger part of the complex, but in some places the Bremo soil predominates. The profiles of these two soils resemble the profile of Manteo silt loam, undulating phase, and Bremo silt loam, undulating phase, respectively.

The Manteo soil is very strongly to extremely acid, and the Bremo soil, medium to strongly acid. The Bremo soil is fairly well supplied with calcium. It has a higher content of plant nutrients than the Manteo soil, which has a small supply. Both soils are shallow to bedrock. The surface soils are moderately permeable, and the subsoils are moderately to rapidly permeable. Surface runoff is rapid on both soils, and internal drainage is medium. The water-holding capacity is low to very low.

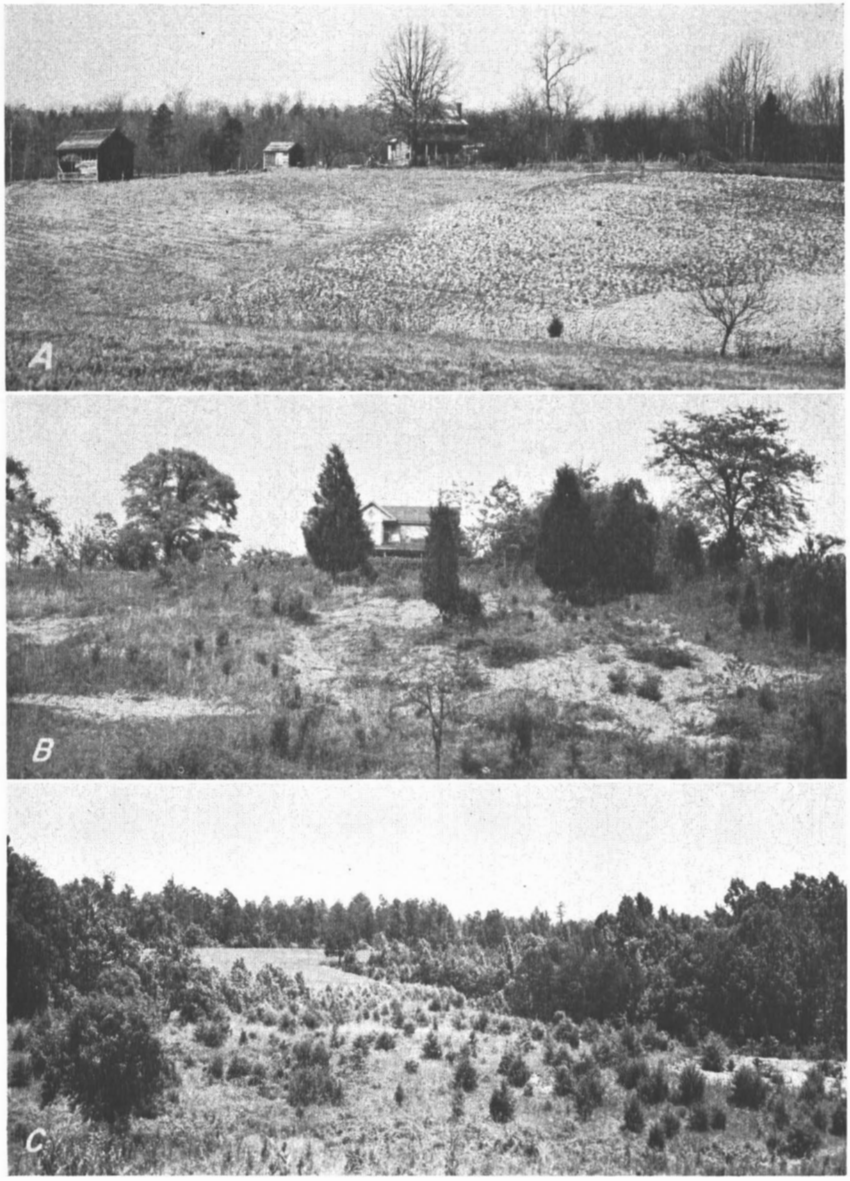
A, Cut in Cecil fine sandy loam, undulating phase, showing the yellowish-brown to grayish-brown surface layer, or A horizon; the firm red clay subsoil, or B horizon; and the medium to course blocky structure of the B_2 horizon.

B, Cut in Manteo silt loam, rolling phase, showing the very shallow depth to the slatelike bedrock. The B horizon has developed little, or none at all.

A, Undulating to rolling soils of the Nason-Tatum-Manteo soil association. A large acreage in this association, impaired by accelerated erosion, is again being made productive by fertilizing and by growing legumes and grasses for hay and pasture.

B, Steep soils of the Manteo and Louisburg series and of the Stony Land type. These occupy only about 6 percent of the county, and their strong slope and shallow to very shallow depth to bedrock make them poorly suited to either crops or pasture.

C, Excellent pasture on a draw occupied by Seneca fine sandy loam. Rolling and hilly phases of Louisburg sandy loam occur on the adjacent strong slope.



A, Landscape dominated by very shallow Manteo, Louisburg, and Wilkes soils, which are less productive and less responsive to good management than areas of some of the deeper, smoother soils of the county.

B, Landscape in which Appling fine sandy loam, eroded rolling phase, predominates. Accelerated erosion has removed most of the surface soil and, in places, part of the subsoil. Productivity is low to very low, and much of the acreage has been abandoned for crops.

C, Area occupied by Nason and Tatum soils, abandoned for crops, but naturally revegetating, chiefly with pines.

Stand of second-growth mixed deciduous hardwood forest that commonly grows on Orange, Lignum, Elbert, and Helena soils. This kind of forest is low in productivity.

About 32 acres of undulating relief (2 to 8 percent slopes) is included in this mapping unit.

Use and management (B–4).—Workability and conservability are poor to very poor, and productivity is medium to very low for the rolling phases of Manteo-Bremo silt loams. The soils have a narrow range of suitability. They are poor to very poor for crops but fair for pasture.

About 75 percent of this complex is in forest, 20 percent is cultivated, 3 percent is pastured, and 2 percent is idle. On the small acreage in crops, yields are low under common management. Pasture is fair under the usual management, but it can be improved by better management.

Manteo-Bremo silt loams, hilly phases (15 to 25 percent slopes) (Mc).—The hilly phases of Manteo-Bremo silt loams have stronger slopes than the rolling phases. They are slightly shallower to bedrock also, and some rock fragments are strewn over the surface. The hilly phases are associated with the rolling phases of Manteo-Bremo silt loams, and with Tatum and Nason soils.

The hilly phases are medium acid to extremely acid. Their content of organic matter is low, and the content of plant nutrients is medium to very low. Permeability to roots, moisture, and air is moderate in the surface soil and moderate to rapid in the subsoil.

Surface runoff is rapid to very rapid, and internal drainage is medium to rapid. The water-holding capacity is low to very low. Most of the acreage is moderately sheet eroded. A few shallow gullies occur in about 87 acres, and many shallow ones have formed in about 84 acres. Approximately 4 acres is deeply gullied.

About 39 acres mapped with this complex has steep relief (more than 25 percent slopes).

Use and management (B–4).—These soils are very poor for crops and poor to fair for pasture. Workability and conservability are very poor, and productivity is low to very low. The stronger slopes and more eroded areas are best used for forest. Some areas can be used for pasture, but unless the pastures are well managed, it would be better to use all areas of these soils for forest. About 78 percent of these soils is in forest, 12 percent is cultivated, 8 percent is pastured, and 2 percent is idle.

Masada fine sandy loam, undulating phase (2 to 8 percent slopes) (Mk).—This light-colored soil is well drained to moderately well drained. It occurs on high terraces that rise from flood plains. The soil is closely associated with Hiwassee, Augusta, and Roanoke soils. The Masada soil has formed from alluvial deposits that consist of sand, silt, and clay derived chiefly from light-colored, coarse-textured soils of the uplands. Moderate sheet erosion occurs in about 279 acres.

Profile in a cultivated area:

0 to 7 inches, grayish-brown very friable to nearly loose fine sandy loam; weak very fine granular structure; white and soft when dry.

7 to 14 inches, pale-yellow friable fine sandy loam, faintly mottled with gray and yellowish brown; very weak fine granular structure; pale yellow when dry.

14 to 18 inches, yellowish-brown light fine sandy loam; weak fine granular structure; contains a few pebbles.

18 to 30 inches, strong-brown to yellowish-red friable light clay loam mingled in the lower part with shades of yellow; weak fine blocky structure; sticky when wet, and hard when dry; contains blue, white, and gray quartz particles.

30 to 38 inches, mottled red, yellow, and white friable to very friable sandy clay loam soil material; very weak fine blocky structure; contains many angular and subangular quartz pebbles and strata of coarse sandy material; gravel and coarse sandy material increase with increasing depth.

The surface soil varies somewhat in color, texture, and depth. In places the yellowish minglings occur higher in the subsoil. In some places texture of the surface soil is loam or sandy loam, and that of the subsoil is heavy clay loam to sandy clay loam. In places a few stones and pebbles are scattered over the surface.

The profile of Masada fine sandy loam, undulating phase, is very strongly acid throughout. The content of organic matter is low, and the soil is low in natural fertility. Permeability is moderate to moderately rapid in the surface soil and moderate to moderately slow in the subsoil. Both surface runoff and internal drainage are medium to slow. The water-holding capacity is moderate.

Mapped with the undulating phase is about 66 acres of Masada fine sandy loam, rolling phase. This included soil has stronger slopes of 7 to 15 percent. Included also is about 33 acres of Altavista fine sandy loam, undulating phase, which occurs on lower terraces. Both these included soils have been moderately damaged by sheet erosion.

Use and management (A–5).—Masada fine sandy loam, undulating phase, is easy to work and fairly easy to conserve. It responds well to good management. By intensive management the soil can be kept highly productive of many crops. It is good to excellent for tobacco and vegetables, but it is not well suited to alfalfa, because of the unfavorable subsoil drainage. Good stands can be obtained, but they die out after a few years.

About 47 percent of the soil is in forest, 36 percent is tilled, 9 percent is idle, and 8 percent is pastured. The cultivated land is used mainly to grow sun-cured tobacco, corn, small grains, and hay.

Mixed alluvial land, well drained (0 to 2 percent slopes) (Mm).—This land type consists largely of recent mixed alluvial deposits. These were washed from many different soils of the uplands and left on first bottoms along some of the smaller streams. The land type is closely associated with soils of first bottoms and with many soils of the uplands. Most areas are well drained, but some small patches are included that are imperfectly or poorly drained. This land is often flooded.

Many variations in soils occur in this land type. In places the soils consist mainly of a thin layer (6 to 12 inches) of brown fine-textured alluvium over beds of sand, gravel, and cobblestones. In some places the soils are similar to the Congaree, Chewacla, and Buncombe soils. In areas resembling the Congaree, Chewacla, and Buncombe soils, the surface layers are brown very friable silt loam to loamy fine sand, 8 to 12 inches thick. The subsoils are brown, yellowish-brown, or mottled brown, gray, and yellowish-brown weakly developed soil material that is friable to loose. In most places these layers overlie rounded waterworn pebbles, cobblestones, or sand that occur at depths of 20 to 40 inches.

At the bases of slopes and at the mouths of intermittent drainageways adjacent to first bottoms, small areas of colluvial material occur. Soils derived from this colluvial material are mapped with Mixed alluvial land, well drained. The soils formed from colluvium generally resemble the Seneca, Starr, or Worsham soils.

Soils that have formed from colluvial materials occupy positions slightly higher than the soils of the first bottoms, and they are not flooded so frequently. They have brownish, yellowish, or grayish friable to very friable silt loam or gravelly silt loam surface layers, and yellow, brown, and reddish, friable, weakly developed subsoil layers. In many places pebbles and stones are numerous on the surface and in the soil layers. Small areas near creek banks are composed principally of coarse sand, gravel, and cobblestones.

This land type is medium acid to extremely acid. The content of organic matter varies widely. Fertility ranges from very low to high. The browner, deeper, better drained areas have the most plant nutrients, and the shallow, light-colored, and stony or gravelly areas have the least. Permeability is slow to very rapid in the surface layer and very slow to very rapid in the lower layers. The water-holding capacity is low to high.

Use and management (B–5).—Mixed alluvial land, well drained, is fairly easy to work and conserve. It is not suited to many crops, however, because of the risk of floods. During the wetter seasons, it is difficult to use heavy farm machinery on the land. Permanent pasture is the best use, but small higher lying areas could, if well managed, be used for vegetables and row crops.

Most of the land was once cropped. At present about 81 percent is in forest, 9 percent is cultivated, 6 percent is idle, and 4 percent is pastured. Forest is mainly second-growth sycamore, birch, black willow, willow oak, and white oak. The undergrowth, which is generally dense, is principally alder, smilax, elder, and Japanese honeysuckle. Scattered small pines and hardwoods and undesirable weeds and grasses grow on most of the idle land.

The small cultivated areas are generally planted to garden vegetables and field corn. These yield fairly well if they are not flooded.

Moisture conditions are excellent for pasture, and dry spells do not interfere seriously with pasture growth. On some areas, however, annual floods deposit materials that reduce grazing considerably. Generally pastures are not well maintained and are grown up to wild grasses and weeds, principally broomsedge, crabgrass, lespedeza, sedgenutgrass, sheep sorrel, wild onion, and cinquefoil. Little of the pasture has been fertilized, limed, and clipped or grazed closely enough to keep down young tree sprouts and large weeds. Good pasture can be established, but better than ordinary management is necessary.

Mixed alluvial land, poorly drained (0 to 2 percent slopes) (Ml).—This land type differs from Mixed alluvial land, well drained, mainly in having predominantly poor drainage. About 80 percent of the land is poorly drained; except for a few moderately well drained areas, the rest is imperfectly drained. The water table is high in most places, and the land is often flooded.

The poorly drained areas resemble Wehadkee and Worsham soils, but they are more variable in color, texture, and consistence and are

relatively shallow over a stratum of sand, gravel, and cobblestones. In imperfectly and moderately well drained areas the soils are similar to those of the Chewacla and Congaree series. Soils in Mixed alluvial land, poorly drained, are more variable, however, and not so well developed.

Use and management (B–5).—Because of unfavorable drainage, this land is poorly suited to tillage. Few crops can be grown on the undrained areas, and in most years damaging floods occur. Except when the land is frozen in winter, or is dry in summer, heavy farm machinery is difficult to use. As the water table is generally near the surface, the land is not suitable for deep-rooted plants, but it is very well suited to pasture. It is productive of many grasses, but productivity varies considerably. Drainage, mainly by bedding, and intensive application of good management practices would improve the pastures.

About 82 percent of Mixed alluvial land, poorly drained, is in forest, 10 percent is idle, and 4 percent each is cultivated or in pasture. The trees and other native vegetation are water tolerant. Few desirable pasture plants grow in the pastured areas, and the idle land is rapidly reverting to forest.

Nason silt loam, undulating phase (2 to 8 percent slopes) (Ng).—This light-colored to medium-colored soil was derived from weathered quartz sericite schist. It has smooth slopes and is comparatively deep to bedrock. It is a very extensive soil. Generally it occupies gently undulating ridgetops scattered throughout the western and northwestern parts of the county. The soil is closely associated with the Tatum, Lignum, Manteo, and Worsham soils (pl. 2, *A*).

Profile in a cultivated area:

0 to 9 inches, yellowish-brown very friable silt loam; nearly white when dry; in wooded areas topmost 1 or 2 inches stained slightly darker brown.
9 to 13 inches, reddish-yellow friable light silty clay loam; weak fine blocky structure; contains a few small quartz fragments and schist particles.
13 to 24 inches, predominantly yellowish-red friable clay mingled with yellowish brown and red; moderate medium blocky structure; hard to very hard when dry; contains some schist, quartz, and mica fragments.
24 to 36 inches, mingled red and reddish-yellow friable clay soil material mixed with many partly weathered schist fragments; contains many schist fragments, which become more numerous with depth.

The surface soil and subsoil vary somewhat in thickness. Texture of the surface soil ranges from silt loam through gravelly silt loam to loam. Texture of the subsoil ranges from clay loam to silty clay. Locally, enough stones and gravel occur on the surface and in the surface soil to interfere considerably with cultivation. Stony and gravelly areas are shown on the soil map by symbols.

This soil is extremely acid throughout. It is low in organic matter, and the content of most of the essential plant nutrients is low to very low. Permeability to roots, moisture, and air is moderate in the surface soil and moderate to moderately slow in the subsoil. Surface runoff is medium to slow. Internal drainage is medium in the upper layers but moderately slow in the lower part. The water-holding capacity is moderate.

Use and management (A–5).—Nason silt loam, undulating phase, is easy to work and to conserve under cultivation. It responds readily

to good management and is fair to good for most crops grown in the county.

About 73 percent is in forest, 18 percent is cultivated, 5 percent is idle, and 4 percent is pastured. Areas in the northern part of the county are used more widely for crops and pasture than those in the southern part.

Crops are generally grown in 4- to 5-year rotations. Wheat is the most common small grain, and yields are relatively better than for corn. The main hay crop consists of a mixture of redtop, lespedeza, and clover. Hay is seldom fertilized. On some farms clover is the principal crop the first year of the rotation, but lespedeza and grasses are more common the third, fourth, and fifth years. Little, if any, grass is grown for seed. Some meadows are grazed the fourth and fifth years of the rotation.

Many pastures contain undesirable weeds and grasses because they are not seeded, fertilized, or clipped, and grazing is not regulated. The carrying capacity of such pastures is low compared to that of pastures where liberal amounts of complete fertilizers, lime, and organic matter have been applied.

Nason silt loam, eroded undulating phase (2 to 8 percent slopes) (Ne).—This soil has lost much of its surface soil through sheet and gully erosion. Sheet erosion is so severe on about 201 acres that only 2 to 5 inches of the surface soil remains. A few to many shallow gullies occur in about 65 acres, and a few deep gullies that make tillage difficult occur in about 27 acres. The soil occurs in small and widely distributed bodies, in the same general areas as other phases of Nason silt loam.

To plow depth this soil is yellowish-brown very friable silt loam to reddish-yellow friable light silty clay. Otherwise, the profile is similar to that of Nason silt loam, undulating phase.

Surface runoff is medium. Internal drainage is medium to moderately slow in the lower part of the profile. The water-holding capacity is moderately low.

Use and management (A–8).—The range of suitability for Nason silt loam, eroded undulating phase, is medium. The soil is not so well suited to crops as the uneroded undulating phase. It is fairly difficult to work and conserve and is low to very low in productivity for most crops. Organic-matter content is very low. Good tilth is more difficult to maintain than on the uneroded undulating phase, and the range of moisture under which the soil can be cultivated is narrower. It is difficult to grow most row crops because it is hard to use heavy farm machinery.

About 52 percent of this soil is in forest, 30 percent is cultivated, 16 percent is idle, and 2 percent is pastured. Management of cropped areas is generally the same as that for Nason silt loam, undulating phase, but yields are somewhat lower. Tillage for row crops should be on the contour, organic matter should be added to the soil, and mulches should be used.

Nason silt loam, rolling phase (8 to 15 percent slopes) (Nf).—This soil has stronger slopes and, in many places, thinner profile layers than Nason silt loam, undulating phase. Although the stronger slope is the principal reason for mapping this phase separately, in most places

it contains slightly more quartz pebbles and schist fragments throughout the profile. Most of this soil occupies slopes that extend from ridgetops. It occurs in the same general location as the undulating and eroded undulating phases. This rolling phase is closely associated with the undulating phase, and with the Tatum, Lignum, and Worsham soils.

Surface runoff is medium to rapid in this soil. Internal drainage is medium in the upper part of the profile and moderately slow in the lower part.

About 92 acres of Nason silt loam, hilly phase, is mapped with the rolling phase.

Use and management (A–8).—The strong slopes of the rolling phase of Nason silt loam make it fairly difficult to work and to conserve under cultivation. Engineering methods to control runoff are necessary. The content of lime and organic matter is low, and the content of plant nutrients is very low. Nevertheless, the soil responds well to good management. The soil is suited to close-growing crops such as small grains and hay. Good yields of such crops can be obtained without losing soil or depleting fertility.

About 85 percent of the soil is in forest, 9 percent is cultivated, 3 percent is in pasture, and 3 percent is idle. Yields of most crops are somewhat lower than on the undulating phase, though management is usually similar.

Nason silt loam, eroded rolling phase (8 to 15 percent slopes) (Nd).—This phase resembles Nason silt loam, rolling phase, but it has lost 4 to 8 inches of the surface soil through erosion. In most areas shallow and deep gullies have formed. Most of this phase is closely associated with the other Nason soils. Its acreage, compared with that of the undulating phase and rolling phase, is fairly small.

The plow layer in places is a mixture of surface soil and subsoil. It is yellowish-brown friable silt loam or heavy silt loam to reddish-yellow friable light silty clay loam.

Surface runoff is rapid. Internal drainage is medium in the upper profile horizons but moderately slow in the lower layers.

About 13 acres of Nason silt loam, eroded hilly phase, and 89 acres of Nason silt loam, eroded steep phase, are mapped with this soil. Stronger slope is the chief difference between the included soils and this soil.

Use and management (B–2).—Strong slopes and erosion make this soil poorly suited to tilled crops. It is difficult to work, and good tilth is hard to maintain. In gullied areas heavy farm machinery is difficult to use. Conservability is poor, and if the soil is used for row crops, further loss from erosion can be expected. Productivity is low, and the range of suitability is narrow.

About 70 percent of Nason silt loam, eroded rolling phase, is in forest, 14 percent is cultivated, 13 percent is idle, and 3 percent is pastured. A large part of the forest is scrub pine. Some areas are in hardwoods—principally hickory and white, chestnut, red, and black oaks. Many of the hardwoods have grown up from sprouts growing on old stumps.

Nason loam, undulating phase (2 to 8 percent slopes) (Nc).—This well-drained, light colored to moderately light colored soil is commonly

called light sandy land. It has developed from weathered products of quartz sericite schist that contain a large proportion of quartz. Though similar to Nason silt loam, undulating phase, this soil has a lighter textured surface layer and subsoil.

The soil occurs on fairly wide undulating ridgetops. Most of it is in the north-central and central parts of the county. The larger areas are northeast of Yancey (Yancey's Store). Nason loam, undulating phase, is closely associated with other Nason soils and with the Tatum and Lignum soils.

Profile in a cultivated area:

0 to 10 inches, pale-yellow very friable loam; soft and white when dry; contains many fairly large quartz pebbles; in wooded areas topmost 1 or 2 inches stained dark with organic matter.
10 to 15 inches, yellowish-brown friable light clay loam; weak fine blocky structure; brownish yellow and hard when dry.
15 to 27 inches, yellowish-red friable heavy clay loam or light clay; moderate medium blocky structure; yellowish brown and hard to very hard when dry; slightly plastic when wet.
27 to 38 inches, mingled yellowish-red, pale-yellow, and reddish-yellow friable clay loam soil material; multicolored quartz pebbles numerous.

Texture varies considerably in this soil. That of the surface soil ranges from very fine sandy loam to gravelly sandy loam, and that of the subsoil from sandy clay to clay. In places both quartz pebbles and stones are numerous on the surface and in the surface soil. The areas that are the most stony and gravelly are north and west of Fork Union.

The soil is very strongly acid to extremely acid throughout. The content of organic matter is low to very low. Permeability to roots, moisture, and air is moderate in the surface soil and moderate to moderately slow in the subsoil. Except that internal drainage is moderately slow in the lower layers, both surface runoff and internal drainage are medium. The water-holding capacity is moderate.

Use and management (A–5).—Nason loam, undulating phase, is very low in fertility. Because of its smooth slopes and light texture, however, it is easy to work and to conserve. It has a wide range of suitability for many crops and is fairly productive under intensive management. Good tilth can be attained more readily than in the undulating phase, but the effects of good management are not so lasting.

About 75 percent of this soil is in forest, 18 percent is tilled, 5 percent is idle, and 2 percent is pastured. Management is generally similar to that of Nason silt loam, undulating phase, but yields of some crops are slightly lower. Because of its lighter textured surface, this phase, under similar management, should produce better yields of vegetables, including potatoes, and better yields of bright tobacco than Nason silt loam, undulating phase.

Nason loam, rolling phase (8 to 15 percent slopes) (Nb).—This soil has stronger slopes, thinner soil layers, and generally shallower depth to bedrock than Nason loam, undulating phase. It is not so extensive as the undulating phase, and most individual areas are comparatively small.

The soil generally occupies slopes that extend from ridgetops. It is closely associated with other Nason soils and with Tatum, Lignum, and Worsham soils. A few gullies have formed on about 462 acres,

but they normally are not deep enough to interfere seriously with the use of heavy farm machinery.

The soil varies mainly in texture of the surface layer and in the thickness of the lower layers. The surface soil ranges from gravelly sandy loam to silt loam. Locally stony areas occur, but these are not large enough to be shown on the soil map. The lower layers range from 6 to 20 inches in thickness.

The soil is very strongly acid to extremely acid. It is low to very low in organic matter and very low in most of the essential plant nutrients. The surface soil is moderately permeable to roots, moisture, and air. Permeability in the subsoil is moderate to moderately slow. Surface runoff is medium to rapid. Internal drainage is generally medium, but it is fairly slow in the lower part of the profile. The water-holding capacity is moderately low.

Use and management (A–8).—Because of its strong slope and comparatively coarse texture, this soil is only fair to poor in conservability. If used for row crops, it will deteriorate unless protected from erosion. Workability is fair to poor, and productivity is poor.

About 88 percent of the soil is in forest, 8 percent is tilled, 2 percent is in pasture, and 2 percent is idle. Yields are somewhat lower than on Nason silt loam, undulating phase, though management is similar. Crops that have strongly developed root systems are best because they can draw out the small supplies of moisture and plant nutrients this soil provides.

Nason loam, eroded rolling phase (8 to 15 percent slopes) (Na).—Except for the loss of a considerable part of its surface soil through erosion, this phase is very similar to Nason loam, rolling phase. In some areas only 2 to 5 inches of the original surface soil remain and a few deep gullies have formed. In others nearly all or all of the surface soil, and in places part of the subsoil, has been lost, and a few to many shallow to deep gullies have formed.

To plow depth the soil is pale-yellow friable loam to yellowish-red friable clay loam. Generally most, or all, of the plow layer is subsoil.

This soil has a very low content of organic matter and is very low in fertility. Surface runoff is rapid. Internal drainage is medium in the upper part of the profile but moderately slow in the lower part. The water-holding capacity is moderately low.

Use and management (B–2).—The soil is poorly suited to tilled crops because of its strong slope and eroded condition. It has poor workability. Heavy farm machinery is difficult to use, especially in deeply gullied areas. Row crops increase the risk of erosion and bring about further soil deterioration.

About 74 percent of the soil is in forest, 20 percent is idle, and 6 percent is cultivated. On the more eroded areas, stands of pine should be established instead of hardwoods. If some seedlings are already on the land, the small hardwoods should be cut out, and pine used to reforest.

Orange silt loam, undulating phase (2 to 8 percent slopes) (Oc).—This light-colored, somewhat poorly drained soil is characterized by a claypan in the subsoil. Locally it is called blackjack land or gumbo land. The soil has formed from material weathered from fine-grained basic quartzite, hornblende schist, or quartz monzonite. It occurs

on undissected uplands and is closely associated with Lloyd, Fluvanna, Bremo, and Elbert soils.

This is a fairly extensive soil, but areas are generally small and widely scattered. The larger ones occur in the central part of the county between Central Plains and Harris Store.

Profile in a cultivated area:

0 to 7 inches, brownish-yellow very friable silt loam; light gray and slightly hard when dry; thin covering of leaf mold in forested areas, and uppermost 2 inches of soil is darker colored.

7 to 12 inches, brownish-yellow firm heavy clay loam or silty clay loam; moderate medium blocky structure; slightly sticky and plastic when wet; pale yellow and hard when dry.

12 to 15 inches, mottled gray and yellowish-brown weakly compacted gravelly silty clay loam or clay pan; extremely hard when dry; brittle when moist; contains pebbles as large as 2 inches in diameter that are mainly quartz.

15 to 34 inches, predominantly yellowish-brown very plastic tough clay faintly mottled with gray; massive structure; brownish yellow and extremely hard when dry; faint gray mottlings more numerous in lower part of layer.

34 to 44 inches, mottled yellowish-brown, brownish-yellow, gray, and olive friable parent material—chiefly soft weathered particles of basic rock.

Fairly wide variations exist in this soil. Depth to the gravelly pan layer, to the mottled layer, and to bedrock vary from place to place. In some places the gravelly layer is very thin or lacking, and in others it is 6 to 10 inches thick. The thickness of the very plastic layer is variable.

Orange silt loam, undulating phase, is medium to strongly acid, but it is less acid in the subsoil and parent material. Its organic-matter content is low. Permeability in the surface soil is moderate, but below the surface layer, it is slow to very slow because of the gravelly pan layer and the dense subsoil. Surface runoff is medium to slow, and internal drainage is slow. The water-holding capacity is moderately low to low.

A few small areas included with this soil resemble an Iredell soil, which was not mapped separately in this county. One such area is about three-fourths of a mile southwest of Fork Union. Its surface soil consists of a thin layer of loam to clay loam that grades abruptly to a layer of grayish-brown plastic clay loam or clay about 6 inches thick. This overlies a mottled yellowish-brown and olive-yellow very plastic tough clay layer about 8 inches thick. The parent material of this included soil occurs at depths of 20 to 28 inches and consists of highly mottled yellowish-brown, pale-yellow, and white partly decomposed coarse-grained diabase rock.

About 40 acres of Orange silt loam, rolling phase, is also mapped with this undulating phase. The included rolling phase differs mainly in having slightly stronger slopes of 8 to 12 percent.

Use and management (A–10).—Although one of the most fertile soils of the uplands, Orange silt loam, undulating phase, is not well suited to crops because of its gravelly pan layer and dense subsoil. Workability is poor. The soil can be tilled over only a narrow range of moisture conditions. In many seasons good tilth is difficult to maintain. Some farmers plow early in winter to improve tilth. It is difficult to harvest crops because harvesting machinery cannot be used except in dry seasons.

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The soil remains too wet during rainy seasons, and in dry seasons it dries out rapidly. Roots of many crops grow near the surface during wet seasons. Dry weather causes severe damage to these plants.

The soil is poorly suited to alfalfa and other deep-rooted crops. It is only fairly well suited to corn, sorghum, and small grains.

About 76 percent of the soil is in forest, 14 percent is tilled, 7 percent is idle, and 3 percent is pastured. Much of the soil was once cleared but has since reverted to forests of pine and hardwood. Under the usual management, yields of corn and wheat are comparatively low. Many partial failures of wheat and other small grains result from the freezing and heaving of the soil in winter. Pasture is the best use for this soil, but most pastures are run down and consist mainly of undesirable grasses and weeds.

Orange silt loam, gravelly subsoil phase (2 to 8 percent slopes) (Ob).—A dark-colored gravelly mineral layer at depths of 7 to 14 inches distinguishes this light-colored somewhat poorly drained soil from the undulating phase. In some places the surface soil is slightly darker and the lower plastic clay layer is somewhat thinner than in the undulating phase. Small dark mineral pebbles lie on the surface in most places. In a few areas there are slopes ranging up to 10 percent.

This soil is closely associated with other Orange soils and with the Zion, Fluvanna, Bremo, and Elbert soils. It occurs at elevations between those of the Zion and Elbert soils. This soil is not extensive. The areas are widely scattered, mainly throughout the central and north-central parts of the county. Some of the larger ones occur east and northeast of Central Plains and Wilmington. One is northwest of Stage Junction.

Profile in a cultivated area:

0 to 7 inches, pale-yellow to yellowish-brown very friable silt loam; strong coarse granular structure; contains many brown and black mineral concretions and some quartz pebbles; topmost 2-inch layer is brown in wooded or grassy areas.

7 to 12 inches, pale-yellow, compact, slightly cemented gravelly silty clay loam or clay; about 75 percent of the layer consists of dark-colored gravel and concretions.

12 to 24 inches, brownish-yellow very plastic tough clay; massive structure; contains a few pebbles and some black mineral film.

24 to 32 inches, predominantly brownish-yellow plastic clay soil material containing a large proportion of weathered dark-colored basic rock; mottled with pale yellow and light gray; contains considerable black mineral film.

32 inches +, largely weathered dark-colored basic rock.

A few important variations occur in this soil. The surface texture ranges from heavy silt loam to gravelly friable silt loam. The gravelly mineral layer is very thin in places, but in some areas it is as much as 12 inches thick. In some areas the surface soil is brown and the gravelly subsoil is similar to that of Zion silt loam, undulating phase.

The upper horizons of the profile of Orange silt loam, gravelly subsoil phase, are strongly acid, but in most places the lower layers are medium acid to neutral. The soil is low in organic matter. Permeability is moderate in the surface soil but moderately slow to very

slow in the subsoil. Surface runoff is medium to slow. Internal drainage is slow, especially where the gravelly layer is thickest. The water-holding capacity is moderately low to low.

Use and management (A–10).—Mainly because of the more porous gravelly layer in the profile, this phase is slightly better suited to most crops than the undulating phase. Good tilth can be maintained more easily, and the moisture supply appears to be more favorable for most crops. Workability is poor, conservability is fair, and productivity is low. The range of suitability is medium.

About 57 percent of the soil is in forest, 32 percent is cultivated, 6 percent is pastured, and 5 percent idle. Many areas now in forest were once cleared and used for crops or pasture.

Orange-Bremo silt loams, undulating phases (2 to 8 percent slopes) (Oa).—Areas of the two soils in this complex are generally so small and so intricately associated that they cannot be separated on a map of the scale used. The complex generally occupies fairly broad level ridgetops on uplands, where it has developed principally from material weathered from basic rock, mainly basic quartzite and hornblende schist. It is associated with Nason, Fluvanna, Bremo, and Elbert soils. Areas of the complex are generally comparatively large. One of the largest is southwest of Grays Mill.

In general the soil profiles resemble either Orange silt loam, undulating phase, which makes up the larger part, or Bremo silt loam, undulating phase. In most places the color of the Bremo soil in the complex is slightly lighter throughout than in areas where it occurs separately. In a few places the subsoil of the Bremo soil is thin and plastic, and mottlings occur in the lower part. In places the Orange soil has a comparatively thin subsoil.

The content of organic matter appears to be slightly lower in this complex than in areas of Bremo and Orange soils that occur separately. Surface runoff is slow to medium. Internal drainage is slow in the Orange soil and medium to slow in the Bremo soil.

Mapped with this complex is about 57 acres having slopes of approximately 12 percent.

Use and management (A–10).—The undulating phases of Orange-Bremo silt loams vary considerably in use suitability within comparatively short distances. As the soils are so intricately associated, they generally must be considered as a unit. Because of the subsoils, the soils are fairly difficult to work and to maintain in good tilth. Conservability is fair, and productivity is low. The soils become thoroughly wet during wet seasons but dry out quickly during dry spells. Consequently, crops are affected by both dry and wet weather. The range of moisture under which the soils can be cultivated properly is narrow. The soils are not suited to deep-rooted crops, such as alfalfa, and are not well suited to corn, small grains, and tobacco. Lespedeza, red clover, alsike clover, Ladino clover, timothy, and fescue can be grown successfully.

These soils are slightly more suitable for crops and pasture than either the undulating phase or the gravelly subsoil phase of Orange silt loam. It is not so well suited as Bremo silt loam, undulating phase. It is poor to fair for crops and fair for pasture and forest.

About 77 percent of the complex is in forest, principally cutover pine, white oak, post oak, black oak, hickory, and red maple. About 13 percent is cultivated, and 5 percent each is idle and pastured.

Riverwash (0 to 2 percent slopes) (Ra).—This land type is made up mainly of recent alluvial sand, gravel, and cobblestones that have been deposited along some of the larger streams in the county. It occurs mainly along the James and Rivanna Rivers. In some places Riverwash consists largely of rocky and gravelly bars, and in others it is thin strata of brown and white very loose coarse sand over gravel and cobblestones.

This land type is closely associated with the Buncombe and Congaree soils. It is inundated frequently, and many areas of sandy material are shifted from place to place during the floods. Relief in most areas is level, and natural drainage is excessive.

Use and management (C–1).—The loose, open texture of Riverwash, and the risk of floods make the range of use suitability very narrow. Riverwash is poorly suited to crops, pasture, and forest. About 63 percent is in forest, however, and about 17 percent each in cultivated and idle land. About 3 percent is in pasture. Some of the larger forested tracts are along the James River. The trees are principally sycamore, river birch, and boxelder. Good management practices are those suitable for forest production.

Roanoke silt loam (0 to 5 percent slopes) (Rb).—This poorly drained level to nearly level soil is commonly called crawfish land. Most of it has developed from sand, silt, and clay washed from the uplands. In places it originated from material derived from other terrace soils. It generally occurs in very small elongated areas on low stream terraces, principally along the James and Rivanna Rivers. A fairly large area lies along the Rivanna River about a mile northeast of Carysbrook.

Roanoke silt loam is associated with the Wickham, Hiwassee, Altavista, and Augusta soils. It occupies the lowest positions of any of these soils. The soil generally occurs in depressions and along drainageways that have formed in stream terraces. In many ways it resembles Worsham silt loam of the colluvial lands and Wehadkee silt loam of the bottom lands.

The natural vegetation in forested areas is mainly sycamore and river birch. In cleared areas the natural vegetation is principally sedgenutgrass, bulrush, and other small wet-land plants.

Profile characteristics:

0 to 7 inches, mottled light-gray and yellowish-red friable to firm silt loam; weak fine granular structure; hard when dry; in wetter areas, topmost 2 inches is dark gray.

7 to 18 inches, highly mottled light-gray and yellowish-red firm silty clay loam; moderate medium blocky structure; very hard when dry.

18 to 30 inches, very highly mottled gray, yellowish-red, and brownish-yellow plastic clay; massive when wet; strong coarse blocky structure when dry.

30 to 50 inches, very highly mottled heavy slightly plastic clay loam that is similar in color to layer above; lighter in texture in lower part; grades into strata of coarse sandy loam and sandy loam soil material that contains a few small rounded pebbles.

Color, texture, consistence, drainage, and depth all vary in this soil. The surface soil ranges from faintly mottled yellowish-brown, gray,

and yellowish-red sandy loam to light silty clay loam in which mottling is fairly distinct. The texture and consistence of the subsoil ranges from friable sandy clay to plastic clay. In pastures that have been trampled, the structure of the surface soil is massive. Depth to the parent material is variable but is generally more than 30 inches. In places the parent material is more gravelly than in others. Except in very dry seasons, water fills holes that are dug before the parent material can be examined thoroughly.

Roanoke silt loam is generally strongly acid throughout, but in a few areas it is medium acid. Fertility is low. Because the water table is high, permeability is moderately slow in the surface soil and very slow in the subsoil. Surface runoff is very slow to ponded, and internal drainage is very slow. The water-holding capacity is moderately low.

Use and management (B–5).—This soil is not suited to tilled crops because it has poor drainage. It is difficult to work, and during most seasons heavy farm machinery cannot be used. Few crops will grow unless the land is adequately drained. Pasture is the best use, but in many places management has been poor and many undesirable grasses and weeds have grown up. Where suitable management is practiced, however, the pasture consists of desirable herbage, largely bluegrass and whiteclover.

About 59 percent of Roanoke silt loam is tilled, and 19 percent is pastured. About 17 percent is forested, and 5 percent is idle. Livestock should not be allowed to trample the pastures during wet periods, as trampling is harmful to the soil.

Rough gullied land (8 to 25+ percent slopes) (Rc).—This land has been eroded to the extent that many shallow to deep gullies have formed. Most, or all, of the surface soil, and in places a large part of the subsoil, has been removed. Gullies have penetrated the parent material and in many places have reached the parent rock. On a few acres there are small patches that are only moderately eroded and still retain some surface soil.

Most of the parent material of Rough gullied land originated from acidic granite and schist, but in a few areas it was derived from basic rock. Most areas of this land type are small and widely scattered. One area, surrounded by granitic rock, occurs a half mile south of Dixie.

Relief is mostly hilly and steep. Surface runoff is rapid to very rapid, and internal drainage is slow.

Use and management (C–1).—Severe gullying makes this land unsuitable for crops and pasture, and it is very poorly suited to forest. Workability and conservability are very poor, and productivity is very low. The land can best be used for forest, as it would be too costly to reclaim it for pasture or crops.

Management should center around producing trees, although most cleared areas will eventually grow up to forest. Pines will generally make better growth than other trees because they outlive hardwoods on droughty eroded sites.

Seneca fine sandy loam (2 to 8 percent slopes) (Sa).—This light-colored moderately well drained soil of the colluvial lands occurs on nearly level to gentle slopes, which are generally about 4 percent.

The soil has formed from local colluvial and alluvial materials washed or sloughed from areas of Appling, Durham, Louisburg, and Cecil soils. It resembles Starr loam in some respects, but it has a lighter color and coarser texture, and is more acid.

The soil occupies depressions at the heads of drainageways and positions at the foot of slopes. In most places it receives considerable seepage and runoff from the adjacent slopes. It generally remains moist throughout dry periods. Areas are small and widely scattered throughout the granitic belt in the southeastern part of the county.

Profile in a cultivated area:

0 to 14 inches, brown very friable to nearly loose fine sandy loam or sandy loam; contains some small pebbles; in wooded areas darker brown in topmost 1 or 2 inches.

14 to 28 inches, yellowish-brown very friable sandy clay loam; very weak fine blocky structure; brownish yellow when dry; contains small number of quartz pebbles and mica flakes.

28 to 44 inches, mottled yellowish-brown, yellowish-red, and light-gray very friable light sandy clay soil material intermixed with many mica flakes and some small white quartz pebbles; mottling increases in intensity with depth.

Variations in texture and depth of the surface soil are pronounced in this soil. In some places the surface soil is 6 to 12 inches thick and ranges from brown loam to yellowish-brown coarse sandy loam. The subsoil ranges from pale-yellow sandy loam to brownish-yellow or yellowish-brown light clay loam.

Seneca fine sandy loam is very strongly acid throughout. Fertility is medium to low. Permeability to roots, water, and air is moderately rapid in the surface soil and moderate in the subsoil. Surface runoff is medium to slow, and internal drainage is medium, except in the lower part of the profile where it is moderately slow. The water-holding capacity is moderate.

Use and management (A–3).—This soil is very desirable for such crops as corn and hay but, because of the moisture, is not well suited to such crops as alfalfa. Small grains do not grow so well as other crops, especially in wetter seasons, and the quality of tobacco in wetter seasons is not so good as on the associated soils. Workability is good, and good tilth is easy to maintain. The soil is easy to conserve. Although its content of plant nutrients is only fair, and it is low in lime, it responds well to good management. High productivity can be built up readily.

About 46 percent of this soil is in forest, 36 percent is cultivated, and 18 percent is idle. If the soil occurs in fields where its area is smaller than that of the associated soils, it will produce well under the same management given the associated soils, but it will need slightly less nitrogen and organic matter.

Seneca silt loam (2 to 8 percent slopes) (Sb).—This soil resembles Seneca fine sandy loam, except that it has a finer textured surface soil and subsoil. Its parent material consists of local colluvium and alluvium derived from the Tatum, Nason, Fluvanna, and Lignum soils. The soil is somewhat more extensive than Seneca fine sandy loam. It occurs in small areas, widely scattered among the Nason, Tatum, Fluvanna, and Lignum soils in the northern part of the county.

The slope, drainage, and relief of Seneca silt loam are similar to those of Seneca fine sandy loam. In most places, however, the con-

tent of lime, organic matter, and essential plant nutrients is lower. Seneca silt loam is very strongly acid to extremely acid throughout. Permeability and water-holding capacity are moderate.

Use and management (A–3).—Except for a small acreage in pasture, Seneca silt loam is used for the same purposes as Seneca fine sandy loam. About 64 percent is in forest, 20 percent is tilled, 14 percent is idle, and 2 percent is pastured. Management practices to improve and maintain productivity are about the same as for Seneca fine sandy loam, but to make Seneca silt loam as productive, it may be necessary to add slightly more lime and commercial fertilizer.

Starr loam (2 to 8 percent slopes) (Sc).—This deep, brown, well to moderately well drained soil has formed from recent colluvial materials washed mainly from Lloyd soils. It occurs in depressions at the heads of drainageways and occupies positions at the bases of slopes. It is closely associated with Lloyd, Fluvanna, Bremo, and Elbert soils. This is not an extensive soil; the small tracts are widely scattered, principally in the northeastern part of the county. Some areas occur immediately east of Wilmington. Generally the slopes are about 4 percent.

Profile in a cultivated area:

0 to 14 inches, brown to dark reddish-brown friable loam to silt loam; weak to moderate fine granular structure.
14 to 30 inches, yellowish-red to reddish-brown friable silty clay loam or clay; weak fine blocky structure; contains black mineral film.
30 to 54 inches, predominantly brownish-yellow very friable silt loam mingled with yellowish red, reddish yellow, and weak red; weak fine crumb or fine granular structure; contains considerable black mineral film.

Most variations in Starr loam consist of differences in texture, thickness, and color of the various profile horizons. The surface soil ranges from brown light loam to red silty clay loam. The subsoil ranges from silt loam, which is brownish yellow or reddish yellow, to red silty clay loam or clay. The surface soil ranges from 6 to 16 inches in thickness. In places the colluvium from which the soil originated is thick. The soil in some areas forms only a thin mantle over an old land surface.

Starr loam is medium acid to very strongly acid. In most places, however, it is medium acid throughout. The content of organic matter is fairly high, and the soil is well supplied with essential plant nutrients. Permeability to roots, water, and air is moderate to moderately rapid in the surface soil and moderate in the subsoil. Surface runoff is slow. Internal drainage is generally medium, but in some places it is slow in the lower horizons of the profile. Seepage water from the adjacent slopes keeps the soil fairly moist most of the time. The water-holding capacity is moderate to high.

Use and management (A–3).—This is one of the most desirable soils in the county for corn and hay. It is less desirable for small grains and deep-rooted plants. The high content of organic matter and nitrogen causes small grains to lodge. Alfalfa and other deep-rooted plants thrive for several years and then die. Apparently the large amount of water in the soil and the slow drainage in the lower part are unfavorable for long-time growth of deep-rooted crops.

About 57 percent of this soil is in forest, 28 percent is cultivated,

14 percent is idle, and 1 percent is pastured. Corn, small grains, and hay, grown in rotation, are the principal crops.

The soil responds well to good management. Many areas are so small, however, that it may be necessary to manage the soil in the same way as larger areas of adjoining soils. The soil usually produces better pasture than the associated soils.

Stony land (8 to 25+ percent slopes) (Sd).—This land type consists of rolling, hilly, and steep areas in which outcrops of bedrock, loose stone fragments, and soils derived from both basic and acidic rock occur. From 40 to 90 percent of the land surface is comprised of rock outcrops, loose stones, and boulders. Many outcrops of basic rock occur in the rolling areas. The outcrops are surrounded by red clay soil resembling the Lloyd soils. In steeper areas, such as along the bluffs of the James River, the rock is acidic, and a very shallow Manteo soil containing schist fragments occurs around the outcrops.

About 75 percent of the land has steep slopes. These steep areas occur along the James and Rivanna Rivers and in other places where rivers have cut deep into the land. The rest consists of small widely scattered areas in many parts of the county.

In most places the soil is low in lime and most plant nutrients. Fertility is low to very low. Surface runoff is medium to very rapid, and internal drainage is very slow to medium. The water-holding capacity is moderate to low.

Use and management (C–1).—Stony land is very poor in workability and conservability and low in productivity. The smoother areas can be used for permanent pasture, but they are poorly suited to it. About 93 percent of the land is in forest, 5 percent is idle, and 2 percent is pastured. The forest is generally very poor, especially on steep slopes that have shallow soils. Management requirements are principally those needed for growing trees.

Tatum silt loam, undulating phase (2 to 8 percent slopes) (Tc).—This well-drained soil occurs on smooth undissected ridgetops on uplands. It has formed from materials weathered from quartz sericite schist. The soil is closely associated with Nason, Manteo, Lignum, and Worsham soils but occupies higher positions on the uplands than any of its associates.

This is one of the most extensive soils of the uplands. As a rule the areas are large and widely scattered over most of the northwestern part of the county. Some of the larger areas occur near Union Mills, Cunningham, and Central Plains. The predominating slope is about 5 percent.

About 50 acres is severely sheet eroded. A few shallow gullies occur in about 209 acres, and a few deep ones in about 13 acres.

Profile characteristics:

0 to 3 inches, yellowish-brown very friable silt loam; weak fine granular structure; very light gray when dry.

3 to 8 inches, brownish-yellow very friable silt loam; weak fine granular structure; pale yellow to grayish brown or light brownish gray when dry.

8 to 12 inches, yellowish-red friable light silty clay loam; moderate medium blocky structure.

12 to 30 inches, red friable to firm clay; moderate medium blocky to coarse blocky structure; very hard to extremely hard when dry.

30 to 42 inches, mingled red, yellow, and brown very friable clay soil material intermixed with similarly colored small weathered schist fragments that make up 50 to 75 percent of the mixture.

Some variations occur in this soil. The surface soil ranges in texture from loam to gravelly silt loam, and in thickness from 5 to 10 inches. In some areas on narrow ridgetops, the horizons are thinner than is typical and the profile is shallower to bedrock. A few to many quartz pebbles occur locally on the surface and in the surface soil. Where they are numerous enough to interfere with tillage, the areas are indicated on the soil map by symbols.

The undulating phase of Tatum silt loam is very strongly to extremely acid in most areas. The soil has a fair to low content of organic matter, and fertility is low. Permeability to roots, moisture, and air is moderate. Both surface runoff and internal drainage are medium. The water-holding capacity is moderate.

Small patches of brown soil that resemble Lloyd silt loam, undulating phase, are mapped with this soil.

Use and management (A–4).—Tatum silt loam, undulating phase, is easy to work and to conserve and is medium in productivity. It responds well to good management. Because of its smooth relief, thick well-developed friable clay subsoil, moderate permeability, and moderate water-holding capacity, productivity can be maintained. The soil is well suited to many crops, particularly to small grains. Corn and hay crops, including alfalfa, grow well. The soil is not so well suited to vegetables and tobacco as the lighter textured soils, but it is good for tomatoes and such crops as beans.

About 82 percent of the soil is in forest, 13 percent is cultivated, 3 percent is idle, and 2 percent is pastured. Wheat is the most common small grain, but other small grains, corn, hay, tobacco, and potatoes are grown. Most of the pastures are poor.

Tatum silt loam, rolling phase (8 to 15 percent slopes) (Tb).—This soil resembles the undulating phase but has steeper slopes. Also it is shallower over bedrock, and its layers are thinner in most places. Generally this soil occupies sharply breaking slopes that extend from ridgetops. It is closely associated with the undulating phase and with the Nason and Manteo soils. It is much less extensive than the undulating phase, but about the same variations occur in the profile.

A few to many shallow to deep gullies have formed in about 178 acres. About 19 acres is severely sheet eroded.

Surface runoff is medium to rapid. Internal drainage is medium.

Use and management (A–7).—Strong slopes make Tatum silt loam, rolling phase, fairly difficult to work and to conserve if used for row crops. A greater quantity of water runs off the soil than off the undulating phase. As a result, slightly less moisture is conserved for crops. About 83 percent of the soil is in forest, 13 percent is tilled, and 2 percent each is pastured and idle.

Tatum loam, undulating phase (2 to 8 percent slopes) (Ta).—In color, depth, drainage, and relief, this phase is similar to Tatum silt loam, undulating phase, but it differs in most other respects. It has developed on undissected upland ridgetops from material weathered from quartz sericite schist that had a large content of quartz. Closely associated are other Tatum soils and Lignum and Worsham soils.

Tatum loam, undulating phase, occupies well-drained areas higher on the landscape than any of the associated soils. It is not an extensive soil. It occurs in rather narrow bands that extend in a northeast-southwest direction across the central part of the county.

Profile characteristics:

0 to 12 inches, dark yellowish-brown to brownish-yellow very friable loam; weak fine granular structure; pale yellow and soft when dry.
12 to 16 inches, yellowish-red very friable to friable light clay loam; weak coarse granular or very weak fine blocky structure; hard when dry.
16 to 48 inches, red friable clay loam; weak fine blocky structure; not plastic or sticky when wet; very hard when dry.
48 to 54 inches, red, mingled with shades of brown and yellow; friable clay loam mixed with red, brown, and yellowish-brown partly decomposed quartz and quartz sericite schist particles.

The texture of the surface soil ranges from loam to sandy loam, and that of the subsoil from sandy clay loam to clay. Slight variations in moisture content cause noticeable changes in consistence and structure. Near Weber City some of this soil is sticky when wet and resembles some of the soils on stream terraces. Locally, loose quartzite and quartz stones are numerous on the surface and in the upper layers. Where these are abundant enough to interfere with tillage, they are shown on the soil map by symbols. The parent material is variable. In the areas near Weber City, it consists almost wholly of weathered quartzite, but in the larger areas around Yancey (Yancey's Store), it contains a fairly large quantity of weathered schist.

In most areas the soil is extremely acid throughout. In the vicinity of Weber City, it is very strongly acid in many places. The organic-matter content is moderate to low, and fertility is low. Permeability to roots, moisture, and air is moderate. Surface runoff and internal drainage are medium. The water-holding capacity is moderate.

Mapped with this soil is about 49 acres of Tatum loam, rolling phase. This rolling phase has stronger slopes, slightly shallower depth to bedrock, and a slightly greater number of loose stones and pebbles on the surface and in the profile.

Use and management (A–4).—Tatum loam, undulating phase, is easier to work than Tatum silt loam, undulating phase, but harder to conserve under cultivation. Mainly because of its coarser texture and high content of quartz and quartzite materials, it has slightly lower fertility. It is not so suitable for hay, especially alfalfa, as Tatum silt loam, undulating phase, nor is it so well suited to corn and small grains. It is better suited to vegetables and tobacco. A few farmers grow sun-cured tobacco, and yields are comparatively good.

About 48 percent of the soil is in forest, 35 percent is cultivated, 9 percent is idle, and 8 percent is pastured. Management needs are similar to those of Tatum silt loam, undulating phase, but because the soil is more porous, fertilizer and lime should be applied more frequently. The soil leaches more rapidly and needs more barnyard manure or green manure than the silt loam soils.

Tatum silty clay loam, eroded undulating phase (2 to 8 percent slopes) (Te).—Severe sheet erosion has removed nearly all, or all, of the original surface soil and, in some places, part of the subsoil. On about 11 acres, erosion is only slight to moderate, but on about 143

acres, a few to many shallow gullies have formed. This soil occurs in small widely scattered areas in association with other Tatum soils and with Nason soils.

To plow depth, the soil is yellowish-brown to yellowish-red friable heavy silt loam or light silty clay loam. In other profile characteristics, it resembles Tatum silt loam, undulating phase.

The soil is very strongly to extremely acid throughout. Organic-matter content and fertility are low. Permeability to roots, moisture, and air is moderate. Surface runoff is medium to rapid, and internal drainage is medium. The water-holding capacity is moderately low to low.

Use and management (A–6).—Because of severe erosion, Tatum silty clay loam, eroded undulating phase, is difficult to work and to maintain in good tilth. It is more difficult to conserve than Tatum silt loam, undulating phase, and is more subject to erosion if planted to row crops. Its productivity is low.

This soil is not suited to so many crops as Tatum silt loam, undulating phase, and it is not so productive as it was before it became severely eroded. It is best suited to hay, but corn and small grains can be grown under good management. The soil is very poorly suited to most vegetables and to tobacco. The average yields of most crops are considerably lower than on the undulating phase of Tatum silt loam, although management is generally the same.

About 42 percent of the soil is in forest, 39 percent is tilled, 11 percent is idle, and 8 percent is pastured.

Tatum silty clay loam, eroded rolling phase (8 to 15 percent slopes) (Td).—In this phase nearly all, or all, of the original surface soil and, in some places, part of the subsoil have been lost through sheet erosion. A few to many shallow gullies occur on about 677 acres, and a few to many deep gullies occur in about 88 acres. This soil is associated with other Tatum soils and with Nason, Worsham, and Manteo soils.

The plow layer is yellowish-brown to yellowish-red friable heavy silt loam to light silty clay loam. In most other profile characteristics the soil resembles Tatum silt loam, undulating phase.

The eroded rolling phase of Tatum silty clay loam is very strongly to extremely acid throughout. It is low in organic matter and fertility. Permeability to roots, moisture, and air is moderate. Surface runoff is rapid, and internal drainage is medium. The water-holding capacity is moderately low to low.

Use and management (A–9).—Strong slopes and erosion make the soil difficult to work and to conserve. Its susceptibility to erosion is great, and if used for row crops such as corn and tobacco, it will continue to deteriorate. The soil is not very productive of many crops and is generally best used for pasture.

About 61 percent of this soil is in forest, 28 percent is cultivated, 6 percent is idle, and 5 percent is pastured. Little is done in the way of management at present, except to allow the timber to grow large enough to cut. In most places where the forest has been clean cut, scrub pines have grown up.

Vance fine sandy loam, undulating phase (2 to 8 percent slopes) (Va).—This soil resembles the Appling fine sandy loam soils, but it has a heavier textured and firmer subsoil that is plastic when wet.

It has only moderately good drainage. The soil has formed from residual material, weathered from mixed granitic and basic rocks. The predominating slope is about 4 percent.

This soil occupies undissected uplands, where it is closely associated with Helena, Worsham, Colfax, and Appling soils. The areas are small and are widely scattered in the northeastern part of the county. Several occur about a mile west of Kents Store. In some places this soil occurs on higher better drained patches within areas of Helena soil. About 39 acres is severely sheet eroded, and a few shallow gullies occur in about 33 acres.

Profile in a cultivated area:

0 to 7 inches, light yellowish-brown very friable fine sandy loam; weak fine granular structure; light gray to almost white when dry.
7 to 10 inches, yellowish-brown firm heavy clay loam; moderate medium blocky structure; slightly plastic when wet and hard when dry.
10 to 21 inches, yellowish-red very firm clay; moderate medium blocky structure; plastic when wet; slightly mottled in lower part and not so firm or plastic.
21 to 34 inches, mottled yellowish-red, red, and yellow friable to firm clay loam soil material; mostly disintegrated granitic material in lower part; structureless.

The principal variations are in texture, parent material, and drainage. Texture of the surface soil in some places ranges from loam to sandy loam. In some places weathered basic rock is very noticeable in the parent material, but in others it is absent. Mica is not common, but it occurs in some areas, especially in the parent material. Most areas are moderately well drained, though drainage ranges from moderately good to somewhat poor.

In most places Vance fine sandy loam, undulating phase, is very strongly acid throughout, but in some areas it is extremely acid. The soil has a low to moderate content of organic matter, and its fertility is low. Permeability is moderate in the surface soil and moderately slow to slow in the subsoil. Surface runoff is medium to slow, and internal drainage is slow. The water-holding capacity is moderate.

Included with this soil as mapped is about 37 acres of Vance fine sandy loam, rolling phase. This included soil differs mainly in having stronger slopes and somewhat thinner profile horizons. A few shallow gullies occur in about 16 acres of the rolling phase. About 8 acres is severely sheet eroded.

Use and management (A–5).—Vance fine sandy loam, undulating phase, has only fair workability. Conservability is fair, and productivity is medium to low. The range of suitability is medium. Alfalfa cannot be grown successfully, and the soil is not well suited to small grains, vegetables, and tobacco. As the soil generally occurs within larger areas of Helena soils, it is planted to the same crops as the surrounding soils, but on some farms its best use is for pasture. On cropped areas average yields of most crops are slightly higher than on the Helena soil.

About 70 percent of this soil is in forest, 24 percent is cultivated, and 6 percent is idle. Only a small acreage is pastured.

Wehadkee silt loam (0 to 2 percent slopes) (Wa).—This poorly drained level to nearly level soil occurs on the lowest parts of first bottoms. As a result it is flooded frequently. The soil has mingled

or mottled colors throughout the profile. It has developed from fine-textured alluvial material derived from soils of the uplands.

Wehadkee silt loam is closely associated with the Congaree and Chewacla soils of the bottom lands and with the Wickham and Altavista soils of the stream terraces. It is not an extensive soil. It occurs in widely scattered areas along most of the major streams in the county. Some of the larger ones are near the James and Rivanna Rivers.

Profile characteristics:

0 to 10 inches, predominantly brown friable silt loam faintly mingled with yellowish brown, grayish brown, and light brownish gray; moderate fine granular structure; topmost 2 inches slightly darker in color.

10 to 36 inches, mottled light-gray, yellowish-brown, gray, and white clay; friable when moist, slightly plastic when wet; weak medium blocky structure; lighter in color and very hard when dry.

36 to 48 inches, highly to very highly mottled gray and brownish-yellow slightly plastic clay loam soil material; very hard when dry; strong blocky structure.

48 inches +, sandy and gravelly alluvial material.

Variations in texture, depth, consistence, and color occur in this soil. The surface soil ranges from grayish-brown fine sandy loam that is only faintly mottled to silty clay loam that is fairly highly mottled. In more or less ponded areas, dark-gray organic matter has accumulated in the topmost 2 to 3 inches of the surface soil. The thickness of the subsoil ranges from 12 inches in some places to as much as 48 inches in others. Where the soil was derived from alluvium washed from Lloyd and similar heavy soils, the subsoil is heavy plastic clay and black mineral films occur in the parent material. In some places the subsoil is friable to firm clay loam or silty clay loam and the parent material contains considerable sand and coarse quartz particles.

Although Wehadkee silt loam is generally medium acid, it ranges from slightly acid to strongly acid. The organic-matter content is low, but fertility is high. Permeability to roots and air is restricted by the high water table in the soil. Surface runoff is slow to very slow, and internal drainage is very slow. In addition to being flooded frequently by adjacent streams, the soil in places receives runoff water from adjoining upland slopes.

Use and management (B–5).—Because of its poor drainage, this soil is difficult to work and is not well suited to tilled crops. It is subject to frequent floods and in places receives considerable drainage water from adjacent upland slopes. The range of moisture under which it can be cultivated is extremely narrow, and good tillage conditions are almost impossible to maintain. During much of the year, heavy farm machinery cannot be moved over the land because the soil is so poorly drained. Conservability is very good. Productivity is low, and few of the crops commonly grown in the county can be grown successfully. Some permanent pasture grasses do fairly well on areas that are not extremely wet.

About 49 percent of this soil is in cutover forest, 25 percent is cultivated, 21 percent is idle, and 5 percent is pastured. The best use for the soil, under present conditions, is for permanent pasture.

Wickham loam, undulating phase (2 to 8 percent slopes) (Wb).—This brown loam soil, commonly called brown chocolate land, has a deep surface soil and good drainage. It has developed from moder-

ately young alluvium consisting of sand, silt, and clay derived from soils of the uplands. Generally it occurs on low stream terraces intermediate in elevation between high stream terraces and first bottoms. Most slopes are about 4 percent. The soil is not extensive. It occurs in widely separated areas along the James and Fluvanna Rivers and along Byrd and Mechum Creeks. Closely associated are the Altavista, Augusta, and Roanoke soils and, in places, the Congaree soils. In about 29 acres sheet erosion is severe, and in about 9 acres a few shallow gullies occur.

Profile in a cultivated area:

0 to 9 inches, brown very friable loam to silt loam; weak fine granular structure; in grassed or wooded areas topmost 1 or 2 inches dark brown.
9 to 28 inches, yellowish-red friable heavy clay loam; medium fine blocky structure; reddish yellow and hard when dry.
28 to 34 inches, predominantly yellowish-red friable clay loam, mingled with reddish yellow; weak fine blocky structure; some small rounded pebbles occur in lower part.
34 to 48 inches, highly mingled yellowish-red and light-gray friable light clay loam soil material containing sandy strata, mica flakes, and rounded pebbles.

Principal variations are in color, texture, and consistence of the soil. The surface soil ranges from brown to dark-brown and from very friable fine sandy loam to silt loam. The subsoil ranges from yellowish-brown friable clay loam to reddish-brown or red friable clay or silty clay.

Wickham loam, undulating phase, ranges from slightly acid to strongly acid but is generally medium acid. The soil has a fair to high content of organic matter and is fairly well supplied with essential plant nutrients. Both surface runoff and internal drainage are medium. Permeability to roots, moisture, and air, is moderate, and water-holding capacity is moderate.

Mapped with Wickham loam, undulating phase, is about 48 acres of Wickham loam, rolling phase, and about 16 acres of State very fine sandy loam. These soils are included because the areas were too small to map separately and because they resemble Wickham loam, undulating phase. The rolling phase of Wickham loam has stronger slopes and thinner soil layers than the undulating phase. The State soil is younger, and its profile horizons are not so well developed. It occupies lower lying stream terraces than Wickham loam, undulating phase, and is more subject to overflow. About 11 acres of the included rolling phase of Wickham loam is severely sheet eroded, and a few shallow gullies occur in about 14 acres.

Use and management (A–1).—Wickham loam, undulating phase, is easy to work and to conserve. It is highly productive. Except for bright and sun-cured tobacco and some vegetables, the soil is one of the most desirable in the county for most of the crops usually grown. Alfalfa grows well, and the stands seem to last as long or longer than those on the better drained soils of the uplands.

About 63 percent of this soil is cultivated, 16 percent is in forest, 11 percent is idle, and 10 percent is pastured. Wheat is the most common small grain. Hay is usually a mixture of red clover, lespedeza, redtop, and grasses. Pastures on this soil are fairly good.

Wilkes sandy loam, rolling phase (8 to 15 percent slopes) (Wd).—This shallow soil has formed on mixed parent material from acidic

and basic rocks. Generally Wilkes sandy loam, rolling phase, occupies slopes, but a small acreage occurs on narrow ridgetops. Surface runoff is rapid, and internal drainage is medium to slow. Nearly all areas are moderately sheet eroded. A few to many shallow gullies occur in about 98 acres, and many deep ones in about 8 acres.

Sizable areas of two shallow soils—Louisburg sandy loam, rolling phase, and Bremo silt loam, rolling phase—have been included with this soil. These included soils are so intricately combined that it is not feasible to separate them on a map of the scale used. The included soils are similar to this one in use and management.

Louisburg sandy loam, rolling phase, derived from weathered granitic material, is the more extensive of the included soils. Bremo silt loam, rolling phase, is a minor inclusion. It has formed from weathered residual material of basic schist. Both of these soils vary in texture and depth to bedrock. Texture of the Louisburg soil ranges from fine sandy loam to gravelly sandy loam, and that of the Bremo from loam to heavy silt loam. Depth over bedrock varies from a few inches to as much as 48 inches. The Louisburg soil is very strongly acid.

Another inclusion with the Wilkes sandy loam, rolling phase, is about 93 acres of Wilkes sandy loam, undulating phase. This included soil has gentler slopes and a little greater depth to bedrock.

Wilkes sandy loam, rolling phase, ranges from medium acid to strongly acid. Fertility is medium to low. Permeability is moderate to rapid in the surface soil and moderate to slow in the subsoil. The water-holding capacity is low to very low.

Use and management (B–4).—Wilkes sandy loam, rolling phase, is droughty and is difficult to work and conserve. Its range of suitability is narrow. The complex is poorly suited to row crops. It is only fairly well suited to pasture, although pasture is its best use.

About 81 percent of the complex is in forest, 10 percent is cultivated, 7 percent is idle, and 2 percent is pastured. If good management practices are used, a good pasture stand can be obtained. It may be necessary to reseed present pastures with adapted varieties of grass to obtain satisfactory grazing. Because of the shallow depth of the soil, overgrazing is detrimental to pastures, particularly during dry periods. New areas that are cleared should not be cropped. They should be put in pasture immediately after they are cleared.

Wilkes sandy loam, hilly and steep phases (15 to 40 percent slopes) (Wc).—The hilly and steep phases of Wilkes sandy loam differ from the rolling phase mainly in having steeper slopes. Generally they are also shallower to bedrock. They occur mostly on slopes below narrow ridgetops in stream-dissected uplands. These phases occur in the same general localities as the rolling phase. They are closely associated with the rolling phase, with the Appling and Louisburg soils, and with Bremo soils. The hilly and steep phases are more extensive than the rolling phase, and individual areas are larger.

Surface runoff is very rapid, and internal drainage is medium to slow in soils of this complex. Most areas are moderately sheet eroded, but in only about 8 acres is sheet erosion severe. A few to many shallow gullies occur in about 566 acres, and a few to many deep ones in about 39 acres.

Use and management (C–1).—These phases are too hilly and steep for cultivation. Conservability is very poor, and productivity is low to very low. The soils are poorly suited to pasture. By good management pastures could be established in some places, but establishing them would be costly. The soils are well suited to forest.

About 83 percent of Wilkes sandy loam, hilly and steep phases, is in forest, 7 percent is cultivated, 7 percent is idle, and about 3 percent is pastured. Some very good timber is now growing on forested areas. The trees are principally oaks—white, red, black, and chestnut—but there is also hickory, poplar, dogwood, and scrub pine. Stands of pine have grown up on areas that once were cleared and cropped. Poplar and white oak grow on the lower slopes. Red, black, and chestnut oaks are on the higher slopes of ridges and on ridgetops.

Worsham sandy loam (0 to 8 percent slopes) (We).—This inextensive light-colored poorly drained soil, often called crawfish land, occurs mainly on colluvial lands. It has formed from local alluvial and colluvial materials. It occupies level upland areas, depressions at the heads of drainageways, and positions at the bases of slopes. Generally its relief is level to nearly level. Around drainage heads, however, the relief is undulating, and slopes are 2 to 8 percent. The soil is closely associated with Colfax, Appling, Louisburg, and Cecil soils. Most of the areas are widely scattered among soils underlain by granitic rock. The usual vegetation consists of bulrushes, sedge-nutgrass, and other small plants that tolerate water.

Profile in a cultivated area:

0 to 8 inches, faintly mottled light-gray, yellowish-brown, and gray very friable sandy loam.
8 to 15 inches, mottled light-gray, yellowish-brown, and yellow friable fine sandy loam to sandy loam; weak fine granular structure.
15 to 32 inches, highly mottled gray, yellowish-brown, and yellow friable clay loam to clay; moderate medium blocky structure.
32 to 45 inches, very highly mottled light-gray, yellowish-brown, and white friable clay loam; from 50 to 75 percent consists of partly disintegrated granitic material, mainly quartz.

From place to place this soil varies greatly in color, texture, consistence, and drainage. The surface soil ranges from gray loam to faintly mottled grayish-brown and yellowish-brown gravelly sandy loam. The subsoil ranges from friable sandy loam to firm or plastic clay. Where the soil grades to Colfax sandy loam, which is better drained, mottling does not occur in the upper two horizons of the profile. In some places the soil is very poorly drained and has water on the surface, even in seasons of normal rainfall.

In most places Worsham sandy loam is strongly acid throughout. Organic-matter content and fertility are low. Permeability is moderate to slow in the surface soil and very slow in the subsoil. Because of unfavorable permeability, aeration is poor and plant roots remain near the surface. Surface runoff is slow to very slow, and internal drainage is very slow. The soil has a high water table.

Use and management (B–5).—Poor drainage makes the soil very difficult to work and poorly suited to tilled crops. Except on areas that have been ditched or tile drained, few crops are grown. Yields are low, and failures occur each year on the small patches used for

crops. Pasture is the best use for the soil. Pasture areas, however, seldom receive proper management, and generally many undesirable grasses and weeds grow in them. About 81 percent of Worsham sandy loam is in forest, 7 percent is under cultivation, 6 percent is in pasture, and 6 percent is idle.

Worsham silt loam (0 to 8 percent slopes) (Wf).—This soil differs from Worsham sandy loam mainly in being finer textured throughout and in being formed from a different parent material. Associated with the Tatum, Nason, Manteo, and Lignum soils, it has formed principally from local alluvial and colluvial materials washed from those soils. The soil is more extensive than Worsham sandy loam. It occurs at the head of drainageways and at the foot of slopes. Areas are small and widely scattered over the entire western part of the county. Relief is level to nearly level. Surface runoff is slow to very slow, and internal drainage is very slow.

Use and management (B–5).—This soil has very poor workability and very low productivity, but is easy to conserve. Like Worsham sandy loam, it is too poorly drained for most crops and is best suited to pasture. About 84 percent is in forest, 8 percent is cultivated, 5 percent is pastured, and 3 percent is idle.

Management is about the same for this soil as for Worsham sandy loam, and requirements for good management are very similar. Because of its heavier texture, Worsham silt loam is somewhat more difficult to ditch or to tile-drain. Generally, it is less fertile and needs slightly more commercial fertilizer and lime than Worsham sandy loam.

Zion silt loam, undulating phase (2 to 8 percent slopes) (Za).—This moderately well drained soil has formed from material derived from coarse- to medium-grained basic rock that contains many dark-colored mineral concretions. It occurs on smooth uplands. The soil occupies elongated, comparatively small areas, mainly in the central part of the county northeast of Central Plains. It is closely associated with the gravelly subsoil phase of Orange silt loam, and with Elbert and Fluvanna soils. In most places the slopes are about 3 percent.

Profile characteristics:

0 to 3 inches, dark grayish-brown very friable silt loam; contains some brown and black mineral concretions.
3 to 10 inches, yellowish-brown to brown friable silt loam to gravelly silt loam; strong coarse granular structure; much of the soil contains small rounded dark-colored mineral concretions.
10 to 14 inches, predominantly small, black, brown, and yellowish brown rounded mineral concretions mixed with a very small amount of yellowish-brown and reddish-brown silty clay loam soil material.
14 to 20 inches, predominantly yellowish-red friable clay mingled with shades of red and yellow; moderate medium blocky structure; plastic when wet; contains many partly decomposed basic rock fragments.
20 to 34 inches, partly decomposed dark-colored basic rock mixed with very friable sandy clay loam soil material.

Many marked variations occur in the profile. The surface soil ranges from dark grayish brown to yellowish brown and from heavy silt loam to gravelly or stony loam. Although the subsoil is generally yellowish red, its color ranges from brownish yellow to mingled yellowish red and yellowish brown. In some places a firm clay subsoil, which

is plastic when wet, occurs immediately below the gravel pan horizon, and except for the color of the surface soil, the profile resembles that of Orange silt loam, gravelly subsoil phase. In many places there is only a very thin friable subsoil. In places many loose stones occur on the surface and in the surface soil. These stony areas are shown on the soil map by symbols.

Zion silt loam, undulating phase, ranges from slightly acid to strongly acid but it is generally medium acid. The upper horizons are generally more acid than the lower ones. The content of organic matter is fair, and fertility is medium. Permeability to roots, moisture, and air is moderate in the surface soil and moderate to slow in the subsoil. Both surface runoff and internal drainage are medium to slow. Water-holding capacity is moderately low.

About 22 acres of Zion silt loam, rolling phase, is mapped with this soil because it is not extensive enough to map separately. This included soil has stronger slopes and somewhat shallower depth to bedrock than the undulating phase. A few to many shallow gullies occur in about 9 acres of the included soil.

Use and management (A–10).—Zion silt loam, undulating phase, is fairly easy to work, but in places stones and gravel make good tilth difficult to maintain. The soil is easy to conserve, but productivity is medium to low. As the soil is only moderately well drained, it is not so well suited to crops as the better drained soils of the uplands. It is only fair for crops.

Especially where internal drainage is slow, its subsoil makes this soil unsuitable for alfalfa and many vegetable crops. The soil is well suited to small grains and hay. Corn does well if management is good.

About 44 percent of the soil is cultivated, 34 percent is in forest, 19 percent is pastured, and 3 percent is idle. Yields of crops are considerably higher than those obtained on Orange silt loam, undulating phase, though management is usually about the same.

USE, MANAGEMENT, AND PRODUCTIVITY OF FLUVANNA COUNTY SOILS

SOIL USE

Proper use of the soil is a basic problem of agriculture in Fluvanna County. Although other factors enter in, the physical characteristics of a soil largely determine its suitability for use. Approximately 110,390 acres, or 61.7 percent of the county, is generally suited to tilled crops; 40,932 acres, or 22.9 percent, is better suited to pasture than to tilled crops; and 27,608 acres, or 15.4 percent, is best suited to forest. The soils, however, are not always used for the purpose for which they are best suited.

Serious damage to potential grassland and forest areas can result from cropping soils that are unsuitable for tillage. The Louisburg soils are an example of soils that have been used improperly. These soils are hilly and shallow and are susceptible to erosion (pl. 2, *B*). While under forest they accumulated enough humus so that tilth was fairly favorable and productivity moderately good. Consequently they were cleared and used for crops in spite of their unfavorable relief, shallow depth, and erodibility.

The original fertility of the Louisburg soils did not last long, for the soils eroded and deteriorated rapidly under cultivation. A large acreage was tilled long enough to impair productivity to a great extent, and many areas have been abandoned and are now idle or in low-quality pasture.

Other soils in Fluvanna County besides the Louisburg soils have been used or are now being used for crops although unsuited to cropping. On the other hand, some land is being pastured that might well be cropped.

MANAGEMENT OF SOILS

In this section, the general management requirements of the soils of Fluvanna County are discussed. The soils vary widely in workability, conservability, and productivity; consequently, their management needs vary. In general, the choice and rotation of crops are the most important management problems, but all management practices are important and are interrelated.

For convenience the soils have been separated into 17 groups, each group consisting of soils that need about the same type of management. Groups A–1 through A–11 are composed of soils suitable for tilled crops. Soils that are poorly suited to tilled crops, but that are at least fairly well suited to pasture, are in groups B–1 through B–5. Soils best suited to forest, and unsuitable for either crops or permanent pasture, are in group C.

GROUP A-1: UNDULATING WELL-DRAINED SOILS OF UPLANDS AND TERRACES

The deep, permeable soils of management group A–1 are among the most fertile in the county. The soils are generally medium to strongly acid, but in some places they are slightly acid or very strongly acid. The following are the soils of management group A–1:

Hiwassee silt loam, undulating phase.
Lloyd silt loam, undulating phase.
Wickham loam, undulating phase.

These soils are well drained but retain large quantities of moisture for plants. The Wickham soil is the best from the standpoint of supplying moisture during dry periods. It also has better tilth and is more favorable for field operations than the Hiwassee and Lloyd soils. Workability and conservability are good for all of these soils.

Use suitability.—Soils of this management group can be cropped intensively. Grasses, legumes (including alfalfa), small grains, corn, and dark tobacco are all well suited. Apples and vegetables such as potatoes are less well suited, but can be grown. The soils are also good for pasture.

Management requirements.—A 3-year rotation consisting of a row crop, a small grain, and a legume is suitable for these soils. Longer rotations may be used. The soils are deficient in phosphorus, potassium, and nitrogen, though not so seriously deficient as most of the upland and terrace soils. Lime is needed, especially for legume crops. An application of 1 to 2½ tons an acre every 3 or 4 years is adequate.

Soils of management group A–1 should not be worked too wet or too dry. They need to be plowed early, and tillage should be shallow. Tillage and other fieldwork should be on the contour on the more sloping areas. Other methods of controlling runoff are generally not

needed if productivity is maintained and row crops are grown only once every 3 or 4 years.

Pastures on these soils need to be fertilized and limed and protected from overgrazing.

GROUP A-2: WELL TO EXCESSIVELY DRAINED VERY FRIABLE TO LOOSE BROWN SOILS OF BOTTOM LANDS

Management group A–2 is made up of the following soils of the nearly level first bottoms:

Buncombe loamy fine sand.
Congaree fine sandy loam.
Congaree silt loam.

The Congaree soils are well drained, and the Buncombe soil is excessively drained. Surface runoff is slow to very slow, and flooding is a serious hazard.

The soils are medium acid to very strongly acid. The Buncombe soil is deficient in organic matter and essential plant nutrients. The Congaree soils are fairly well supplied with organic matter, but are deficient in phosphorus and, in some places, in potassium.

Workability is good in Congaree silt loam, very good in Buncombe loamy fine sand, and excellent in Congaree fine sandy loam. Conservability is excellent in both of the Congaree soils, but only fair for the Buncombe soil.

Use suitability.—All of the soils of group A–2 can be used intensively for row crops. They are well suited to corn and to some legumes, such as red clover and alsike clover, but not to alfalfa. Small grains tend to lodge. Melons and vegetables can be grown if the soils are well fertilized and otherwise well managed. Rotations of 2 or 3 years' duration are suitable. The Buncombe soil is poorly suited to pasture of any kind. The Congaree soils, particularly Congaree silt loam, are good to excellent for pasture.

Management requirements.—If legumes are to be grown for hay or pasture, 1 to 2 tons of lime an acre is needed every 3 to 5 years. The Congaree soils need less manure or other organic matter than most of the soils in the county. Applications of nitrogen may increase yields of some crops, but the soils are not seriously deficient in nitrogen.

Areas that are frequently flooded are more suitable for permanent pasture than for crops. Good pastures can be established and maintained on the Congaree soils if phosphorus is applied and if grazing is regulated. Ladino clover is a good pasture plant for these soils. A ton of lime an acre every 3 or 4 years is needed in most places.

GROUP A-3: MODERATELY WELL DRAINED FERTILE TO FAIRLY FERTILE SOILS OF COLLUVIAL LANDS

The soils of management group A–3 are gently undulating to strongly undulating and are deep over bedrock. Drainage is slow in the lower part of the profiles. The soils occur in depressions and at the bases of slopes; consequently, considerable runoff water and seepage water from adjacent slopes accumulate on them. The following soils are in this group:

Seneca fine sandy loam.
Seneca silt loam.
Starr loam.

The Seneca soils are very strongly to extremely acid, and the Starr soil is medium acid. Starr loam is the darkest colored and the most fertile soil of the group. The soils are easy to work, but the slow internal drainage in their lower layers limits the period during which they can be tilled. Runoff and erosion are easily controlled, and high fertility and productivity are comparatively easy to maintain.

Use suitability.—These soils have a wide range of suitability, though not so wide as the soils of group A–1. In wet seasons they are too wet to be suitable for tobacco or small grains. They are not well suited to alfalfa but are well suited to other legumes and to grasses, corn, and vegetables. All are well suited to pasture, and, if fertility is maintained, they produce some of the best grazing in the county (pl. 2, *C*).

Management requirements.—A 2-year rotation consisting of corn and clover or mixed hay is suitable for these soils. As a rule, however, the soils occur as small scattered tracts within areas of other soils and are therefore cropped with the surrounding soils in a 3- to 4-year rotation consisting of corn, a small grain, and hay. The soils respond well to fertilization.

An application of 1 to 2 tons an acre of ground limestone, or equivalent, every 3 or 4 years is generally sufficient. As a rule Seneca silt loam needs more lime and fertilizer than the other soils of the management group.

Nitrogen, phosphorus, and potassium may be needed to establish good pasture. Phosphorus is the principal fertilizer requirement for pastures on the Starr soil. To keep down weeds and improve the stand, pastures should be grazed closely but not overgrazed.

GROUP A-4: UNDULATING WELL-DRAINED SOILS OF UPLANDS AND TERRACES

The soils of management group A–4 are deep, friable, permeable to roots, moisture, and air, and moderate in water-holding capacity. They are strongly to extremely acid. Fertility is low, the least fertile soil of the group being the undulating phase of Tatum loam. All of the soils, however, retain plant nutrients well, and high productivity for most crops can be built up. Soils of this group are the following:

Cecil fine sandy loam, undulating phase.
Cecil sandy loam, undulating phase.
Hiwassee fine sandy loam, undulating light-colored phase.
Madison loam, undulating phase.
Tatum loam, undulating phase.
Tatum silt loam, undulating phase.

These soils have coarser textured surface layers than the soils of management group A–1. They are lower in fertility, and their productivity is somewhat more difficult to maintain. Workability is good to very good, conservability is fair to good, and productivity is generally moderate.

Use suitability.—The soils of group A–4 have medium to very wide ranges of suitability. They are suited to such hay crops as mixed clover, lespedeza, redtop, orchardgrass, and timothy. If soil fertility is maintained at a high level, alfalfa and Ladino clover can be grown successfully. None of the soils is so well suited to alfalfa, however, as the soils of management group A–1. Heavy fertilization is generally needed to obtain a good stand that will last.

Because of the fairly deep, very friable plow layer, most of the soils are comparatively well suited to vegetables, especially to root crops. Rather heavy fertilization is needed, however, to obtain high yields. The soils are not so suitable for pasture as the soils of management group A–1, and herbage of high quality is difficult to maintain.

Management requirements.—Where high fertility is maintained, a 3-year rotation consisting of a row crop, a small grain, and a legume hay crop is suitable for these soils. In some places a 4- to 6-year rotation, in which the legume hay crop remains for a longer period, may be better.

More lime is needed on the soils of this management group than on those of management group A–1. An application of 2 or 3 tons of ground limestone every 3 to 5 years is sufficient for areas where legumes are to be grown. Cecil sandy loam, undulating phase, does not need so much lime as the finer textured soils of the group.

These soils, particularly those that have a sandy texture, can be cultivated satisfactorily over a comparatively wide range of moisture conditions. Contour cultivation is advisable on the more sloping areas. Great care is needed to control runoff if row crops are grown frequently and the land is without a vegetative cover during much of the year.

It is difficult to maintain good-quality pasture on these soils. Many undesirable plants generally grow on the pasture—mainly broomsedge, bermudagrass, poverty oatgrass, and various briers and shrubs.

To maintain high quality pastures, grazing should be moderately close and weeds and other undesirable vegetation should be clipped. A thin stand of locust and walnut trees on permanent pasture may be beneficial.

GROUP A-5: UNDULATING WELL DRAINED TO MODERATELY WELL DRAINED LESS FERTILE SOILS OF UPLANDS AND TERRACES[6]

The soils of management group A–5 occur on uplands and terraces. They are all moderately deep to bedrock. They are not so fertile as soils of management group A–4. Their surface soils are somewhat coarser textured, deeper, and lighter colored, and their subsoils are thinner and lighter colored. The following soils are in management group A–5:

Altavista silt loam, undulating phase.
Appling fine sandy loam, undulating phase.
Appling gritty fine sandy loam, undulating phase.
Appling sandy loam, undulating phase.
Durham fine sandy loam, undulating phase.
Fluvanna fine sandy loam, undulating phase.
Fluvanna silt loam, undulating phase.
Masada fine sandy loam, undulating phase.
Nason loam, undulating phase.
Nason silt loam, undulating phase.
Vance fine sandy loam, undulating phase.

[6] In the color group legend on the soil map, this group of soils is described as "Undulating moderately well to somewhat excessively drained less fertile soils of uplands and terraces." The description was revised after the map was prepared.

The Fluvanna soils are medium to strongly acid. The other soils of the group range from strongly acid to extremely acid. The soils are low to very low in fertility. They retain plant nutrients well but generally not so well as soils in management group A–4. Surface runoff is medium to slow, and internal drainage is slow to rapid. In general, moisture conditions are moderately favorable, but the soils tend to leach rapidly and to become somewhat droughty. Workability is generally good to very good, but it is only fair in the Vance soil. Conservability is fair to good, and productivity is medium to low.

Use suitability.—Mainly because of their low fertility, soils of management group A–5 are not so well suited to crops and pasture as soils of the preceding groups, and they require more intensive management to build up and maintain high productivity. The Vance and Altavista soils are poorly suited to alfalfa because of their unfavorable internal drainage, but alfalfa can be grown successfully on other soils of the management group.

Management requirements.—The soils of management group A–5 are well suited to 3- or 4-year rotations consisting of a row crop, a small grain, and 1 or 2 years of hay. If the hay crop remains for 2 years, it can be pastured to good advantage during the second year. If fertility is maintained at as high a level as possible, a mixture of red clover, lespedeza, redtop, orchardgrass, and timothy makes a good hay crop.

Tillage should be on the contour on the more sloping areas. If row crops such as tobacco are grown continuously, it may be necessary to stripcrop these areas.

Pastures need a complete fertilizer frequently, and 1 to 1½ tons an acre of lime every 3 or 4 years. A mixture of bluegrass, whiteclover, lespedeza, and orchardgrass is good for seeding. Where grazing is moderately close, good-quality pasture that is free of weeds can be maintained.

GROUP A–6: ERODED UNDULATING WELL-DRAINED LESS FERTILE SOILS OF UPLANDS AND TERRACES[7]

The soils of management group A–6 have lost much of their original surface soil through erosion. As a result, they are generally somewhat less productive than the soils of management group A–4 and are more difficult to work and to conserve. Good tilth is difficult to maintain because the clayey surface layer tends to clod if plowed too wet. Surface runoff is medium to rapid, so the soils will erode to a greater degree unless protected properly. They have a comparatively low content of organic matter. They tend to dry out fairly readily. The following soils belong to management group A–6:

Cecil clay loam, eroded undulating phase.
Hiwassee clay loam, eroded undulating phase.
Lloyd silty clay loam, eroded undulating phase.
Tatum silty clay loam, eroded undulating phase.

[7] In the color group legend on the soil map, this group of soils is described as "Eroded undulating well drained to somewhat excessively drained less fertile soils of uplands and terraces." The description was revised after the map was prepared.

Use suitability.—The range of suitability for soils of management group A–6 is medium to wide. If properly managed, most of the crops generally grown in the county will grow on these soils. The soils are not well suited to vegetables.

Management requirements.—Good management of these soils consists of applying intensively the practices recommended for the soils of management group A–4. In addition liberal quantities of manure and other organic matter should be used, tillage should be on the contour, the soils should be stripcropped where necessary, and fairly long rotations should be used that consist chiefly of cover crops or sod. Straw or mulches may be desirable on eroded areas.

Under usual conditions good pasture is difficult to maintain on these soils. To establish and maintain permanent pasture of high quality, at least 2 tons of ground limestone and 300 to 600 pounds of 20-percent superphosphate an acre will usually be needed every 3 or 4 years. Livestock should be fenced off the land until a good sod is established. It may be desirable to allow brush to grow up in gullies in the pastures.

The Tatum soil needs more fertilizer and lime than other soils of this management group.

Moderately close grazing and clipping of weeds and other undesirable vegetation will help maintain high quality pasture. For permanent pasture, a thin stand of locust and walnut trees should be beneficial.

GROUP A-7: PREDOMINANTLY ROLLING WELL-DRAINED SOILS OF UPLANDS AND TERRACES[7a]

The soils of management group A–7 differ from those of management group A–4 chiefly in having stronger slopes. In addition, although the soils are comparatively deep to bedrock, both the surface layer and subsoil are in many places thinner than in soils of management group A–4. The soils are therefore a little less favorable for plant growth. The following soils are in this management group:

Cecil sandy loam, rolling phase.
Hiwassee fine sandy loam, rolling light-colored phase.
Hiwassee silt loam, rolling phase.
Lloyd silt loam, rolling phase.
Madison loam, rolling phase.
Tatum silt loam, rolling phase.

Fertility is medium in Hiwassee silt loam, rolling phase, and high in the Lloyd soil; it is low in the other soils of the group. The soils retain plant nutrients well. Surface runoff is medium to rapid. Moisture conditions are generally favorable, but where erosion is severe, the soils are somewhat droughty and are generally less productive. Workability is fair to poor in these soils; conservability, poor to fair; and productivity, medium to low.

Use suitability.—The range of suitability for soils of management group A–7 is medium to wide. They are well suited to alfalfa if fertility is maintained at a high level. All of the soils are well suited to pasture. On many farms they can be pastured advantageously much of the time.

[7a] In the color group legend on the soil map, this group of soils is combined with soils of group 8 and is described as "Predominantly rolling well drained to excessively drained soils of uplands and terraces." The description was revised after the map was prepared.

Management requirements.—Mainly because of strong slopes and comparatively poor workability and conservability, the soils of management group A–7 need moderately long rotations in which few row crops are grown. Rotations of 4 to 6 years, consisting of a row crop, a small grain, and 2 to 4 years of hay, are suitable. If the hay crop remains in the rotation for 4 years, it can be pastured the last year. Other good rotations consist of either a small grain 1 year and hay 2 years or a small grain 2 years and hay 2 years. Red clover, lespedeza, redtop, and timothy make a good hay mixture.

About 2 tons of ground limestone is needed every 3 or 4 years, and the finer textured soils of the group need larger quantities. The lighter sandy soils should have frequent applications of small quantities of lime and fertilizer to obtain good results.

Great care is needed to control surface runoff on these soils. All tillage should be on the contour. Stripcropping is desirable on the longer, smoother slopes. Close-growing vegetation should cover the land as much of the time as feasible. Liming properly and increasing the organic-matter content of the plow layer will help to improve tilth. Livestock should never be allowed to trample the soil when it is wet nor to graze it too closely. Straw or other mulches would be of benefit on eroded areas.

GROUP A–8: PREDOMINANTLY ROLLING WELL-DRAINED SOILS OF UPLANDS AND TERRACES [8]

The soils of management group A–8 differ from those of management group A–5 mainly in having stronger slopes. They are also slightly shallower to bedrock, and in places their surface soil is thinner and the consistence of the plow layer heavier. The following soils are in this management group:

Appling fine sandy loam, rolling phase.
Appling gritty fine sandy loam, rolling phase.
Appling sandy loam, rolling phase.
Fluvanna fine sandy loam, rolling phase.
Fluvanna silt loam, rolling phase.
Nason loam, rolling phase.
Nason silt loam:
  Eroded undulating phase.
  Rolling phase.

Fertility is low to very low in most of these soils, but it is medium in Fluvanna silt loam, rolling phase. Surface runoff is medium to rapid, and the water-holding capacity is moderate to moderately low. Workability is generally fair, but for some of the soils it is fair to poor. Conservability is fair to poor, and productivity ranges from medium to very low. The shallower and more eroded soils, particularly Nason silt loam, eroded undulating phase, are so droughty that it is difficult to maintain their productivity.

Use suitability.—The range of suitability is generally medium for soils of management group A–8, but for Fluvanna silt loam, rolling phase, the range is medium to wide. Mainly because of their stronger slopes, poorer workability, and greater conservation problem, these soils have a narrower range of suitability than the soils of management group A–5. None of them are well suited to alfalfa, but it can be grown if the soil is well managed. The Nason soils and the rolling

[8] In the color group legend on the soil map, this group of soils is described as "Predominantly rolling well drained to excessively drained soils of uplands and terraces." The description was revised after the map was prepared.

phase of Appling gritty fine sandy loam are less suitable for most crops, especially for alfalfa, than the other soils of the group.

Management requirements.—Crops on these soils should be planted in 4- to 6-year rotations. Rotations should consist of a row crop, a small grain, and 2 to 4 years of hay. This rotation will help to conserve the soil and water and to maintain soil productivity. If the hay crop is continued for several years, it can be used for temporary pasture. Another good rotation consists of a small grain 1 year and 2 to 4 years of hay. A good hay mixture is red clover, lespedeza, orchardgrass, and redtop.

Because of the strong slopes, it may be necessary to till these soils on the contour and to stripcrop to conserve water and reduce soil losses. Terracing is needed mainly on soils where crops such as tobacco are grown.

If feasible the soils of management group A–8 should be used for permanent pasture. Pasture management requirements are similar to those of soils in management group A–7. Grazing should be close, but it should be regulated so that it will not be too close. Livestock should not be allowed to trample when the soils are wet.

GROUP A–9: ERODED ROLLING WELL-DRAINED LESS FERTILE SOILS OF UPLANDS AND TERRACES[9]

The soils of management group A–9 differ from those in management group A–6 mainly in having stronger slopes and, in most places, shallower depth to bedrock. Erosion has removed much of their surface soil. The following soils belong to this group:

Cecil clay loam, eroded rolling phase.
Hiwassee clay loam, eroded rolling phase.
Lloyd silty clay loam, eroded rolling phase.
Tatum silty clay loam, eroded rolling phase.

These soils are generally poor in workability, productivity, and conservability. Moisture conditions are not favorable, and crops are affected by dry weather. Surface runoff is generally rapid. Because of the clay content of the plow layer, good tilth is difficult to maintain.

Use suitability.—The range of suitability for the soils of management group A–9 is medium to narrow. The soils are best suited to hay and small grains; they are less suitable for corn and other row crops and for vegetables. Under intensive management, pasture is good.

Management requirements.—These soils require comparatively heavy applications of fertilizer and lime. Most general crops will need about 2 tons an acre of ground limestone every 3 or 4 years, but alfalfa may need 3 or 4 tons. For established stands of alfalfa, a topdressing of 1 to 2 tons every 4 or 5 years may be necessary.

Because of their rolling relief and erosion, the soils in management group A–9 need special care to control surface runoff. Comparatively long rotations, consisting largely of close-growing crops, should be used, tillage should be on the contour, and if row crops are grown frequently, the soils should be stripcropped.

The more severely eroded soils need liberal quantities of manure or a fertilizer that is high in nitrogen. It should be beneficial to feed

[9] In the color group legend on the soil map, this group of soils is described as "Eroded rolling excessively drained less fertile soils of uplands and terraces." The description was revised after the map was prepared.

cattle on these soils while it is in grass, but cattle should not be allowed to trample the soils.

Generally, many undesirable plants grow in the pastures on soils of management group A–9, and good-quality herbage is difficult to maintain. It may be necessary to reseed pastures and to keep livestock off the land until a good sod has been established. Brush that is cut can be used for mulch in gullies. Moderately close grazing, and clipping to remove weeds and other undesirable vegetation, will help maintain good pasture. A thin stand of locust and walnut trees may be beneficial to permanent pasture.

GROUP A–10: SOMEWHAT POORLY TO MODERATELY WELL DRAINED SOILS HAVING A PAN IN THEIR SUBSOIL

The soils of management group A–10 have undulating relief and generally slow internal drainage. The following soils belong to this management group:

Augusta fine sandy loam.
Colfax sandy loam.
Goldvein gritty silt loam, undulating and rolling phases.
Helena fine sandy loam, undulating phase.
Lignum loam, undulating phase.
Lignum silt loam, undulating phase.
Orange-Bremo silt loams, undulating phases.
Orange silt loam:
  Gravelly subsoil phase.
  Undulating phase.
Zion silt loam, undulating phase.

The Augusta soil occurs on terraces; the Colfax soil at the foot of slopes, around drainage heads, and on upland flats; and the Lignum soils, on foot slopes and slopes around drainage heads. The other soils occur on undissected uplands.

Except for the Orange-Bremo soil, these soils are moderately deep to bedrock. They range from slightly acid to extremely acid; the Augusta, Colfax, and Lignum soils are very strongly acid, and the Goldvein soils are extremely acid. The other soils are generally less acid. Fertility is low in many of the soils, but is high in the Orange soils and medium to high in the Orange-Bremo soils. Control of surface runoff and the conservation of soil present no serious problems. The water-holding capacity is moderate to low.

Use suitability.—The range of suitability is medium to narrow in these soils. Productivity is very low to medium and is more difficult to maintain than in soils of management groups A–4 and A–5.

Management requirements.—Except for the Orange and Zion soils, soils of management group A–10 are low in organic matter, phosphorus, nitrogen, and potassium, but they all respond well to proper fertilization. Suitable management practices for field crops consist of (1) selecting well-suited crop varieties; (2) using short or long rotations consisting mostly of close-growing crops; (3) applying moderately large amounts of complete fertilizer; (4) applying suitable quantities of ground limestone; (5) using all the manure available; (6) growing and turning under green-manure crops; and (7) fertilizing the sod crops. In wet seasons some farmers find it helpful to make small ridges on which to grow crops. Ditching or subsoiling has not proved very successful. Stripcropping is not needed, but in some areas it may be helpful to till on the contour.

Good pasture management consists of: (1) fertilizing and liming properly, (2) clipping undesirable herbage, and (3) regulating grazing.

GROUP A-11: UNDULATING WELL DRAINED TO SOMEWHAT EXCESSIVELY DRAINED SHALLOW SOILS OF UPLAND RIDGES

The soils of management group A–11 are the least suitable for crops of any of the soils of the uplands. They are shallow to bedrock, droughty, and medium to low in productivity. The following soils are in management group A–11:

Bremo silt loam, undulating phase.
Manteo silt loam, undulating phase.

The Bremo soil, formed from basic rock, is less acid and more fertile than the Manteo soil, which formed from acidic rock. The Bremo soil has medium surface runoff and internal drainage; the Manteo, medium to rapid surface runoff and internal drainage. Both are low in water-holding capacity. Workability and conservability are fair.

Use suitability.—The range of suitability for soils of this management group is medium. Largely because of their shallow depth, they are not so well suited to tilled crops as soils of the preceding groups. On some farms, especially on eroded areas, the soils could best be used for permanent pasture. They are fairly well suited to small grains and to mixed hay, mainly redtop, orchardgrass, timothy, and lespedeza. They are not well suited to corn, tobacco, and vegetables and are too shallow for alfalfa. Red clover can be grown if liberal quantities of organic matter are applied.

Management requirements.—If intertilled crops are grown, 3- to 6-year rotations can be used. A good rotation on some farms is a small grain followed by 2 years of mixed hay, principally lespedeza, herdsgrass, timothy, and clover. If corn is grown, a rotation that consists of corn, a small grain, and 2 or 3 years of hay would be suitable if the soils were fertilized each year of the rotation.

The Manteo soil is less fertile and more droughty than the Bremo soil, so it needs heavier applications of manure and commercial fertilizer. Organic matter must be supplied, however, or the soil will not respond well to fertilization.

Applying manure and turning under legumes will do more to increase the water-holding capacity of these soils and otherwise improve them than most other practices. Feeding hay and fodder on the land also helps to improve the soils. Stripcropping does not appear to be needed on most areas, but contour cultivation and deep plowing would be beneficial. Terracing is not advisable because of the shallow depth of the soils. Close grazing and overtrampling should not be allowed.

GROUP B-1: MODERATELY TO SOMEWHAT POORLY DRAINED BROWN SOILS OF BOTTOM LANDS

Chewacla silt loam, the only soil in management group B–1, occurs on low-lying first bottoms that are subject to overflow from adjacent streams. During part of the growing season, this soil is too wet for many crops. Both surface runoff and internal drainage are slow, and the water-holding capacity is moderate. The soil is medium to strongly acid, and fertility is medium to high. Workability is fair; conservability, very good; and productivity, medium to low.

Use suitability.—The range of suitability of Chewacla silt loam is medium. Unfavorable drainage limits its suitability mainly to row

crops, such as corn, and to soybeans and certain other legumes and grasses. It is not suited to small grains and alfalfa. Moisture conditions favorable for grass make the soil suitable for permanent pasture. In most areas it can best be used for pasture, but if fertility is maintained and drainage is not too poor, row crops can be grown frequently.

Management requirements.—A 2-year rotation of corn and clover or other hay crops is suitable for this management group. The principal fertilizer needed for corn is phosphorus; small quantities of nitrogen may help to start the crop growing in the spring. If clover is to be grown, 1 ton of ground limestone an acre will be needed.

If it is properly fertilized, excellent pasture can be maintained throughout much of the grazing season. Phosphorus is the fertilizer most needed. Ditching is not needed. Close grazing will keep down undesirable weeds and grasses.

GROUP B-2: ERODED ROLLING WELL DRAINED TO SOMEWHAT POORLY DRAINED LESS FERTILE SOILS OF UPLANDS [10]

The soils of management group B–2 are so eroded that it is not feasible to use them for crops (pl. 3, *B*). Surface runoff is medium to rapid, and internal drainage is rapid to very slow. The water-holding capacity is generally low to very low. The following soils are in management group B–2:

Appling fine sandy loam, eroded rolling phase.
Appling sandy loam, eroded rolling phase.
Fluvanna silt loam, eroded rolling phase.
Helena fine sandy loam:
  Eroded rolling phase.
  Rolling phase.
Nason loam, eroded rolling phase.
Nason silt loam, eroded rolling phase.

Fertility is low to very low, and productivity is low. Workability is poor to very poor. There are gullied areas on which it is difficult to use heavy farm machinery. Conservability is poor to very poor.

Use suitability.—Soils in management group B–2 can best be used for pasture. The Helena soils, which have a claypan in the subsoil, are the least suitable of the group for that use. The soils are poorly suited to tilled crops. If row crops are grown, further soil deterioration will be caused by erosion.

Management requirements.—The native pasture on soils of management group B–2, under average conditions, is only a little better than browse. If properly seeded, fertilized, and limed, and otherwise well managed, comparatively good pasture can be established. From 1 to 2 tons of ground limestone an acre every 3 or 4 years is generally needed, but it is advisable to have the soils tested for acidity to determine the exact amounts needed. Most of the pasture needs reseeding with a good grass mixture, which should include Korean lespedeza, redtop, orchardgrass, Kentucky bluegrass, and whiteclover. Straw and brush should be placed over areas that are gullied or severely sheet eroded.

The best way to build up the soil fertility is to add liberal quantities of manure or other organic matter and to use commercial fertilizer.

[10] In the color group legend on the soil map, this group of soils is described as "Eroded rolling somewhat excessively to somewhat poorly drained less fertile soils of uplands." The description was revised after the map was prepared.

Where fertility has been built up and maintained, moderately close grazing and clipping to remove weeds and other excessive growth will help to maintain good-quality pasture. On the more severely eroded areas, it may be necessary to keep out livestock until good pasture is established. Cattle should not be allowed to trample wet soils.

Although soils of management group B–2 are poorly suited to tilled crops, it may be necessary to crop some areas. If it is necessary to till some areas, those that have the mildest slopes and have been least damaged by erosion should be selected. The soils are suitable for long or moderately long rotations that consist mainly of close-growing crops. It may be necessary to stripcrop and plow some areas on the contour. Lime and fertilizer requirements for tilled crops are similar to those of the soils of management group A–4.

GROUP B-3: WELL-DRAINED COBBLY SOILS OF TERRACES

The only soil in management group B–3 is Hiwassee cobbly fine sandy loam, undulating light-colored phase. This soil is similar to Hiwassee fine sandy loam, undulating light-colored phase, which is in management group A–4. It differs principally in having loose cobblestones strewn over its surface and embedded in its profile. These cobblestones make tillage difficult.

Use suitability.—This soil is better suited to permanent pasture than to tilled crops. Under ordinary management, pasture will be comparatively poor, however, mainly because of the cobblestones and the low fertility of the soil.

Management requirements.—To establish good pasture, this soil should be seeded with a mixture of lespedeza, orchardgrass, redtop, Kentucky bluegrass, and whiteclover; receive adequate amounts of a complete fertilizer; and be treated with 1 to 2 tons of ground limestone. If the soil is to be cropped, it should be cleared of cobblestones and managed in the same way as the soils of group A–4.

GROUP B-4: PREDOMINANTLY ROLLING EXCESSIVELY DRAINED SHALLOW SOILS OF UPLANDS

The soils of management group B–4 are shallow to bedrock. Partly weathered schist and granitic rock fragments are mixed throughout their profiles. In the rolling phases, slopes are 8 to 15 percent, and in the hilly phases, 15 to 25 percent. The following soils are in management group B–4:

Bremo silt loam:
  Hilly phase.
  Rolling phase.
Louisa loam, rolling phase.
Louisburg sandy loam, rolling and hilly phases.
Manteo-Bremo silt loams:
  Hilly phases.
  Rolling phases.
Manteo silt loam, rolling phase.
Wilkes sandy loam, rolling phase.

These soils range from medium acid to extremely acid, and fertility is medium to very low (pl. 3, *A*). Surface runoff ranges from medium to very rapid. Internal drainage is generally medium to rapid, but it is medium to slow in the Wilkes soil. Workability is fair to very poor; conservability, poor to very poor; and productivity, medium to very low.

Use suitability.—Soils of management group B–4 are poorly suited to tilled crops. They are not so well suited to pasture as soils of

management groups B–1 and B–2. They tend to be droughty during dry spells, so that pasture growth is greatly retarded, especially on the drier western and southern slopes. Pasture is fairly good on much of the acreage, however, if properly managed. The hilly phases of the Bremo and Manteo-Bremo soils are not so well suited to pasture as the other soils of the management group.

Management requirements.—Bluegrass, whiteclover, and other pasture plants should produce fairly thick stands on soils of management group B–4 within 3 or 4 years after liberal quantities of lime and high-grade fertilizer have been applied. Either lime or high-grade fertilizer used alone will improve pasture to some extent, but the two combined give much better results.

Potassium and nitrogen, as well as lime and phosphorus, are generally needed to obtain good stands of bluegrass and whiteclover. Moderately close grazing and, where feasible, clipping of undesirable plants are other good practices for pasture management. Much of the pasture on soils of management group B–4 is so depleted that reseeding will be necessary to obtain good grazing.

The soils of management group B–4 are poorly suited to crops (pl. 3, *A*) even if heavily fertilized. Long rotations, consisting principally of fall-sown small grains and hay, should be used where feasible. Tillage and other fieldwork should be on the contour. Stripcropping might be feasible in some fields. The soils are not suitable for terracing because they are too shallow.

Because the hilly phases of the Bremo and Manteo-Bremo soils are not so well suited to pasture as the other soils, they need more care if good pasture is to be maintained. It is especially important to keep livestock from grazing these phases. Some areas may best be used for forest.

GROUP B-5: LEVEL TO UNDULATING PREDOMINANTLY POORLY DRAINED SOILS OF COLLUVIAL LANDS, TERRACES, AND BOTTOM LANDS

The following soils and miscellaneous land types are in management group B–5:

Elbert silt loam.
Mixed alluvial land:
  Poorly drained.
  Well drained.
Roanoke silt loam.
Wehadkee silt loam.
Worsham sandy loam.
Worsham silt loam.

Mixed alluvial land, well drained, generally has medium internal drainage, but the range is from slow to very rapid. All of the other soils of management group B–5 are poorly drained, and all have very slow internal drainage. Except for the Elbert and Worsham soils, the soils are subject to overflow from adjacent streams. Surface runoff is generally slow to very slow. On the Roanoke soil it is very slow to ponded.

The soils range from slightly to extremely acid. Fertility varies considerably; it is low to very low in the Roanoke and Worsham soils. Workability is fair to very poor, and conservability is good to very good. Mixed alluvial land, well drained, is very low to high in productivity. All the other soils are very low in productivity.

Use suitability.—Chiefly because of poor drainage, the soils of management group B–5 are not well suited to tilled crops. If adequately drained, however, they are well suited to some crops, although

the risk of floods is great. These soils are suitable for pasture, but the quality and carrying capacity of the pastures vary widely.

Management requirements.—Vegetation of low value for grazing grows on the most poorly drained areas of these soils. On many of the better drained areas, there is vegetation that is high in grazing value. The more desirable grazing land can generally be improved by removing shrubs and brush and by clipping weeds.

The chief requirement for better pasture is improved internal drainage. The Elbert and Worsham soils are difficult to drain by either ditching or tiling. Bedding or tiling may be more satisfactory than ditching for the other soils of the group. In some places the cost of installing artificial drainage may be excessive compared to the benefits to be derived.

Pastures need 1 to 2 tons an acre of ground limestone every 3 to 5 years. The soils vary in acidity, and they should be tested before lime is applied. Fertilizer is needed, but the Wehadkee and Elbert soils have somewhat lower requirements than the other soils of the group.

Adequately drained areas of these soils are well suited to certain crops, although the risk of floods is great. Some areas of Mixed alluvial land, well drained, can be used for crops without much risk of damage from the frequent overflows. Corn, soybeans, and such hay crops as timothy, redtop, and red clover are among the most suitable crops. If drained and well fertilized, the soils will give good yields of the suitable crops, assuming there is no flood damage. The principal fertilizer requirements are phosphorus and potassium. Worsham sandy loam may need nitrogen also.

GROUP C-1: PREDOMINANTLY EXCESSIVELY DRAINED SHALLOW SOILS OF UPLANDS AND FIRST BOTTOMS

The following predominantly shallow, excessively drained soils of uplands and first bottoms are in management group C–1:

Louisa loam, hilly and steep phases.
Louisburg sandy loam:
  Eroded rolling and hilly phases.
  Eroded steep phase.
Made land.
Manteo silt loam:
  Hilly phase.
  Steep phase.
Riverwash.
Rough gullied land.
Stony land.
Wilkes sandy loam, hilly and steep phases.

The soils of management group C–1 generally have rolling to steep relief. As a rule surface runoff is rapid to very rapid. On Riverwash and Made land, it is slow to very slow. Internal drainage is medium to very rapid in many of the soils of this management group, but it is medium to slow or very slow in Rough gullied land, Stony land, and Wilkes sandy loam, hilly and steep phases. The water-holding capacity is generally low to very low. Except for Wilkes sandy loam, hilly and steep phases, in which fertility is low to medium, fertility is low to very low. Workability, conservability, and productivity are generally very poor.

Use suitability.—Because of their unfavorable physical characteristics, these soils are generally unsuited to crops and pasture. They can best be used for forest, but they differ in degree of suitability for growing trees. Thus, Louisburg sandy loam, eroded steep phase, and

Stony land are both physically suited to forest, but the species for which the Louisburg soil is best suited are different from those best adapted to Stony land.

Management requirements.—These soils should not be tilled. Good forest management practices should be applied, including the following: (1) Maintaining a full stand of suitable species; (2) protecting from fires, from browsing and trampling by livestock, and from damage caused by using harvesting equipment; (3) cutting and weeding systematically; and (4) harvesting the mature trees so that they will be replaced by desirable species.

ESTIMATED YIELDS

Average acre yields of principal crops to be expected on the soils of Fluvanna County are listed in table 3. In columns A are yields to be expected under common management, and in columns B, yields to be expected under improved management.

So far as possible, the yields in table 3 are based on data obtained from experiment stations on yields from similar soils, and from records and trials made by farmers in the county. Sufficient data were not available for some soils, so yields were estimated by comparing these soils with soils on which data were available, by field observations, and by consulting farmers, county agricultural agents, and others who work with the soil.

Common management.—Yields to be expected under the soil management prevailing in the county are given in columns A of table 3. The most common practices are rotating crops and using comparatively small to fairly large quantities of commercial fertilizers for corn, wheat, and other small grains and vegetables. Usually 200 to 300 pounds of 3–12–6, or its equivalent, an acre is applied each year to corn and small grains. On most of the soils of uplands, colluvial lands, and terraces, 4-year rotations are the most commonly used; on the bottom lands, 2-year rotations are usual.

Manure is used in small quantities, chiefly on eroded areas. Lime is applied to some of the soils that are planted to legumes. Some hay crops are topdressed with fertilizers containing phosphorus; a few farmers sidedress corn with nitrogen fertilizer. Comparatively heavy applications of fertilizer and lime are used on soils where alfalfa or tobacco is to be grown.

Only a small proportion of the permanent pastures are topdressed with fertilizer or lime. Some small pasture areas are manured every few years. Only a few of the permanent pastures are clipped, and some are burned over occasionally. A few are limed and topdressed with a fertilizer containing phosphorus.

Improved management.—In general improved management calls for the proper choice and rotation of crops; correct use of commercial fertilizer, lime, and manure; use of correct tillage methods; return of organic matter to the soil; and control of water. All of these kinds of practices are applied, as needed, to maintain or increase soil productivity within feasible limits. Improved management practices needed to obtain the yields listed in columns B of table 3 are those discussed in the subsection, Management of Soils.

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TABLE 3.—*Estimated average acre yields of principal crops to be expected on the soils of Fluvanna County, Va., under two levels of management*

[Yields in columns A are to be expected under common management; those in columns B, under improved management. Where no yield is given, the crop is not commonly grown on the soil and is not considered suitable for it under the management specified]

Soil	Map symbol	Corn		Wheat		Barley		Oats		Lespedeza hay		Timothy and clover hay		Alfalfa hay		Potatoes		Tobacco [1] (sun-cured)	Permanent pasture	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	B	A	B
		Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Lb.*	*Acres per animal unit* [2]	*Acres per animal unit* [2]
Altavista silt loam, undulating phase	Aa	30	50	10	15	(3)	(3)	(3)	(3)	1.2	1.6	1.0	1.8	(3)	(3)	90	190	(3)	5.4	3.0
Appling fine sandy loam:																				
Eroded rolling phase [4]	Ab	18	30	8	16	14	26	19	31	.8	1.2	.6	.9	(3)	(3)	(3)	150	1,000	6.0	3.7
Rolling phase	Ac	28	46	10	18	16	28	21	33	.9	1.4	.9	1.5	1.8	2.8	85	185	1,250	5.8	3.4
Undulating phase	Ad	32	50	12	20	18	30	23	35	1.0	1.5	1.0	1.6	2.1	3.2	110	210	1,350	5.6	3.2
Appling gritty fine sandy loam:																				
Rolling phase	Ae	20	32	7	15	12	22	17	27	.7	1.0	.6	1.1	1.2	2.2	70	150	1,050	6.5	3.7
Undulating phase	Af	25	38	8	16	14	25	19	30	.8	1.2	.7	1.3	1.5	2.5	80	180	1,200	6.0	3.6
Appling sandy loam:																				
Eroded rolling phase [4]	Ag	16	27	7	15	13	25	18	30	.7	1.1	.5	.8	(3)	(3)	(3)	140	(3)	6.5	3.8
Rolling phase	Ah	26	45	8	16	15	27	20	32	.8	1.3	.7	1.1	1.6	2.5	82	182	1,200	6.2	3.7
Undulating phase	Ak	30	47	10	18	16	28	21	33	.9	1.4	.8	1.2	1.8	2.8	115	215	1,350	5.8	3.5
Augusta fine sandy loam	Al	22	35	6	14	(3)	(3)	(3)	(3)	.7	1.1	.9	1.3	----	----	----	----	----	5.5	3.1
Bremo silt loam:																				
Hilly phase	Ba	----	----	----	----	----	----	----	----	(3)	(3)	(3)	(3)	----	----	----	----	----	(3)	4.5
Rolling phase	Bb	18	30	8	15	(3)	(3)	(3)	(3)	.6	1.1	.6	1.0	----	----	(3)	(3)	----	5.5	3.5
Undulating phase	Bc	20	35	9	16	(3)	(3)	(3)	(3)	.7	1.2	.8	1.3	----	----	(3)	(3)	(3)	5.6	3.2
Buncombe loamy fine sand	Bd	20	30	----	----	----	----	----	----	----	1.0	----	1.0	----	----	80	190	----	6.0	4.0
Cecil clay loam:																				
Eroded rolling phase [4]	Ca	20	40	10	18	15	27	20	32	.8	1.3	.7	1.2	1.6	2.8	(3)	(3)	(3)	6.0	3.7
Eroded undulating phase	Cb	26	48	11	21	18	32	23	37	.9	1.4	1.0	1.6	2.0	3.5	70	140	(3)	4.6	3.1
Cecil fine sandy loam, undulating phase.	Cc	35	57	15	25	25	40	30	45	1.3	1.9	1.2	1.8	2.5	3.7	95	195	1,250	5.3	2.8
Cecil sandy loam:																				
Rolling phase [4]	Cd	27	50	12	22	20	35	25	40	1.0	1.5	.9	1.3	1.8	2.9	(3)	160	900	6.0	3.5
Undulating phase	Ce	32	55	13	23	21	37	26	42	1.2	1.7	1.1	1.7	2.2	3.5	100	200	1,200	5.5	3.0
Chewacla silt loam [5 6]	Cf	45	60	----	----	----	----	----	----	1.3	1.8	1.2	2.0	----	----	----	----	----	3.1	2.0
Colfax sandy loam	Cg	28	40	8	15	13	25	18	30	1.0	1.5	.9	1.3	----	----	77	177	[7] 950	5.5	3.0
Congaree fine sandy loam [6]	Ch	50	65	(3)	(3)	(3)	(3)	(3)	(3)	1.5	2.2	1.5	2.2	(3)	(3)	100	190	----	2.9	1.9
Congaree silt loam [6]	Ck	52	67	(3)	(3)	(3)	(3)	(3)	(3)	1.5	2.2	1.7	2.3	(3)	(3)	80	180	----	2.8	1.8
Durham fine sandy loam, undulating phase.	Da	28	45	9	17	14	25	19	30	.9	1.4	.7	1.2	1.6	2.6	115	215	1,400	6.0	3.7
Elbert silt loam	Ea	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	5.4	3.0

Fluvanna fine sandy loam:																			
Rolling phase	Fa	28	47	10	18	16	28	21	33	1.0	1.5	.9	1.4	1.7	2.9	80	180	1,175	5.7	3.3
Undulating phase	Fb	30	50	12	20	18	30	23	35	1.1	1.6	1.0	1.6	2.1	3.2	85	185	1,275	5.6	3.2
Fluvanna silt loam:																			
Eroded rolling phase	Fc	20	32	8	16	13	25	18	30	.8	1.2	.8	1.0	(3)	(3)	(3)	140	(3)	5.0	3.0
Rolling phase	Fd	28	48	10	18	17	30	22	35	1.0	1.5	1.1	1.7	1.8	3.2	70	170	900	5.5	3.2
Undulating phase	Fe	32	52	12	20	19	33	24	38	1.1	1.6	1.2	1.7	2.2	3.4	77	177	1,000	5.4	3.1
Goldvein gritty silt loam, undulating and rolling phases.	Ga	20	30	7	15	12	20	17	25	.8	1.1	.7	1.2	------	------	60	150	(3)	6.5	4.0
Helena fine sandy loam:																			
Eroded rolling phase	Ha	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	------	------	------	------	------	7.0	4.5
Rolling phase	Hb	20	30	7	15	11	19	16	24	.7	1.2	.6	1.0	------	------	55	100	800	6.5	3.8
Undulating phase	Hc	25	35	7	14	12	20	17	25	.8	1.3	.7	1.1	------	------	60	110	850	6.3	3.8
Hiwassee clay loam:																			
Eroded rolling phase	Hd	30	52	10	19	19	34	24	39	.9	1.5	1.2	1.8	2.0	3.0	(3)	(3)	------	4.6	2.7
Eroded undulating phase	He	35	57	13	22	25	40	30	45	1.0	1.7	1.4	2.1	2.5	3.8	55	100	(3)	4.0	2.5
Hiwassee cobbly fine sandy loam, undulating light-colored phase.	Hf	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	6.0	3.5
Hiwassee fine sandy loam:																			
Rolling light-colored phase [4]	Hg	33	55	12	20	20	35	25	40	1.2	1.7	1.1	1.7	2.0	3.0	80	180	1,050	5.7	3.0
Undulating light-colored phase	Hh	37	60	15	25	23	40	28	45	1.3	1.9	1.2	1.8	2.2	3.5	100	200	1,300	5.2	2.7
Hiwassee silt loam:																			
Rolling phase	Hk	35	57	15	22	25	40	30	45	1.4	1.9	1.7	2.3	2.0	3.0	57	105	(3)	4.0	2.5
Undulating phase	Hl	45	65	17	27	30	45	35	50	1.5	2.0	1.8	2.5	2.7	4.0	85	182	(3)	3.5	2.0
Lignum loam, undulating phase	La	23	33	9	15	12	22	17	27	1.0	1.5	1.0	1.5	------	------	80	170	[7] 800	5.1	3.1
Lignum silt loam, undulating phase	Lb	25	35	9	15	13	23	18	28	1.0	1.5	1.0	1.5	------	------	70	150	[7] 750	5.0	3.0
Lloyd silt loam:																			
Rolling phase	Lc	40	55	12	22	23	37	28	42	1.2	1.9	1.3	2.0	2.2	3.5	82	170	850	4.2	2.7
Undulating phase	Ld	45	60	15	25	25	40	30	45	1.3	2.0	1.4	2.1	2.4	3.7	85	175	900	4.0	2.5
Lloyd silty clay loam:																			
Eroded rolling phase	Le	32	50	10	18	18	32	23	37	1.1	1.6	1.1	1.7	1.8	2.9	(3)	(3)	(3)	4.8	3.3
Eroded undulating phase	Lf	38	54	11	21	20	35	25	40	1.2	1.8	1.3	1.9	2.1	3.5	70	140	(3)	4.5	3.0
Louisa loam:																			
Hilly and steep phases	Lg	------	------	------	------	------	------	------	------	(3)	(3)	(3)	(3)	------	------	------	------	------	(3)	(3)
Rolling phase	Lh	15	25	8	12	(3)	(3)	(3)	(3)	.6	1.1	.4	.8	------	------	(3)	(3)	(3)	5.8	3.9
Louisburg sandy loam:																			
Eroded rolling and hilly phases	Lk	------	------	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	------	------	(3)	(3)	------	(3)	4.2
Eroded steep phase	Ll	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Rolling and hilly phases [5]	Lm	16	27	8	15	(3)	(3)	(3)	(3)	.6	1.0	(3)	(3)	------	------	(3)	(3)	(3)	7.0	4.0
Made land	M	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Madison loam:																			
Rolling phase	Ma	30	50	11	21	19	34	24	39	1.1	1.5	1.1	1.7	2.1	3.2	75	175	1,100	5.1	2.7
Undulating phase	Mb	33	55	14	24	24	38	29	43	1.2	1.6	1.2	1.8	2.3	3.6	87	187	1,150	5.3	2.9
Manteo-Bremo silt loams:																			
Hilly phases	Mc	------	------	------	------	------	------	------	------	(3)	(3)	------	------	------	------	------	------	------	(3)	(3)
Rolling phases	Md	12	22	6	10	(3)	(3)	(3)	(3)	.6	.8	.5	.9	------	------	(3)	(3)	------	5.7	3.8
Manteo silt loam:																			
Hilly phase	Me	------	------	------	------	------	------	------	------	(3)	------	(3)	------	------	------	------	------	------	(3)	(3)
Rolling phase	Mf	10	20	(3)	(3)	------	------	------	------	.5	.7	(3)	.7	------	------	(3)	(3)	------	7.0	4.5
Steep phase	Mg	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Undulating phase	Mh	12	25	7	10	(3)	(3)	(3)	(3)	.6	1.0	.6	1.0	------	------	(3)	(3)	(3)	6.5	4.0

See footnotes at end of table.

TABLE 3.—*Estimated average acre yields of principal crops to be expected on the soils of Fluvanna County, Va., under two levels of management*—Continued

[Yields in columns A are to be expected under common management; those in columns B, under improved management. Where no yield is given, the crop is not commonly grown on the soil and is not considered suitable for it under the management specified]

Soil	Map symbol	Corn		Wheat		Barley		Oats		Lespedeza hay		Timothy and clover hay		Alfalfa hay		Potatoes		Tobacco [1] (sun-cured)	Permanent pasture	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	B	A	B
		Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Lb.*	*Acres per animal unit* [2]	*Acres per animal unit* [2]
Masada fine sandy loam, undulating phase	Mk	28	50	11	19	16	28	21	33	1.0	1.5	1.1	1.7	1.8	2.8	112	212	1,500	5.5	3.1
Mixed alluvial land:																				
Poorly drained	Ml																		5.0	3.0
Well drained [6]	Mm	25	40		(3)					1.0	1.5	1.0	1.5			70	150		4.2	2.5
Nason loam:																				
Eroded rolling phase [4]	Na	12	24	7	15	11	26	16	31	.7	1.0	.5	.8	(3)	(3)	(3)	170	(3)	7.0	4.1
Rolling phase	Nb	18	35	9	17	13	28	18	33	.8	1.3	.7	1.2	1.2	2.5	90	190	1,100	6.7	3.7
Undulating phase	Nc	25	42	10	18	15	30	20	35	.9	1.4	.9	1.5	1.3	2.7	100	200	1,250	6.5	3.5
Nason silt loam:																				
Eroded rolling phase [4]	Nd	14	25	7	15	13	25	18	30	.7	1.0	.5	.8	(3)	(3)	(3)	165	(3)	7.0	4.0
Eroded undulating phase [4]	Ne	20	40	10	18	14	26	19	31	.8	1.2	.7	1.1	1.2	2.6	72	172	850	6.5	3.6
Rolling phase	Nf	20	40	10	18	14	26	19	31	.8	1.3	.8	1.3	1.3	2.7	85	180	1,000	6.4	3.4
Undulating phase	Ng	27	45	11	19	16	30	21	35	.9	1.4	1.0	1.6	1.5	2.8	90	190	1,100	6.0	3.2
Orange-Bremo silt loams, undulating phases	Oa	18	30	7	14	(3)	(3)	(3)	(3)	.6	1.2	.6	1.2			(3)	(3)		6.2	3.7
Orange silt loam:																				
Gravelly subsoil phase	Ob	18	32	7	14	(3)	(3)	(3)	(3)	.6	1.2	.6	1.2			(3)	(3)		6.2	3.7
Undulating phase	Oc	16	30	6	13	(3)	(3)	(3)	(3)	.5	1.0	.5	1.0						6.5	3.8
Riverwash	Ra																			
Roanoke silt loam	Rb																		5.5	3.0
Rough gullied land	Rc																			
Seneca fine sandy loam [9]	Sa	37	55	10	15	15	25	20	30	1.3	1.9	1.3	2.0	(3)	(3)	105	205	[7] 1,100	4.5	2.2
Seneca silt loam [9]	Sb	35	52	10	15	15	25	20	30	1.2	1.8	1.2	1.9	(3)	(3)	75	175	[7] 1,000	4.5	2.2
Starr loam [9]	Sc	47	62	14	20	20	30	25	35	1.5	2.2	1.5	2.3	(3)	(3)	90	180	(3)	3.5	2.1
Stony land	Sd																		(3)	5.0
Tatum loam, undulating phase	Ta	30	52	13	22	21	35	26	40	1.0	1.5	1.0	1.6	1.7	2.9	90	190	1,050	5.5	3.2
Tatum silt loam:																				
Rolling phase	Tb	24	46	12	20	18	33	23	38	1.0	1.4	1.0	1.6	1.7	3.1	70	170	800	5.7	3.2
Undulating phase	Tc	30	52	14	23	22	37	27	42	1.1	1.5	1.1	1.7	2.0	3.5	75	177	850	5.4	3.0
Tatum silty clay loam:																				
Eroded rolling phase [4]	Td	18	35	9	17	14	26	19	31	.8	1.2	.8	1.2	1.3	2.6	(3)	130	(3)	6.8	3.7

Eroded undulating phase	Te	23	45	11	20	17	31	22	36	.9	1.3	.9	1.5	1.5	3.0	55	155	(3)	6.5	3.5
Vance fine sandy loam, undulating phase	Va	27	42	8	16	(3)	(3)	(3)	(3)	.9	1.4	.9	1.4	(3)	(3)	70	170	(3)	6.0	3.5
Wehadkee silt loam	Wa																		4.5	2.5
Wickham loam, undulating phase	Wb	50	70	18	27	30	45	35	50	1.5	2.0	2.0	2.5	3.0	4.0	90	195	1,050	3.2	2.0
Wilkes sandy loam:																				
Hilly and steep phases	Wc			(3)	(3)					(3)	(3)					(3)	(3)		(3)	(3)
Rolling phase	Wd	17	28	8	13	(3)	(3)	(3)	(3)	.7	1.2	.6	1.1			80	180	950	5.6	3.7
Worsham sandy loam	We																		5.5	3.0
Worsham silt loam	Wf																		5.5	3.0
Zion silt loam, undulating phase	Za	25	42	10	18	18	27	23	32	1.1	1.6	1.2	1.7			(3)	(3)	(3)	5.8	3.4

[1] Average yields of tobacco given for only one level of management because the crop is generally grown according to the best practices known.

[2] Average number of acres required to furnish, without injury to the pasture, adequate grazing for 1 animal unit for the grazing season, assumed to be 228 days. An animal unit is equivalent to 1 mature cow, steer, or horse, 5 hogs, or 7 sheep or goats.

[3] Crop not commonly grown, but the soil is considered physically suited to it, although less so than to crops for which yields are given.

[4] This soil includes many eroded hilly areas, and yields on these areas are lower than on the more level, less eroded areas.

[5] Yields for this soil are those to be expected on undrained areas.

[6] Periodic floods reduce average acre yields of crops on this soil.

[7] The wetter or more poorly drained areas of this soil are not suited to tobacco.

[8] Most of this soil is hilly.

[9] In wet seasons small grains lodge on this soil and yields are reduced.

Comparing the yields in columns B with those in columns A shows the results that can be expected from good soil management. Yields in columns B are production goals that can be achieved by using management practices that have been found to be feasible in the county.

As different crops grown on the same soil need different treatment, so also the requirements of the same crop on dissimilar soils may be very unlike. Moreover, the farmer may reach the point where he no longer finds it profitable to intensify further the management practices by which higher yields are obtained.

The best choice of practices depends on the farm business as a whole. On one farm it may be possible to manage the soils so that yields will exceed those in columns B; on another it may not be feasible to reach the goal. The best practical management for a farm unit may result in yields in excess of the goal for one crop and soil, but yields below the goal for another crop on the same soil. Much depends upon the particular soil and the crop, as well as on other soils and crops and other enterprises on the farm.

PRODUCTIVITY RATINGS

Productivity ratings for the soils of Fluvanna County are given in table 4. The productivity rating for each crop is a percentage of the standard yield given at the top of the column for each crop. The standard yield is the approximate average yield obtained, without the use of fertilizer or other amendments, on the more extensive and productive soils of the region in the United States where the crop is most commonly grown.

The figures in columns A show the percentage of the standard yield that can be expected under the level of management common in the county at the time of the survey; those in columns B, the yields that could be obtained under improved management. Common management and improved management are described in the section, Estimated Yields.

An index of 100 indicates that the soil yields as much as the standard yield. An index of 50 indicates that the soil yields about half the standard yield. Unusually productive soils which have been limed or fertilized may have a productivity index of more than 100 for some crops.

Productivity ratings cannot be used to determine the total production of crops by soil areas, unless the acreage of the individual soils planted to each crop is also considered. They cannot be interpreted as indicative of land values, because distance to market, relative prices of farm products, association with other soils that are suitable for different uses, and many other factors influence land values.

The ratings can be used for comparing the productivity of different soils within the county for specific crops and for comparing the productivity of the soils of Fluvanna County with soils of other parts of the United States. They can also be used to show the differences in yields that can be expected from different levels of management. Combined with other information, they can be used to estimate the total production of crops by soil areas.

TABLE 4.—*Productivity ratings for crops and pasture, and workability of soils of Fluvanna County, Va.*

[Productivity indexes in columns A are for common management; those in columns B are for improved management. Absence of data indicates crop specified is not commonly grown because the soil is physically unsuited to it]

Soil [1]	Corn (100=50 bu.)		Wheat (100=25 bu.)		Barley (100=40 bu.)		Oats (100=50 bu.)		Lespedeza hay (100=1½ tons)		Timothy and clover hay (100=2 tons)		Alfalfa hay (100=4 tons)		Potatoes (100=200 bu.)		Tobacco [2] (sun-cured) (100=1,200 lb.)	Permanent pasture (100=228 cow-acre-days) [3]		Workability
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	B	A	B	
SOILS GOOD TO EXCELLENT FOR CROPS AND GOOD TO EXCELLENT FOR PASTURE																				
Wickham loam, undulating phase	100	140	72	108	75	113	70	100	100	133	100	125	75	100	45	98	88	71	114	Good.
Hiwassee silt loam, undulating phase	90	130	68	108	75	113	70	100	100	133	90	125	68	100	43	91	(4)	65	114	Moderately good.
Congaree silt loam [5]	104	134	(4)	(4)	(4)	(4)	(4)	(4)	100	147	85	115	(4)	(4)	40	90	----------	81	127	Good.
Congaree fine sandy loam [5]	100	130	(4)	(4)	(4)	(4)	(4)	(4)	100	147	75	110	(4)	(4)	50	95	----------	79	120	Excellent.
Starr loam [6]	94	124	56	80	50	75	50	70	100	147	75	115	(4)	(4)	45	90	(4)	65	109	Good.
SOILS FAIR TO GOOD FOR CROPS AND FAIR TO VERY GOOD FOR PASTURE																				
Lloyd silt loam, undulating phase	90	120	60	100	63	100	60	90	87	133	70	105	60	93	43	88	75	57	91	Good.
Seneca fine sandy loam [6]	74	110	40	60	38	63	40	60	87	127	65	100	(4)	(4)	53	103	[7] 92	51	104	Good.
Seneca silt loam [6]	70	104	40	60	38	63	40	60	80	120	60	95	(4)	(4)	38	88	[7] 83	51	104	Good.
Hiwassee fine sandy loam, undulating light-colored phase.	74	120	60	100	58	100	56	90	87	127	60	90	55	88	50	100	108	44	84	Very good.
Cecil fine sandy loam, undulating phase.	70	114	60	100	63	100	60	90	87	127	60	90	63	93	48	98	104	43	81	Very good.
Cecil sandy loam, undulating phase	64	110	52	92	53	92	52	84	80	113	55	85	55	88	50	100	100	41	76	Good.
Madison loam, undulating phase	66	110	56	96	60	95	58	86	80	107	60	90	58	90	44	94	96	43	79	Very good.
Appling fine sandy loam, undulating phase.	64	100	48	80	45	75	46	70	67	100	50	80	63	80	55	105	113	41	71	Good.
Hiwassee clay loam, eroded undulating phase.	70	114	52	88	63	100	60	90	67	113	70	105	63	95	28	50	(4)	57	91	Fair.
Fluvanna silt loam, undulating phase	64	104	48	80	48	83	48	76	73	107	60	85	55	85	38	89	83	42	74	Good.
Fluvanna fine sandy loam, undulating phase.	60	100	48	80	45	75	46	70	73	107	50	80	53	80	43	93	106	41	71	Very good.
Tatum silt loam, undulating phase	60	104	56	92	55	93	54	84	73	100	55	85	50	88	38	89	71	42	76	Good.
Hiwassee silt loam, rolling phase	70	114	60	88	63	100	60	90	93	127	85	115	50	75	29	53	(4)	57	91	Fair.

See footnotes at end of table.

TABLE 4.—*Productivity ratings for crops and pasture, and workability of soils of Fluvanna County, Va.*—Continued

[Productivity indexes in columns A are for common management; those in columns B are for improved management. Absence of data indicates crop specified is not commonl grown because the soil is physically unsuited to it]

SOILS POOR TO FAIR FOR CROPS AND VERY POOR TO GOOD FOR PASTURE

Soil [1]	Corn (100=50 bu.)		Wheat (100=25 bu.)		Barley (100=40 bu.)		Oats (100=50 bu.)		Lespedeza hay (100=1½ tons)		Timothy and clover hay (100=2 tons)		Alfalfa hay (100=4 tons)		Potatoes (100=200 bu.)		Tobacco [2] (sun-cured) (100=1,200 lb.)	Permanent pasture (100=228 cow-acre-days) [3]		Workability
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	B	A	B	
Masada fine sandy loam, undulating phase.	56	100	44	76	40	70	42	66	67	100	55	85	45	70	56	106	125	41	74	Good.
Altavista silt loam, undulating phase.	60	100	40	60	(4)	(4)	(4)	(4)	80	107	50	90	(4)	(4)	45	95	(4)	42	76	Good.
Durham fine sandy loam, undulating phase.	56	90	36	68	35	63	38	60	60	93	35	60	40	65	58	108	117	38	62	Good.
Appling sandy loam, undulating phase.	60	94	40	72	40	70	42	66	60	93	40	60	45	70	58	108	113	39	65	Very good.
Tatum loam, undulating phase	60	104	52	88	53	88	52	80	67	100	50	80	43	73	45	95	88	41	71	Very good.
Nason loam, undulating phase	50	84	40	72	38	75	40	70	60	93	45	75	33	68	50	100	104	35	65	Good.
Lloyd silt loam, rolling phase	80	110	48	88	58	93	56	84	80	127	65	100	55	88	41	85	71	54	84	Fair.
Nason silt loam, undulating phase	54	90	44	76	40	75	42	70	60	93	50	80	38	70	45	95	92	38	71	Good.
Lloyd silty clay loam, eroded undulating phase.	76	108	44	84	50	88	50	80	80	120	65	95	53	88	35	70	(4)	51	76	Fair.
Cecil clay loam, eroded undulating phase.	52	96	44	84	45	80	46	74	60	93	50	80	50	88	35	70	(4)	50	74	Poor to fair.
Fluvanna fine sandy loam, rolling phase.	56	94	40	72	40	70	42	66	67	100	45	70	43	73	40	90	98	40	69	Fair.
Appling fine sandy loam, rolling phase.	56	92	40	72	40	70	42	66	60	93	45	75	45	70	43	93	104	39	67	Fair.
Zion silt loam, undulating phase	50	84	40	72	45	68	46	64	73	107	60	85	-----	-----	(4)	(4)	(4)	39	67	Fair.
Bremo silt loam, undulating phase	40	70	36	64	(4)	(4)	(4)	(4)	47	80	40	65	-----	-----	(4)	(4)	(4)	41	71	Fair.
Appling gritty fine sandy loam, undulating phase.	50	76	32	64	35	63	38	60	53	80	35	65	38	63	40	90	100	38	63	Good.
Vance fine sandy loam, undulating phase.	54	84	32	64	(4)	(4)	(4)	(4)	60	93	45	70	(4)	(4)	35	85	(4)	38	65	Fair.
Fluvanna silt loam, rolling phase	56	96	40	72	43	75	44	70	67	100	55	85	45	80	35	85	75	41	71	Fair.
Hiwassee clay loam, eroded rolling phase.	60	104	40	76	48	85	48	78	60	100	60	90	50	75	(4)	(4)	---------	50	84	Poor.
Hiwassee fine sandy loam, rolling light-colored phase.[5]	66	110	48	80	50	88	50	80	80	113	55	85	50	75	40	90	88	40	76	Fair.
Madison loam, rolling phase	60	100	44	84	48	85	48	78	73	100	55	85	53	80	38	88	92	45	84	Fair.
Appling sandy loam, rolling phase	52	90	32	64	38	68	40	64	53	87	35	55	40	63	41	91	100	37	62	Fair.
Tatum silt loam, rolling phase	48	92	48	80	45	83	46	76	67	93	50	80	43	78	35	85	67	40	71	Fair to poor.
Augusta fine sandy loam	44	70	24	56	(4)	(4)	(4)	(4)	47	73	45	65	-----	-----	-----	-----	---------	41	74	Fair.
Colfax sandy loam	56	80	32	60	33	63	36	60	67	100	45	65	-----	-----	39	89	79	41	76	Fair to good.
Nason loam, rolling phase	36	70	36	68	33	70	36	66	53	87	35	60	30	63	45	95	92	34	62	Fair to poor.
Nason silt loam, rolling phase	40	80	40	72	35	65	38	62	53	87	40	65	33	68	43	90	83	36	67	Fair to poor.
Lloyd silty clay loam, eroded rolling phase.	64	100	40	72	45	80	46	74	73	107	55	85	45	73	(4)	(4)	(4)	48	69	Poor.

Tatum silty clay loam, eroded undulating phase.	46	90	44	80	43	78	44	72	60	87	45	75	38	75	28	78	(4)	35	65	Poor.
Lignum loam, undulating phase	46	66	36	60	30	55	34	54	67	100	50	75			40	85	[7] 67	45	74	Fair.
Lignum silt loam, undulating phase	50	70	36	60	33	58	36	56	67	100	50	75			35	75	[7] 63	46	76	Fair.
Cecil sandy loam, rolling phase [8]	54	100	48	88	50	88	50	80	67	100	45	65	45	73	(4)	80	75	38	65	Poor.
Manteo silt loam, undulating phase	24	50	28	40	(4)	(4)	(4)	(4)	40	67	30	50			(4)	(4)	(4)	35	57	Fair.
Orange-Bremo silt loams, undulating phases.	36	60	28	56	(4)	(4)	(4)	(4)	40	80	30	60			(4)	(4)		37	62	Poor to fair.
Orange silt loam, gravelly subsoil phase.	36	62	28	56	(4)	(4)	(4)	(4)	40	80	30	60			(4)	(4)		37	62	Poor.
Helena fine sandy loam, undulating phase.	50	70	28	56	30	50	34	50	53	87	35	55			30	55	71	36	60	Poor.
Cecil clay loam, eroded rolling phase	40	80	40	72	38	68	40	64	53	87	35	60	40	70	(4)	(4)	(4)	38	62	Fair to poor.
Appling gritty fine sandy loam, rolling phase.	40	64	28	60	30	55	34	54	47	67	30	55	30	55	35	75	88	35	62	Fair.
Goldvein gritty silt loam, undulating and rolling phases.	40	60	28	60	30	50	34	50	53	73	35	60			30	75	(4)	35	57	Good.
Orange silt loam, undulating phase	32	60	24	52	(4)	(4)	(4)	(4)	33	67	25	50						35	60	Poor.
Nason silt loam, eroded undulating phase.	40	80	40	72	35	65	38	62	53	80	35	55	30	65	36	86	71	35	63	Fair.
Buncombe loamy fine sand	40	60								67		50			40	95		38	57	Very good.
SOILS VERY POOR TO POOR FOR CROPS AND VERY POOR TO GOOD FOR PASTURE																				
Chewacla silt loam [5, 9]	90	120							87	120	60	100						74	114	Fair.
Mixed alluvial land, well drained [3]	50	80							67	100	50	75			35	75		54	91	Fair.
Manteo-Bremo silt loams, rolling phases.	24	44	24	40	(4)	(4)	(4)	(4)	40	53	25	45			(4)	(4)		40	60	Poor to very poor.
Louisa loam, rolling phase	30	50	32	48	(4)	(4)	(4)	(4)	40	73	20	40			(4)	(4)	(4)	39	58	Fair.
Wehadkee silt loam																		51	91	Very poor.
Mixed alluvial land, poorly drained																		46	76	Very poor to poor.
Hiwassee cobbly fine sandy loam, undulating light-colored phase.																		38	65	Poor.
Bremo silt loam, rolling phase	36	60	32	60	(4)	(4)	(4)	(4)	40	73	30	50			(4)	(4)		41	65	Poor.
Worsham sandy loam																		41	76	Very poor.
Elbert silt loam																		42	76	Poor.
Wilkes sandy loam, rolling phase	34	56	32	52	(4)	(4)	(4)	(4)	47	80	30	55			40	90	79	41	62	Poor.
Worsham silt loam																		41	76	Very poor.
Roanoke silt loam																		41	76	Very poor.
Helena fine sandy loam, rolling phase	40	60	28	60	28	48	32	48	47	80	30	50			28	50	67	35	60	Poor.
Appling fine sandy loam, eroded rolling phase.	36	60	32	64	35	65	38	62	53	80	30	45	(4)	(4)	(4)	75	83	38	62	Poor.
Appling sandy loam, eroded rolling phase.	32	54	28	60	33	63	36	60	47	73	25	40	(4)	(4)	(4)	70	(4)	35	60	Poor.
Fluvanna silt loam, eroded rolling phase.	40	64	32	64	33	63	36	60	53	80	40	50	(4)	(4)	(4)	70	(4)	46	76	Very poor.
Tatum silty clay loam, eroded rolling phase. [8]	36	70	36	68	35	65	38	62	53	80	40	60	33	65	(4)	65	(4)	34	62	Poor.
Nason silt loam, eroded rolling phase [8]	28	50	28	60	33	63	36	60	47	67	25	40	(4)	(4)	(4)	83	(4)	33	57	Poor.
Nason loam, eroded rolling phase [8]	24	48	28	60	28	65	32	62	47	67	25	40	(4)	(4)	(4)	85	(4)	33	56	Poor.
Louisburg sandy loam, rolling and hilly phases. [10]	32	54	32	60	(4)	(4)	(4)	(4)	40	67	(4)	(4)			(4)	(4)	(4)	33	57	Poor.
Manteo silt loam, rolling phase	20	40	(4)	(4)					33	47	(4)	35			(4)	(4)		33	51	Very poor.

See footnotes at end of table.

TABLE 4.—*Productivity ratings for crops and pasture, and workability of soils of Fluvanna County, Va.*—Continued

[Productivity indexes in columns A are for common management; those in columns B are for improved management. Absence of data indicates crop specified is not commonly grown because the soil is physically unsuited to it]

Soil [1]	Corn (100=50 bu.)		Wheat (100=25 bu.)		Barley (100=40 bu.)		Oats (100=50 bu.)		Lespedeza hay (100=1½ tons)		Timothy and clover hay (100=2 tons)		Alfalfa hay (100=4 tons)		Potatoes (100=200 bu.)		Tobacco [2] (sun-cured) (100=1,200 lb.)	Permanent pasture (100=228 cow-acre-days) [3]		Workability
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	B	A	B	
SOILS VERY POOR TO POOR FOR CROPS AND VERY POOR TO GOOD FOR PASTURE—Continued																				
Bremo silt loam, hilly phase									[4]	[4]	[4]	[4]						[4]	51	Very poor.
Manteo-Bremo silt loams, hilly phases									[4]	[4]								[4]	[4]	Very poor.
Helena fine sandy loam, eroded rolling phase	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]						33	51	Very poor.
SOILS VERY POOR FOR CROPS AND POOR TO VERY POOR FOR PASTURE																				
Louisa loam, hilly and steep phases									[4]	[4]	[4]	[4]						[4]	[4]	Very poor.
Wilkes sandy loam, hilly and steep phases			[4]	[4]					[4]	[4]					[4]	[4]		[4]	[4]	Very poor.
Louisburg sandy loam:																				
Eroded rolling and hilly phases			[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]			[4]	[4]		[4]	54	Very poor.
Eroded steep phase																				Very poor.
Manteo silt loam:																				
Hilly phase										[4]		[4]						[4]	[4]	Very poor.
Steep phase																				Very poor.
Stony land																		[5]	46	Very poor.
Riverwash																				Very poor.
Rough gullied land																				Very poor.
Made land																				Very poor.

[1] Soils listed in the approximate descending order of their physical suitability for crops commonly grown in the area, under good management practices.

[2] Productivity indexes for tobacco are given for only one level of management because the best practices known are followed in growing the crop.

[3] Cow-acre-days is a term used to express the carrying capacity of pastures. It represents the number of days a year 1 animal unit can be supported on 1 acre without injury to the pasture. An animal unit is 1 mature cow, steer, or horse, 5 hogs, or 7 sheep or goats. For example a soil type that would provide grazing for 1 cow (or 1 animal unit) to the acre for 100 days would rate 100 cow-acre-days; a soil that would provide grazing for 1 cow to 4 acres for 100 days would rate 25 cow-acre-days.

[4] Crop not commonly grown, but soil considered physically suited to it, though not so well suited as for crops for which yields are given.

[5] Floodwater occasionally damages crops on this soil, but the flood hazard was not considered in estimating yields.

[6] Lodging of small grains on this soil reduces yields in wet years, but this was not considered in estimating yields.

[7] The wetter, or more poorly drained, areas of this soil not suited to tobacco.

[8] Soil includes many eroded hilly areas. Yields on these areas are lower than on the smoother less eroded areas.

[9] Yields in columns A are those to be expected on undrained areas; those in columns B are for areas that are artificially drained.

[10] Workability is poor because most of this soil is hilly.

CAPABILITY GROUPS OF SOILS

The capability grouping is an arrangement of soils to show relative suitability for crops, grazing, forestry, wildlife, or other uses, and the risk of erosion or other damage. It is widely used in helping farmers plan their practices for soil and water conservation.

Eight broad classes are provided in the capability arrangement. Only seven of the classes occur in Fluvanna County. Each soil is placed in one of these broad classes after several persons have jointly studied the ways the soil responds when it is farmed.

Soils that are easy to farm and have no serious limitations for use are placed in capability class I. Such soils are not subject to more than slight erosion, drought, wetness, or other limitations, and are at least fairly fertile. They are good for many uses. The farmer can use his class I soils for crops without special practices other than those needed for good farming anywhere. He can choose one of several cropping patterns, or if he wishes he may use the soil for pasture, trees, or for other purposes.

Soils are placed in class II if they are a little less widely adaptable, and thus more limited, than those in class I. For example a gently sloping soil may have a slight erosion hazard and require contour farming or other practices to control runoff. Other soils may be placed in class II because they are too droughty, too wet, or too shallow to be in class I. Climate can also be a limiting factor if too cool or too dry, but is not a limiting factor in the capability grouping for Fluvanna County.

Class III contains the soils that are suitable for regular cropping, but that have more stringent management requirements than those in class II. The soils that are even more limited and have more narrow crop adaptations than those in class III, but are still suitable for tillage part of the time, or with special precautions, are placed in class IV.

Soils not suitable for cultivation, or on which cultivation is not advisable, are in classes V, VI, VII, or VIII. Class V consists of soils not subject to erosion, but unsuited to cultivation because of stones, standing water, or frequent overflows. Class VI contains soils that are steep, droughty, or shallow, but that will produce fairly good amounts of forage, orchard, or forest products. As a rule class VI soils should not be cultivated, but some of them can safely be disturbed to prepare for planting trees or seeding long-time pastures.

Soils in class VII are more limited than those in class VI, require more care in handling and usually give only fair to poor yields of forage or wood products. Class VIII consists of soils so severely limited that they produce little useful vegetation. They may provide attractive scenery or may be parts of valuable watersheds. Some may have value for wildlife. None of the soils of Fluvanna County are in capability class VIII.

Subclasses.—Although the soils in a single capability class present use and management problems of about the same degree, the kinds of problems may differ greatly. If the main problems and limitations are caused by risk of erosion, a capability subclass is designated by the symbol (e); other subclass designations show that the main limiting factor is excess water (w), or low moisture capacity or low fertility (s). No capability subclasses are defined in class I.

CAPABILITY CLASSES AND SUBCLASSES IN FLUVANNA COUNTY

Capability classes and subclasses in Fluvanna County are defined below. The brief description of each subclass gives the general nature of the dominant soils included in each.

Class I.—First-bottom soils that are easy to farm and have no outstanding limitations as to use. No subclasses of class I are recognized.

Class II.—Soils that can be used for tilled crops under only slight risk of erosion or other minor limitations.
- IIe: Mostly undulating soils and some rolling soils.
- IIw: Moderately well drained alluvial and colluvial soils.

Class III.—Soils that can be used for tilled crops, but under moderate risk of erosion or other moderate limitations.
- IIIe: Mostly rolling and undulating soils subject to erosion.
- IIIw: Somewhat poorly drained and moderately well drained soils on low terraces and bottom lands.

Class IV.—Soils that have severe limitations for cultivation and that require extreme care if cultivated.
- IVe: Rolling, hilly, and steep soils subject to severe erosion.
- IVw: Poorly drained soils and mixed alluvial land.
- IVs: Sandy, droughty, bottom-land soils.

Class V.—Soils not subject to erosion but totally unsuited to cultivation because of standing water, stoniness, or overflow.
- Vw: Low wet soils subject to frequent overflow.

Class VI.—Soils too wet, too steep, too eroded, too stony, or too shallow for cultivation, except occasionally to seed long-producing pasture or forage or to plant trees.
- VIe: Hilly soils.
- VIw: Poorly drained terrace soils of low fertility.

Class VII.—Soils that are unsuitable for cultivation and that usually produce only fair to poor amounts of forage or wood products because they are steep or eroded.
- VIIe: Hilly and steep soils and gullied land.
- VIIs: Riverwash.

The capability class and subclass for each soil is shown in the following list:

	Capability class and subclass
Altavista silt loam, undulating phase (Aa)	IIIe.
Appling fine sandy loam:	
Eroded rolling phase (Ab)	IVe.
Rolling phase (Ac)	IIIe.
Undulating phase (Ad)	IIe.
Appling gritty fine sandy loam:	
Rolling phase (Ae)	IIIe.
Undulating phase (Af)	IIe.
Appling sandy loam:	
Eroded rolling phase (Ag)	IIIe.
Rolling phase (Ah)	IIIe.
Undulating phase (Ak)	IIe.
Augusta fine sandy loam (Al)	IIIw.

	Capability class and subclass
Bremo silt loam:	
Hilly phase (Ba)	VIIe.
Rolling phase (Bb)	IVe.
Undulating phase (Bc)	IIIe.
Buncombe loamy fine sand (Bd)	IVs.
Cecil clay loam:	
Eroded rolling phase (Ca)	IVe.
Eroded undulating phase (Cb)	IIIe.
Cecil fine sandy loam, undulating phase (Cc)	IIe.
Cecil sandy loam:	
Rolling phase (Cd)	IIIe.
Undulating phase (Ce)	IIe.
Chewacla silt loam (Cf)	IIIw.
Colfax sandy loam (Cg)	IIIw.
Congaree fine sandy loam (Ch)	I.
Congaree silt loam (Ck)	I.
Durham fine sandy loam, undulating phase (Da)	IIe.
Elbert silt loam (Ea)	IVw.
Fluvanna fine sandy loam:	
Rolling phase (Fa)	IIIe.
Undulating phase (Fb)	IIe.
Fluvanna silt loam:	
Eroded rolling phase (Fc)	IVe.
Rolling phase (Fd)	IIIe.
Undulating phase (Fe)	IIIe.
Goldvein gritty silt loam, undulating and rolling phases (Ga)	IIIe.
Helena fine sandy loam:	
Eroded rolling phase (Ha)	IVe.
Rolling phase (Hb)	IIIe.
Undulating phase (Hc)	IIe.
Hiwassee clay loam:	
Eroded rolling phase (Hd)	IVe.
Eroded undulating phase (He)	IIIe.
Hiwassee cobbly fine sandy loam, undulating light-colored phase (Hf)	IIIe.
Hiwassee fine sandy loam:	
Rolling light-colored phase (Hg)	IIIe.
Undulating light-colored phase (Hh)	IIe.
Hiwassee silt loam:	
Rolling phase (Hk)	IIIe.
Undulating phase (Hl)	IIe.
Lignum loam, undulating phase (La)	IIIe.
Lignum silt loam, undulating phase (Lb)	IIIe.
Lloyd silt loam:	
Rolling phase (Lc)	IIIe.
Undulating phase (Ld)	IIe.
Lloyd silty clay loam:	
Eroded rolling phase (Le)	IVe.
Eroded undulating phase (Lf)	IIIe.

	Capability class and subclass
Louisa loam:	
Hilly and steep phases (Lg)	VIIe.
Rolling phase (Lh)	IIIe.
Louisburg sandy loam:	
Eroded rolling and hilly phases (Lk)	VIIe.
Eroded steep phase (Ll)	VIIe.
Rolling and hilly phases (Lm)	IIIe.
Made land (M)	Unclassified.
Madison loam:	
Rolling phase (Ma)	IIIe.
Undulating phase (Mb)	IIe.
Manteo-Bremo silt loams:	
Hilly phases (Mc)	VIIe.
Rolling phases (Md)	IVe.
Manteo silt loam:	
Hilly phase (Me)	VIIe.
Rolling phase (Mf)	VIe.
Steep phase (Mg)	VIIe.
Undulating phase (Mh)	IVe.
Masada fine sandy loam, undulating phase (Mk)	IIe.
Mixed alluvial land:	
Poorly drained (Ml)	VIIe.
Well drained (Mm)	IVw.
Nason loam:	
Eroded rolling phase (Na)	IVe.
Rolling phase (Nb)	IIIe.
Undulating phase (Nc)	IIe.
Nason silt loam:	
Eroded rolling phase (Nd)	IVe.
Eroded undulating phase (Ne)	IIIe.
Rolling phase (Nf)	IIIe.
Undulating phase (Ng)	IIe.
Orange-Bremo silt loams, undulating phases (Oa)	IIIe.
Orange silt loam:	
Gravelly subsoil phase (Ob)	IIIe.
Undulating phase (Oc)	IIIe.
Riverwash (Ra)	VIIs.
Roanoke silt loam (Rb)	VIIw.
Rough gullied land (Rc)	VIIs.
Seneca fine sandy loam (Sa)	IIIw.
Seneca silt loam (Sb)	IIw.
Starr loam (Sc)	IIe.
Stony land (Sd)	VIIs.
Tatum loam, undulating phase (Ta)	IIe.
Tatum silt loam:	
Rolling phase (Tb)	IIIe.
Undulating phase (Tc)	IIe.
Tatum silty clay loam:	
Eroded rolling phase (Td)	IVe.
Eroded undulating phase (Te)	IIIe.
Vance fine sandy loam, undulating phase (Va)	IIe.

	Capability class and subclass
Wehadkee silt loam (Wa)	IVw.
Wickham loam, undulating phase (Wb)	IIe.
Wilkes sandy loam:	
Hilly and steep phases (Wc)	VIIe.
Rolling phase (Wd)	IVe.
Worsham sandy loam (We)	V.
Worsham silt loam (Wf)	V.
Zion silt loam, undulating phase (Za)	IIIe.

SOILS AND FORESTRY [11]

FORESTS IN FLUVANNA COUNTY

Although hardwoods are the typical native vegetation of Fluvanna County, many stands of shortleaf or Virginia (scrub) pine are scattered throughout the county. The stands of pine were established largely through accident. Fields that had been cultivated but were abandoned after the Civil War provided an ideal environment for pine—a bare mineral soil and unlimited light. Pines grew in nearby woodlands, and the light winged seeds became well distributed in the abandoned fields. As a result fairly dense stands of pine grew up.

A few small oaks and other hardwoods were scattered among the pines. As the pine stands grew older, new hardwoods became established as an understory in many places. When the pine forests were cut, and the source of their seed destroyed, the hardwoods established themselves in the second growth. Then the forest began to revert to the original, or climax, type of vegetation.

Up to the present, pine has been predominant in the forest economy. It will withstand more crowding than most of the hardwood species and will consequently produce more wood per acre than the hardwoods.

SOILS SUITED TO FOREST GROWTH

Yellow-poplar, white oak, and red oak now make excellent growth both in diameter and in height, on cove sites in the county, especially on the Starr and Seneca soils. Associated with them are hickory, redgum, red maple, beech, redcedar, and walnut. Walnut is the most desirable of these, because of its fairly favorable rate of growth and its high value. Redcedar, usually a minor component, is always useful as fence posts so should be encouraged. The other species are less desirable. They should be removed and used for fuel or for any other use for which a market can be found. Dogwood, a frequent associate on the Starr, Seneca, and many other soils, should be encouraged. It beautifies the landscape, and the wood is valuable for making shuttles and bobbins.

Oaks have made fairly rapid growth on the Lloyd, Fluvanna, Hiwassee, Wickham, and Masada soils. The trees are generally tall and well shaped. White oak and red oak are the most common. Chestnut oak grows on the stony sites. Associated with these oaks

[11] Material for this section was submitted by S. G. Hobart, University of Virginia, Charlottesville, Va.

are scarlet oak, pignut hickory, and occasional black oaks, red maples, and blackgums. Dogwood and sassafras also grow in the association, and redcedar is common in fence rows and fields.

White oak, red oak, and chestnut oak, and an understory of dogwood, should be encouraged. The short-lived scarlet oak and black oak species are not so desirable. They make good lumber, however, especially black oak, if not allowed to overmature. The other species should gradually be weeded out.

Hardwoods have made good growth on the Louisburg, Louisa, and Bremo soils, and poplars grow to exceptional heights in the upper and lower coves. The species growing on these soils consist of white oak, hickory, red maple, black oak, red oak, beech, walnut, redcedar, some dogwood, and a little redbud. A stand of hemlock grows on Louisa soil along Byrd Creek.

Stands of birch, sycamore, and willow—typical bottom-land hardwoods—and some alder and elder, grow on the Congaree, Buncombe, and Chewacla soils of the first bottoms and on the Altavista and Augusta soils of low terraces. In addition to these species, a mixture of pin oak, swamp white oak, and redgum grows on wet sites on the Worsham soils. On the Wehadkee soil, red maple, hackberry, blue beech, and alder are intermixed.

Except for the Congaree and Altavista soils, the soils of terraces and first bottoms have little potential value as timber producers. The principal species growing on these soils are generally of comparatively low value, although desirable species could be grown on the Congaree and Altavista soils. Little needs be done in the way of management. Unless the soils are worth draining and clearing, the trees should be allowed to grow and then should be cut and sold when there is a market.

White oak grows on the Cecil, Appling, Durham, Madison, Colfax, and Goldvein soils, and chestnut oak on the stony areas of these soils. Scarlet oak, hickory, blackgum, dogwood, black oak, Virginia pine, shortleaf pine, and some cedar also grow on these soils. A few poplars grow on the Appling soils, but other soils, particularly the Starr and Seneca soils, are more favorable for these.

Pine grows fairly well on the soils of this group, and should be encouraged, especially shortleaf pine. Some existing stands are predominantly hardwood. Although preference should be given to pine, white, chestnut, and black oak, cedar, and dogwood should also be encouraged. Other species should be weeded out. Spaces of about 150 feet on the downwind, or northeast, side, and 75 feet on the opposite side, should be cleared around pine stands. Such openings, especially if they are made during good pine seed years, will promote reproduction of pines and will thus gradually increase the percentage of pine in the mixture.

Post, blackjack, hickory, white, willow, red, and scarlet oaks, redcedar, red maple, redgum, and Virginia and shortleaf pines grow on the Orange and Helena soils. Here again pine is more desirable than other species. Shortleaf pine is preferable to Virginia pine. Until it is practical to convert to pine, white and red oaks and redcedar should be favored. Most of the other species should be eliminated.

The Nason, Tatum, and Lignum soils support comparatively slow growing hardwoods and some Virginia pine. White, chestnut, red,

and black oaks, hickory, blackgum, and Virginia pine are the common species, along with dogwood, sassafras, and huckleberries. Pine should be favored, then the white oak, chestnut oak, red oak, and black oak, in the order named. It is well to cut the hardwoods when they are small, to be used for small-dimension products such as crossties, because larger trees tend to become defective on these soils. This is most likely to happen if the area has been burned over or the trees have been injured otherwise during growth.

On the Manteo soil, chestnut, scarlet, red, and white oaks, hickory, red maple, sourwood, dogwood, and some yellow-poplar and Virginia pine grow. Virginia pine should be favored, and the stands should gradually be converted to that species. In the absence of pine, yellow-poplar, white, red, and chestnut oaks should be encouraged by removing competing growth. Yellow-poplar and white, red, and chestnut oaks grow well on the lower slopes of coves on the Manteo soil.

SOIL ASSOCIATIONS

A soil association is an area of land comprised of one or more soil types that occur in a characteristic pattern. The association may consist of soils that are similar or that differ widely in important characteristics. Each soil association, however, has a certain repeating pattern of the same important soil type or types, and other features that give it a characteristic landscape.

Nineteen soil associations have been recognized in Fluvanna County. The soil association map (fig. 3) shows the geographic distribution of the associations. The soil association map does not give enough detail for study of individual farms, but it is useful in regional studies of agricultural production, forestry, and watershed protection.

All the soil associations of Fluvanna County tend to follow exposures of rock formations or deposits of colluvial or alluvial material. Five of the associations—the Tatum-Nason-Manteo, the Nason-Tatum-Manteo, the Manteo-Tatum-Nason, the Manteo-Wehadkee-Worsham, and the Nason-Manteo-Tatum—coincide with areas of quartz sericite schist and slate, or colluvial and alluvial deposits. These areas cover about two-thirds of the county; they occur in the northwestern half and in part of the southeastern half.

The Goldvein-Nason-Worsham association occurs southwest of Palmyra. It overlies quartz monzonite, quartz sericite schist, and colluvial material.

Five associations—the Cecil-Appling-Louisburg, the Appling-Cecil-Louisburg, the Louisburg-Appling-Cecil, the Appling-Louisburg, and the Appling-Louisburg-Colfax—overlie granite and gneiss in the eastern and southeastern parts of the county.

The Helena-Vance-Appling association occurs in the eastern part of the county. It overlies areas of granite and basic rocks mixed.

The Madison-Louisa-Lloyd association is in the eastern part of the county, mainly along the county boundary. It overlies areas of quartz muscovite schist or hornblende schist and hornblende gneiss.

Four associations—the Lloyd-Fluvanna, the Bremo-Orange-Fluvanna, the Orange-Fluvanna-Zion, and the Fluvanna-Lloyd-Bremo—

coincide with areas of hornblende schist, hornblende gneiss, basic quartzite, quartz monzonite, and granite. They occur in the eastern and southwestern parts of the county.

The Hiwassee-Masada association coincides with areas of old alluvial deposits along the principal streams.

The Congaree-Wickham-Chewacla association coincides with areas that consist largely of recent alluvial deposits. It occurs along the rivers and larger creeks in the county.

In the following pages each soil association is discussed in terms of its extent and use, the relation and proportion of member soils, and its importance to the agriculture of the county.

TATUM-NASON-MANTEO

The Tatum-Nason-Manteo association (fig. 3) is one of the most extensive. It occupies about 23 percent of the county. It is composed mainly of undulating soils that occur on broad upland ridges between drainageways. Besides the three predominant soils, the association includes small acreages of Seneca, Worsham, Lignum, and Chewacla soils, and Mixed alluvial land. The Seneca and Worsham soils occur on colluvial slopes, and the Chewacla soil and Mixed alluvial land are on first bottoms. The rest of the association consists of upland soils. Most areas of this association are about 75 percent Tatum soils.

A large part of this association is made up of smooth workable soils that are well suited to intensive cultivation, but only about 20 percent of it has been cleared. Most of the farms are small, and the products are grown mainly for home use. Some farms are operated on a part-time basis. Livestock and dairy farms are increasing in number. Lumbering is an important source of income.

Most of the soils are low to very low in fertility, but their relief is favorable for tillage. Good crop yields are possible if the soils are well managed. They particularly need liberal fertilization to build up their productivity.

NASON-TATUM-MANTEO

The Nason-Tatum-Manteo association (fig. 3) occupies between 21 and 22 percent of the county area. For the most part, it occupies gently undulating to gently rolling ridgetops (pl. 2, *A*). It contains a larger proportion of Nason soils than does the Tatum-Nason-Manteo association. Lignum, Chewacla, Worsham, and Orange soils are included in the association. Some areas of these soils lie within larger areas of Nason soils and may affect the use and management of the Nason soils.

The association consists predominantly of soils that are suitable for tillage; most of the soils are suited to intensive use. Farms are similar in type and size to those in the Tatum-Nason-Manteo soil association. The Nason soils are used more widely for tilled crops than other soils of the association. Except for the small areas of Chewacla and Orange soils, which have medium to high fertility, all of the soils are low to very low in fertility. Tilth, however, is generally good, and the soils will produce well if productivity is built up and maintained by fertilization.

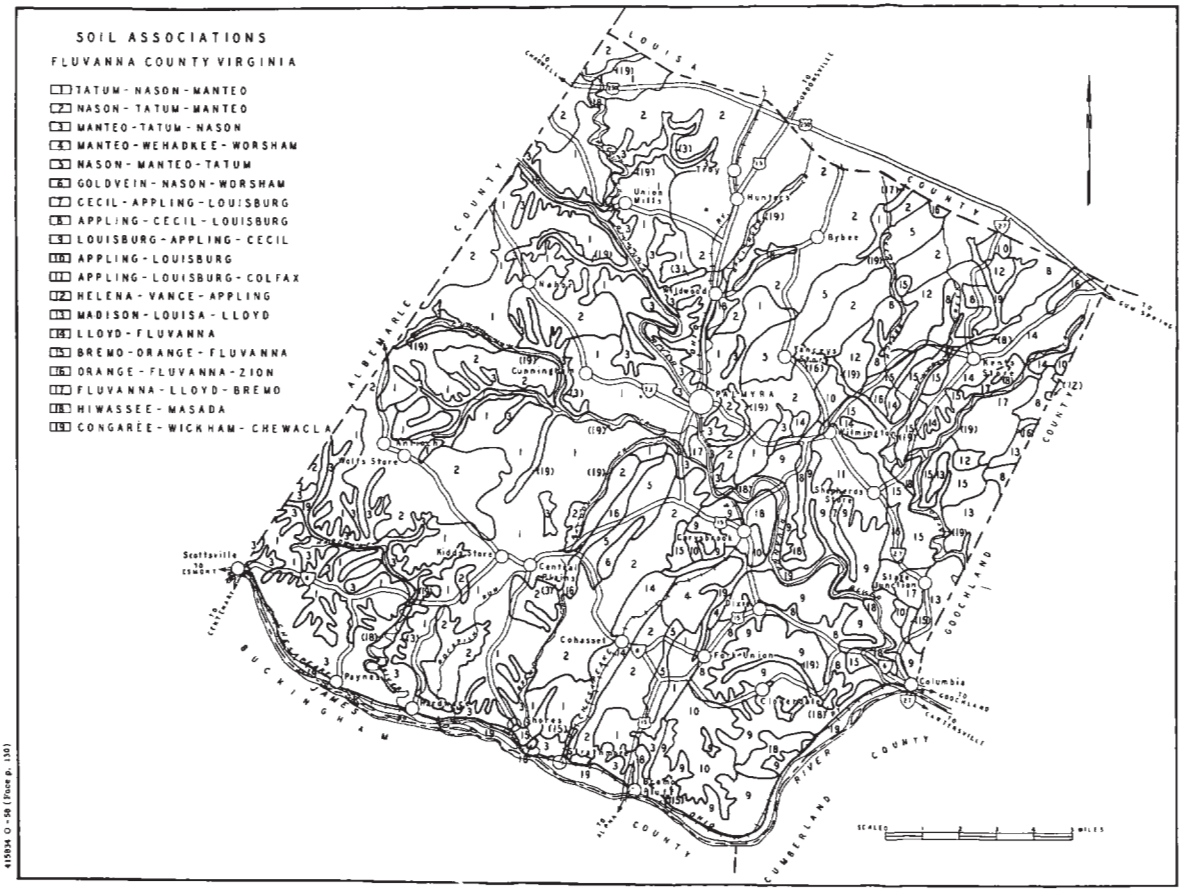

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FIGURE 3.—*Soil associations of Fluvanna County, Virginia.*

MANTEO-TATUM-NASON

The Manteo-Tatum-Nason association (fig. 3) occupies between 8 and 9 percent of the county. It consists of areas of hilly and steep soils that occur mainly along the James, Rivanna, and Hardware Rivers and Cunningham Creek. Manteo soils make up about 75 percent of the association. The rest consists of small areas of Tatum and Nason soils and some Mixed alluvial land and Stony land. Mixed alluvial land occupies first bottoms along drainageways, and Stony land occurs mainly along bluffs of the James, Rivanna, and Hardware Rivers.

Only a small part of this association is well suited to crops. Some areas that are not suitable for cropping have been used more intensively than they should have been; consequently, their productivity has been further reduced. Many areas, once cleared and cropped, have been allowed to revert to forest (pl. 3, *C*) because returns from the soils were too low to make it feasible to grow crops, even for home use. Some areas of Tatum and Nason soils and Mixed alluvial land are so isolated from other cropland that cropping is impractical.

Most of this association is in forest. A few part-time farms produce crops for home use. Except along lower slopes, the forest is generally of poor quality. Most of the timber is chestnut, scarlet, red, and white oaks, pignut hickory, scrub pine, dogwood, sourwood, poplar, and red maple. The chestnut oak, sourwood, scarlet oak, and hickory grow on ridges and upper slopes. The white oak, red maple and poplar grow mainly in coves and on soils developed from alluvial material. Areas that have been cleared and cultivated until moderately eroded support almost pure stands of Virginia pine.

Most of the crops that are successful are grown on the Nason and Tatum soils. Some areas are in pasture, but as a rule pasture is very poor. Management of the soils is very poor in most areas, and crop failures are common on the Manteo soils, especially in dry seasons.

Soil management and farm management are both very difficult. It is almost impossible to obtain worthwhile yields. The best use for most areas is forest or wildlife reservations.

MANTEO-WEHADKEE-WORSHAM

The Manteo-Wehadkee-Worsham association (fig. 3) occupies only 1 to 2 percent of the county. Undulating and rolling phases of Manteo soils make up about 85 percent of the total area. Steep and hilly phases of Manteo soils, areas of Wehadkee, Worsham, Chewacla, and Seneca soils, and tracts of Mixed alluvial land make up the rest.

The soils are poorly suited to agriculture mainly because of shallowness and unfavorable drainage. There are only 3 or 4 farms in the association, and on these much of the land is idle and some is growing up to forest. Trees grow slowly, and most of the forest is cutover or burned over. Pasture is fairly good only if the soils have been treated with manure, lime, and large amounts of commercial fertilizer, and grazing is regulated properly.

It is doubtful if it is possible to make farms within this association self-supporting. The cost of maintaining productivity exceeds the income that can be derived from farming. This should be taken into consideration before clearing more of the land for crops or pasture.

NASON-MANTEO-TATUM

The Nason-Manteo-Tatum association (fig. 3) covers about 5 percent of the county. It contains a larger proportion of Manteo soils than the Nason-Tatum-Manteo association, and the Nason soil is loam instead of silt loam. Most of the soils are coarser textured than those in the Nason-Tatum-Manteo association. Minor members of the association are the Lignum, Worsham, Seneca, and Orange soils, and Mixed alluvial land. These soils occur on many farms, but generally not in acreages that greatly influence the use of the land. The farms have enough acreage of fairly good cropland so that there is little need for intensive use of the less favorable soils.

All of the soils of this association are better suited to vegetables and tobacco than the finer textured soils of the Nason-Tatum-Manteo association. The soils are not fertile. The principal management requirement is to build up productivity by applying manure, lime, and liberal amounts of commercial fertilizer, and by growing legumes. The cost of building up and maintaining productivity would be more than the income that could be derived from farming these soils.

GOLDVEIN-NASON-WORSHAM

The Goldvein-Nason-Worsham soil association (fig. 3) comprises only about 0.1 percent of the county acreage. It occurs in only one area in the south-central part of the county. Goldvein soils make up about 95 percent of the association, and the rest is about equally divided between Nason and Worsham soils. The Goldvein and Nason soils are light colored. They occur on ridgetops in uplands and on gentle slopes. The poorly drained Worsham soils were derived chiefly from colluvial materials. A small acreage of Mixed alluvial land is included in the association. Coarse-grained quartz monzonite underlies most of the association.

Except for a few very small fields that are in crops or idle, all of the land is in cutover forest. Trees grow very slowly, especially on the Goldvein soils. Most management problems pertain to forest production.

If cropped, the soils of the Goldvein-Nason-Worsham association would have to be managed very intensively to improve fertility. High productivity would be difficult to maintain. Most of the soils are easy to work and fairly easy to conserve. Under present conditions, however, yields would not provide even enough products for home use.

CECIL-APPLING-LOUISBURG

The Cecil-Appling-Louisburg soil association (fig. 3), occurs in the southeastern part of the county. It comprises only about 0.1 percent of the total acreage of the county. The soils occupy narrow upland ridgetops and a few slopes. In most places their relief is undulating to gently rolling. About 92 percent of the association is made up of the Cecil soils, but minor acreages of the Appling and Louisburg soils occur. Nearly all of the soils were derived from granite or gneiss.

The Appling soils occupy comparatively extensive areas near Cloverdale; Colfax, Seneca, and Worsham soils occur on small widely scattered areas. The shallow Louisburg soils occur on the stronger slopes

immediately below ridgetops; the poorly drained Worsham soils occupy areas around drainheads; and the somewhat poorly drained, light-colored Colfax soil occurs mainly in depressions in the uplands.

Drainage is generally good in the Cecil and Appling soils. As a rule surface runoff is medium, but a small part of the cleared land is severely sheet eroded and gullied.

About 65 percent of the association, mainly the Cecil soils, is cleared, and most of the soils in cleared areas are well suited to crops and pasture. Forests consist of mixed hardwood and pine. Roads are adequate on the association, and areas are fairly thickly populated.

Most of the cultivated areas on this association are in small general farms, but a few areas are planted only to crops for home use. The soils are well suited to these two types of farming; much of the cleared land is well suited to pasture. The soils are generally fairly to highly productive of crops if fertility is maintained at a high level, but on many farms, soil management is only fair to poor. Soil management could be improved considerably by adopting such practices as liming and fertilizing properly and using suitable crop rotations and good tillage methods. The cost of maintaining productivity is likely to be more than the income that can be derived from farming these soils.

APPLING-CECIL-LOUISBURG

The Appling-Cecil-Louisburg soil association (fig. 3) occupies about 4 percent of the county. It is distributed over the eastern part of the county. It occurs on the higher uplands in fairly large areas that are predominantly undulating and rolling.

The association is made up of some of the most desirable soils in the county. Appling soils on gently undulating to gently rolling upland ridges occupy 50 to 60 percent of the total area; well-drained Cecil soils on narrow ridgetops, 20 to 25 percent; and the somewhat excessively drained Louisburg soils, 10 to 15 percent. The rest of the association consists principally of Worsham, Colfax, Vance, Helena, Durham, and Seneca soils.

The Worsham and Seneca soils occur on colluvial slopes, and the Colfax, Vance, Helena, and Durham soils on undulating uplands. The Durham soil is well drained; the Vance and Seneca soils moderately well drained; the Helena and Colfax, somewhat poorly drained; and the Worsham soils, poorly drained. In nearly all areas, the soils have formed from weathered granitic rock.

Most of the soils are generally well suited to agriculture. As a rule they have smooth surface relief that is favorable for fieldwork. Workability is generally good, and good tillage conditions are easily maintained. A substantial part of the land is cropped or pastured, or is idle. The greater part, however, is in forest. The soils are well suited to forest, and valuable species of trees are grown.

Most farms in this association produce only for home use, but there are a few livestock farms. Many of the farms are larger and more prosperous than those on the associations described in the preceding pages, and management is generally better. A large proportion of the population of the granitic belt of the county lives on this association. Roads are good.

Although some improvement could be made, land-use adjustment is generally good. Improved soil management should include measures for the conservation of soil and water, as well as suitable crop rotation, fertilization, and careful tillage.

LOUISBURG-APPLING-CECIL

The Louisburg-Appling-Cecil soil association (fig. 3) in the southeastern part of the county occupies about 7 percent of the total county. About 85 percent of the association consists of rolling, hilly, and steep areas of the Louisburg soils; 10 percent, of Appling and Cecil soils; and the rest, of very small widely scattered areas of mixed alluvial land and Seneca, Colfax, Worsham, and Helena soils. The Louisburg soils occur on deeply dissected uplands. They are shallow and, in most places, hilly and steep. The deep, well-developed Appling and Cecil soils occupy upland ridgetops and, in places, rolling slopes.

The Seneca soils have formed from recent colluvial material derived from soils on uplands; the Colfax soil, in part from alluvial, colluvial, and residual materials. Both of these soils occupy depressions around the heads of drainageways and positions at the bases of slopes. The poorly drained Worsham soils occur on colluvial slopes. The somewhat poorly drained Helena soils, which have a claypan in the subsoil, occur on undissected undulating uplands. Mixed alluvial land occurs on first bottoms along some of the smaller streams.

Most of the soils of this association are not suited to tilled crops and are not good for pasture, mainly because of their strong slopes and shallow depth. It may not be feasible to use the soils, even for pasture, except on farms that extend into other associations in which the soils are better suited to crops. Management requirements for the association consist largely of practices to improve forests.

APPLING-LOUISBURG

The Appling-Louisburg association (fig. 3) makes up about 3 percent of the county area. Its relief is predominantly undulating to rolling but in places it is hilly. Most of the association is made up of Appling and Louisburg soils, but widely scattered Colfax, Cecil, Durham, Seneca, and Worsham soils, and Mixed alluvial land occur on a small acreage.

The Appling soils and small areas of Cecil soils occupy upland ridgetops and gentle slopes. These soils are well drained and deep. Most of the farms and roads and many of the homes are located on them. The Louisburg soils are somewhat excessively to excessively drained, shallow, and rolling to hilly. They occupy slopes that extend from upland ridgetops to the deeper drainageways. As a rule the Colfax soil occupies depressed to gently rolling upland areas around the heads of drainageways, or occurs on colluvial slopes. It is somewhat poorly drained. The light-colored, well-drained Durham soil occurs on undulating uplands. The Seneca and Worsham soils occupy undulating colluvial slopes, and Mixed alluvial land occurs on bottom lands. The Seneca soils are moderately well drained; Mixed alluvial land, well drained; and the Worsham soils, poorly drained.

A large proportion of the association is suited to intensive agricultural use and is well suited to crops. Roads are good. Many farms

are scattered over the association. On most of them, the products are grown only for home use. Some farms, however, are part-time or livestock farms.

Much of this association is in forest, though a larger proportion is cleared and cropped or pastured than is the case on associations that have less favorable soil conditions. Much improvement could be made in land-use adjustment and soil management. Many areas that are well suited to crops are in forest. The principal management need is to build up soil productivity, which is only moderate on most farms. Measures to conserve soil and water should also be applied.

APPLING-LOUISBURG-COLFAX

Soils of the Appling-Louisburg-Colfax soil association (fig. 3) make up 1 to 2 percent of the county. Their relief is predominantly undulating to rolling. These soils occupy broad upland ridgetops and a few gentle slopes immediately south of Wilmington. The Louisburg soils of the association occur in widely scattered areas on rolling and hilly slopes that lead to drainageways. The less extensive Colfax soil and a few patches of Helena soils occupy upland flats and areas around the heads of drainageways. The Worsham and Seneca soils occupy small scattered areas on colluvial slopes, and the few patches of Mixed alluvial land occur on areas along drainageways.

The Appling soils are much more extensive than other soils in the association. About 60 percent of the association is made up of the undulating and rolling phases of Appling gritty fine sandy loam. These soils are gritty and gravelly, and in places the Louisburg soils are noticeably so.

Although the undulating and rolling phases of Appling gritty fine sandy loam are not well suited to crops, they are nevertheless the best in the association, and are the principal agricultural soils. The soils of this association are the least fertile of any in the county, but on many farms productivity has been built up to a fairly high level. Relief is generally favorable for tillage. Pastures are generally poor to very poor except where management has been intensive, but forests grow well.

There are only five or six farms in this association, and farm products are generally grown only for home use. The areas are fairly densely populated, however.

Maintaining the productivity of the loose, open, gritty soils is the principal management problem. Suitable crop rotations and liberal fertilization are necessary. Barnyard manure should be applied if it is available. The stronger slopes erode easily, so runoff control is also essential.

HELENA-VANCE-APPLING

Several very small areas of the Helena-Vance-Appling association (fig. 3) occur in the northeastern part of Fluvanna County. Soils of this association make up only about 2 percent of the county area. The Helena soils occupy about 75 percent of the association, and the Vance and Appling soils, minor areas. Colfax, Worsham, Louisburg, Fluvanna, and Bremo soils, and Mixed alluvial land occupy a small part. Except for the Worsham soils, which are mainly on colluvial slopes, and the Mixed alluvial land of first bottoms, all of these soils

occupy uplands. Generally the relief is very gently undulating to gently rolling, although it is rolling to hilly in the Louisburg soils.

The somewhat poorly drained Helena soils have pan layers that are plastic when wet, and these soils are poorly suited to many crops. The moderately well drained Vance soil has a firm subsoil that is plastic when wet. The Appling soils are deep and well drained, but a brittle pan occurs in the somewhat poorly drained Colfax soil. The Worsham soils and most of the Mixed alluvial land are poorly drained. The Louisburg soils are shallow and excessively drained. The Fluvanna soils—similar to the Appling soils in many respects—are well drained to somewhat excessively drained. Drainage in the Bremo soils is also good to excessive.

Most of the soils of this association are poorly suited to tilled crops. Pasture grows well if management is good. The soils are well suited to many species of trees.

Most of the land is in cutover forests, principally hardwood. Only a few farms of any size have been established, and on these the products are grown for home use. Some are run by part-time operators. Many areas, once cleared, have either reverted to forest or are idle. Pasture is generally very poor. The few home orchards are poor. Probably because of the milder relief, a larger part of this association has been cleared than is the case in some associations that have better soils.

It is doubtful if farms that are wholly within this association can be made self-supporting under present circumstances. Unless the soils are used with better cropland in adjacent associations, it will be difficult to use them advantageously. Mainly because of pans and unfavorable drainage, the soils are difficult to manage. Few can be drained adequately so that crops will grow well. Even under the highest levels of management, yields of essential crops produced for home use can be expected to be low.

MADISON-LOUISA-LLOYD

The Madison-Louisa-Lloyd soil association (fig. 3) comprises between 2 and 3 percent of the county. Most of the association consists of Madison soils, but Louisa soils are fairly extensive. Lloyd, Bremo, and Starr soils, and Mixed alluvial land occur in small, widely scattered areas.

The association occurs in the extreme eastern part of the county along the Goochland County line. Relief is very gently undulating to steep, but in about 75 percent of the association, it is undulating to rolling. Except for the Starr soil on colluvial slopes, and Mixed alluvial land on first bottoms, the soils occupy uplands. Mixed alluvial land is poorly drained, but drainage is good to excessive in the other soils.

About 93 percent of this sparsely populated association is in forest, and the land that is cleared is not cropped extensively. Good sand-clay roads serve the area. There has been some prospecting for gold.

The soils as a rule are well suited to a number of crops. Workability is very good to poor; conservability is mainly fair to poor. Productivity can be maintained at a fairly high level in most of the soils.

Some of the better soils could be cleared and used for crops and pasture. Good management would be necessary, however, to obtain satisfactory results.

LLOYD-FLUVANNA

The Lloyd-Fluvanna soil association (fig. 3) occurs in the northeastern part of the county. It occupies about 5 percent of the county area. Most of the association is made up of Lloyd soils. The well-drained Lloyd and Fluvanna soils occur on upland ridgetops and slopes. Bremo, Starr, Orange, Wilkes, Elbert, Zion, and Seneca soils, and Mixed alluvial land are the minor members of the association.

Most of the soils in this association have developed from weathered material of basic rock. Nearly all have a silt loam or silty clay loam texture. Relief is undulating for the most part.

These soils are among the most fertile in the county. To a large extent, they are cropped or pastured. Workability and conservability are fair to good. The soils are well suited to general grain-and-livestock farms and to pasture and forest.

Many of the larger, more productive farms of the county are in this association. Livestock farms and farms where products are grown mainly for home use are the two main types of farms. Land use could be improved, but is generally fairly good. Areas of this association are fairly densely populated.

Because much of this association is well suited to crops, the main problem that the farmer has is to manage his soils properly. Some change should be made, however, in the use that is being made of some of the soils so that they will be used for the purpose for which they are best suited. Management requirements include crop rotation, fertilization, careful tillage, and water control.

BREMO-ORANGE-FLUVANNA

The Bremo-Orange-Fluvanna soil association (fig. 3) covers about 4 percent of the county. Bremo soils make up about 80 percent of the association, and Orange and Fluvanna soils, about 15 percent. The rest is comprised of Starr, Lloyd, Elbert, Worsham, Wehadkee, and Wilkes soils and Mixed alluvial land.

The soils of this association are generally shallow, and their relief is rolling to hilly. Except for the Starr and Wehadkee soils and Mixed alluvial land, the soils occur on uplands. The Elbert and Wehadkee soils, though occurring on level uplands, are not typical upland soils.

Many areas of Starr and Fluvanna soils are so isolated from other areas of good cropland that it is not feasible to use them for crops. Only a few farms are made up entirely of soils of this association. Most of the farms are operated by part-time farmers. Few areas are improved; about 95 percent of the association is in cutover mixed hardwood and pine forest (pl. 4).

Areas that are well suited to crops are so small and scattered that it is not practical to use them for that purpose unless the farms extend into associations that have a larger acreage of good crop soils. Areas that are close to better soils of other associations can be pastured if carefully managed. Present management needs are mainly those that will improve the forests.

ORANGE-FLUVANNA-ZION

The Orange-Fluvanna-Zion soil association (fig. 3) makes up 1 to 2 percent of the county. Most of the association is in the south-central part of the county, but two small areas occur along the northeastern border. The association consists mainly of Orange soils, but Fluvanna and Zion soils occupy a minor part, and small areas of Elbert, Bremo, Lloyd, Nason, Wilkes, and Seneca soils, and Mixed alluvial land occur. The prevailing relief is gently undulating to gently rolling.

The Orange soils occur on gently undulating to gently rolling uplands, mainly on some of the lower parts. These soils have firm claypan subsoils that are very plastic when wet. The deep, well-drained Fluvanna soils occupy upland positions intermediate between the Lloyd and Orange soils. The Zion soil, resembling the Orange soils in relief, is slightly better drained, but it has a gravel pan in the subsoil.

The poorly drained Elbert soil and the moderately well drained Seneca soils occur on colluvial slopes. The Bremo and Wilkes soils are shallow upland soils; the Bremo soils are well drained to somewhat excessively drained; and the Wilkes soils, somewhat excessively drained. The inextensive Lloyd and Nason soils are the best soils of the association.

The soils of this association are poorly to very poorly suited to crops and are fairly well suited to very poorly suited to pasture. Nevertheless, they are more widely used for crops than better soils in other associations, because the relief is so favorable. Trees grow very slowly on these soils, and much of the land has been kept from reverting to forest because of the poor quality of the trees. Most areas of the more desirable Lloyd, Nason, and Fluvanna soils are so small that they do not affect the use of the more extensive soils. Workability is poor to good, and conservability is fair to good. Generally the soils can be cultivated under only a narrow range of moisture conditions.

Livestock or dairy farms, or farms that produce for home use, predominate. Some of the farms are fairly large and have a comparatively large acreage in crops and pasture. Some extend into associations in which the soils are better suited to crops.

FLUVANNA-LLOYD-BREMO

The Fluvanna-Lloyd-Bremo soil association (fig. 3), occurring mainly in the northeastern part of the county, occupies about 2 percent of the county. The association is comprised mainly of Fluvanna, Lloyd, and Bremo soils of the uplands and small acreages of Elbert, Worsham, and Seneca soils of colluvial slopes; Wehadkee and Chewacla soils and Mixed alluvial land of first bottoms; and Orange, Helena, and Wilkes soils of uplands. Relief is predominantly undulating to rolling. Undulating and rolling phases of Fluvanna fine sandy loam are the principal Fluvanna soils of the association.

Few areas of this association are farmed, although most are well suited to crops and pasture. Management is principally that needed to produce forest. Trees grow fairly rapidly, and some are of valuable species. If more of the soils are cleared for crops, their management

should include the use of suitable crop rotations, proper fertilization, careful tillage, and other measures to build up and maintain productivity.

HIWASSEE-MASADA

The Hiwassee-Masada soil association (fig. 3) occupies about 3 percent of the county area. The soils occur in small widely scattered areas, generally on high undulating to rolling terraces along the James and Rivanna Rivers. Hiwassee soils predominate, and the Masada soil occupies only a minor part. A few small areas of Roanoke, Altavista, and Augusta soils are included.

The Hiwassee soils occur on high terraces. They are well drained to somewhat excessively drained. The moderately well drained to well drained Masada soil generally occurs on very gently undulating terraces on lower positions than the Hiwassee soils. The somewhat poorly drained Augusta soil occurs on low stream terraces.

Good agricultural soils predominate in this association. The soils are, for the most part, more fertile than those of other associations. Small isolated areas along the James River, however, are difficult to use for crops. Most farms include areas of both uplands and first bottoms. Most of the farms produce for home use, but there are also a few tobacco and livestock farms.

Most of the soils are well suited to a number of crops. The population is comparatively dense, and the standard of living is fairly high. Some small areas that are not well suited to crops are idle, and others have reverted to forest. Because some small farms have only a little good agricultural land, good management has been applied to some of the less favorable soils, and the farms have thereby been made self-sustaining.

Apparently the soils of the Hiwassee-Masada association were among the first in the county to be cleared. They were evidently considered good cropland, as practically every area has at some time been cleared. Most areas are still cropped. Adjustment in use of the soils, however, is needed in some places. The principal management needs are crop selection, crop rotation, fertilization, careful tillage, and in some places other measures to reduce soil and water losses.

CONGAREE-WICKHAM-CHEWACLA

Soils of the Congaree-Wickham-Chewacla soil association (fig. 3) make up approximately 5 percent of the county. The soils occur in widely scattered elongated areas along many of the larger streams. They occupy nearly level first bottoms and, to a small extent, undulating terraces. The Congaree soils make up more than 60 percent of the association; the rest is mainly Wickham and Chewacla soils, small areas of Wehadkee and Buncombe soils, and Mixed alluvial land. The Congaree and Wickham soils are well drained; the Chewacla soil, somewhat poorly drained; the Buncombe soil, excessively drained; and the Wehadkee soil and Mixed alluvial land, poorly drained.

The well-drained soils of this association are used extensively for crops. The poorly drained soils are used principally for pasture. These are good agricultural soils—for the most part, better than those of the adjacent associations. All but the Wickham soil are frequently

flooded. Artificial drainage would improve the pasture and broaden the use suitability of Wehadkee and Chewacla soils. The areas that need drainage are not large, and on some farms, artificial drainage is not especially needed. Because of the risk of floods, some soils are suitable only for summer annual crops. Drainage and flood prevention are important problems of soil management.

AGRICULTURE

EARLY HISTORY

In the area that is now Fluvanna County the Indians of the Monacan Confederacy practiced a crude form of agriculture before the white man came (*1*). Indian corn and beans were the principal crops. They were grown mainly on the Hiwassee and Wickham soils of the terraces, and on the Congaree soils of the bottom lands bordering the James and Rivanna Rivers. The Indians probably chose these soils because they were near the rivers and were more productive than the uplands. Wild fruits such as persimmons, grapes, blackberries, strawberries, and plums, were abundant. Deer, bear, grouse, quail, turkey, and fish were plentiful.

Most of the early white settlers built their homes along the James River and other large streams. They cleared and farmed the fertile bottom lands. As the number of settlers increased, all the arable lands were taken up. Later more and more of the uplands were cleared, and eventually a large part of the county was used for agriculture.

Agriculture has been the main occupation of the inhabitants of Fluvanna County from its earliest settlement around 1730. At first the settlers were entirely self-sustaining, mainly because distances to market were so great and transportation facilities poor. The forests that covered the county furnished lumber and logs for shelter and fuel. Wild game and fruit supplied some of the food.

At first corn, oats, wheat, potatoes, and vegetables were the only crops. Tobacco soon became the main cash crop, however. It was grown year after year on the same soils. Most of the tobacco was exported to England after it had been shipped by flatboat down the James River and marketed in Richmond. In the early settlements, tobacco was often used in place of money, particularly to make payments to the church. The sale of lumber and other forest products may have supplied part of the farm income.

The early agricultural practices were generally wasteful of soil resources. Little attention was given to crop rotations, cover crops, or to runoff and erosion control. As a result gullies formed in the cultivated areas. Remnants of these old gullies can still be seen in some forests of scrub pine on areas once used to grow corn and tobacco. Land was cheap and plentiful. As the fertility in cultivated fields became depleted or the soils became otherwise unsuitable for crops, new fields were cleared to replace them and the abandoned land reverted to forest.

Immediately following the Civil War, the value of land and agricultural products decreased greatly. Little money was available to

employ help to till the land. Plantations that had once been productive were abandoned, and were subsequently divided into smaller subsistence units or were allowed to grow up in forest. Land was seldom used or managed properly. Consequently the soils became more depleted and eroded and less productive. Corn, wheat, and oats were still the principal crops grown for home use, but both tobacco acreage and yields declined sharply.

Lespedeza was introduced about 1930. Its use was accompanied by a greatly increased use of lime and fertilizer. Agriculture in the county began to improve, and better land use and soil management were introduced.

Livestock, including poultry and poultry products, became more important in the more diversified system of farming that developed. Livestock largely replaced tobacco as a source of cash. More soils were used for permanent pasture and hay, instead of for corn and wheat. Systematic crop rotations became more common, and other good management practices were adopted to improve the soils.

Agriculture has benefited by the construction of better rural roads and by the use of more automobiles and motortrucks. Since 1933 the State Highway Department has maintained the county roads. Before that time the secondary roads were so poor that during wet periods trucks could not be used to haul lime, fertilizer, or other agricultural materials to farms.

FARMS AND FARM CHARACTERISTICS

LAND USE

Table 5 gives number of farms and land in farms in Fluvanna County during the period 1930–50. The Federal census reported 889 farms in the county in 1950. The average size of the farms was reported to be 127.5 acres.

TABLE 5.—*Number of farms and land in farms in Fluvanna County, Va., in stated years*

Number and acreages of farms	1930	1940	1950
Farms—number	1, 109	1, 157	889
Area in farms—acres	127, 146	120, 639	113, 320
Proportion of county—percent	69. 7	66. 8	62. 8
Average size of farms—acres	114. 6	104. 3	127. 5
Improved land in farms—acres	45, 595	39, 936	33, 342
Proportion of farmland—percent	35. 9	33. 1	29. 3
Average per farm—acres	41. 1	34. 5	37. 4

Table 6 classifies farmland of Fluvanna County according to use in stated years. Most of the soils not in farms are covered by timber in various stages of growth. The timber is not concentrated in any one part of the county; it is fairly well distributed.

TABLE 6.—*Farmland according to use in Fluvanna County, Va., in stated years*

Use	1939		1949	
	Farms reporting	Area	Farms reporting	Area
Land in farms according to use:	*Number*	*Acres*	*Number*	*Acres*
Cropland harvested	1,116	20,751	765	16,890
Crop failure	32	370	(1)	(1)
Cropland idle or fallow	467	5,990	415	8,231
Cropland used only for pasture	[2] 764	[2] 12,825	393	8,221
Woodland pastured	(1)	(1)	355	10,431
Other pasture (not cropland and not woodland)	(1)	(1)	491	11,185
Woodland not pastured	(1)	(1)	700	54,023
Other land [3]	1,153	14,498	833	4,339
Cropland, total	[2] 1,146	[2] 39,336	845	33,342
Land used for crops (harvested and failure)	1,116	21,121	(1)	(1)
Land pastured, total	(2)	(1)	750	29,837
Woodland, total	1,000	66,205	796	64,454

[1] Figure not available.

[2] Figures for 1939 include land pastured that could have been plowed and used for crops without additional clearing, drainage, or irrigation. The 1949 figures include rotation pasture and all other cropland used only for pasture.

[3] Includes all wasteland, house lots, barnyards, feed lots, lanes, roads, and ditches.

TYPES OF FARMING AND SIZE OF FARMS

Of the farms reported by the 1950 Federal census, approximately 71.4 percent were miscellaneous and unclassified. The remaining farms are listed by type of farm in 1950 as follows:

Field-crop farms other than vegetable and fruit and nut	10
Cash-grain	5
Other field-crop	5
Fruit and nut	4
Livestock farms	182
Dairy farms	38
Poultry farms	55
Livestock farms other than dairy and poultry	89
General farms:	
Primarily crop	2
Primarily livestock	32
Crop and livestock	18

In 1950 the size of farms ranged from less than 10 acres to more than 1,000 acres. A little more than a third of the farms ranged in size from less than 10 acres to 49 acres; about half contained from 50 to 219 acres; and the remainder contained more than 220 acres.

CROPS

In the early days of the county, farming consisted mainly of growing corn, small grains, tobacco, and hay, and raising livestock. Forests,

orchards, garden crops, and poultry supplied some income. Though grain, tobacco, hay, and livestock have generally been the principal source of income, they have varied in relative importance.

The acreage of the principal crops and the number of fruit trees and grapevines of bearing age grown in Fluvanna County in stated years is shown in table 7. Fairly recent crops are soybeans and lespedeza. The lespedeza especially has replaced some of the acreage in older crops. A few minor crops such as broomcorn are no longer grown.

The acreage in hay and other close-growing, soil-conserving crops has increased considerably since 1929. Corn was the most extensive crop until about 1939, when the acreage reported for hay was greater than for corn. Corn and wheat acreages have declined since about 1929, however. Acreages in other soil-depleting crops, such as tobacco, potatoes, and sweetpotatoes, have decreased also.

TABLE 7.—*Acreage of the principal crops and number of fruit trees and grapevines of bearing age in Fluvanna County, Va., in stated years*

Crop	1929	1939	1949
	Acres	*Acres*	*Acres*
Corn harvested for grain	8, 633	6, 690	4, 058
Oats:			
Threshed or combined	208	399	521
Cut and fed unthreshed	130	52	71
Winter wheat, threshed	3, 860	2, 976	2, 260
Rye, threshed	118	56	13
Barley, threshed	9	347	255
Cowpeas for all purposes grown alone	170	370	49
Soybeans for all purposes grown alone	1, 023	281	257
Hay	[1] 5, 422	[1] 8, 582	[2] 9, 159
Timothy and (or) timothy and clover mixed	2, 547	1, 160	2, 823
Clover alone	395	[3] 70	(4)
Lespedeza	(4)	5, 174	5, 365
Alfalfa	292	184	309
Other cultivated grasses or tame hay	750	1, 131	563
Wild grasses	217	211	(4)
Small grains cut for hay	137	195	65
Annual legumes saved for hay	1, 084	[5] 457	(4)
Corn cut for silage	24	(4)	136
Coarse forage	216	(4)	72
Potatoes	195	144	36
Sweetpotatoes	72	78	9
Vegetables harvested for sale [6]	331	122	19
Tobacco	259	139	87
	Number	*Number*	*Number*
Apple trees	20, 547	10, 641	5, 621
Peach trees	4, 817	2, 981	1, 506
Pear trees	1, 136	874	508
Plum and prune trees	777	506	435
Cherry trees	947	455	341
Grapevines	2, 136	1, 382	1, 114

[1] Exclusive of sorghums; includes acreage of legumes saved for hay.
[2] Exclusive of soybean, cowpea, peanut, and sorghum hay.
[3] Sweetclover grown alone.
[4] Not reported.
[5] Includes soybeans and cowpeas harvested for hay.
[6] Does not include potatoes and sweetpotatoes.

Corn harvested for grain, tobacco, potatoes, and sweetpotatoes totaled 9,159 acres in 1929 according to the Federal census. By 1949 there had been a decrease of 4,969 acres in these crops (see table 7), as a total of 4,190 acres was reported by the census in that year.

CROPPING PRACTICES

Corn.—In Fluvanna County corn has increased in average yields during the past few years. In 1939 the Federal census reported an average of 25 bushels an acre, in contrast to 36 bushels reported for 1949. Some farmers who had good soils reported yields as high as 90 bushels in 1947. The increased yields have resulted, to a great extent, from an increased use of lime and complete fertilizers, and the use of new hybrid corn varieties. About 60 percent of the corn produced in 1945 was hybrid.

Corn is grown on nearly all of the soils of Fluvanna County, but it yields much better on some soils than on others. The recent trend has been to grow corn on the better soils such as the well-drained, undulating phases of Tatum, Nason, Lloyd, Fluvanna, Cecil, and Appling soils of uplands; the Starr and Seneca soils of colluvial lands; the Wickham and Hiwassee soils of terraces; and the Congaree soils of bottom lands.

Normally, cornland is plowed in February or March. On some farms it is plowed in November and on others as late as April. The time of plowing depends mainly on weather and availability of labor. If tractors are not available, two-horse walking plows are used to break the land. The seedbed is prepared by disking, harrowing, and dragging or rolling.

Most corn is planted early in May. It is usually drilled in rows by using one-row planters. Corn is planted later on most soils of bottom lands. The reason is that these soils usually remain too wet to plow until late in spring or early in summer. These soils also remain cold much later than soils of uplands, so they are best suited to varieties of corn that require only a short growing season.

If corn is fertilized, the fertilizer is generally applied at planting time by means of an attachment on the corn planter. Some farmers prefer to broadcast the fertilizer and harrow it in before the corn is planted. Some farmers then sidedress it with nitrate of soda or other nitrogen fertilizers.

Ordinarily corn is cultivated two or three times during the growing season, depending on the weather and the number of weeds. On most farms walking cultivators are used. Most cornfields are chopped or hoed once, usually after the second cultivation.

Early in the fall, the ripe corn is cut, usually by hand. In most cases it is left in shocks in the field until late fall or early in winter; then the ears are pulled from the stalks, shucked, and stored in cribs. The stalks are tied in bundles and shocked or stacked and are used later for fodder. Some farmers do not cut or shock the cornstalks, but turn livestock into the fields to forage after the ears of corn have been removed from the stalks. A few farmers top the corn by cutting off the green plant just above the ear and pulling off the other blades. The tops and blades are used for forage. On some farms the whole cornstalks are cut and removed from the fields and the ears are re-

moved and husked later. Corn for silage is cut several weeks earlier than that to be used for grain.

Most of the corn is stored in open cribs or barns to dry out or cure. It is then either fed to livestock or ground to make bread.

Corn has become less important as a feed since high-yielding varieties of barley and other small grains have been introduced. Upland soils on which corn is grown are more subject to accelerated erosion than soils on which small grains are grown. Corn should be planted on the relatively smoother and more productive soils. If possible the acreage should be reduced and management practices used that will improve the physical condition of the soil.

Small grains.—Except for oats, small grains have decreased in acreage during recent years (see table 7) though some have increased in yields. The acreage of oats, threshed or combined, though small, increased somewhat from 1939 to 1949, according to the Federal census. The average yield increased from about 23 bushels an acre in 1939 to about 29 bushels in 1949. Rye has decreased in acreage until it is of little significance as a crop. The higher yields of some small grains have resulted mainly from growing higher yielding varieties and using more fertilizer and lime. The decrease in wheat acreage may stem largely from the adoption of the Federal wheat-allotment program.

Most small grains are grown on the same soils used for corn. Good yields are obtained on nearly all of the well-drained soils of uplands. Little of wheat or of other small grains is grown on soils of first bottoms, which are not so well suited to small grains as soils of uplands. Oats produce well, however, on a few of the better drained bottom lands.

Seedbeds are usually prepared for small grains by disking, harrowing, and dragging, or rolling, cornstubble land. The seed is planted by using grain drills, and the fertilizer is generally applied at the same time. Wheat and rye are sown about the time of the first killing frost. Barley is sown about 2 weeks earlier than wheat or rye; and oats about 4 weeks earlier, or as soon as the soil can be made ready. Abruzzi rye, used for grazing, is sown 2 to 3 weeks earlier than wheat.

Binders are generally used to harvest small grains, although a few small combines are used. The grain is cut during the latter part of June or the early part of July. Oats usually ripen first, followed by barley and wheat. Most small grains are tied into bundles and shocked in the field, where they dry out and cure before they are threshed. Some farmers haul their small grains to local threshers to have them threshed. Others stack them in the fields or store them in barns to be threshed later in the summer or in the fall. Some oats are mowed, raked, and put into barns, where they are fed unthreshed to livestock.

Nearly all small grains are stored in barns after they are threshed, so that they will dry out thoroughly before being used or sold. Some farmers, however, sell part of their crop to local millers immediately after it is threshed. Some small grain is used by the farm family, and some is shipped to outside markets. An increasing use is being made of small grains to feed livestock and poultry on the farm. Increasing the acreage of small grains would benefit the agricultural economy, and it would be an improvement in land use.

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Small grains grow well on many soils, and they are good cover crops and nurse crops. Under good management they will produce comparatively high yields. On well-suited soils and under proper management, wheat will produce more than 30 bushels an acre in a favorable season.

Cowpeas and soybeans.—Cowpeas and soybeans are grown mainly for hay or for soil improvement in Fluvanna County. The acreage is not large (see table 7). These crops are grown in all parts of the county, usually on the same soils used for corn.

Cowpeas and soybeans are usually planted on land that has been plowed and prepared too late for corn. The seed is generally inoculated and the crop fertilized at the time of seeding. It is broadcast about 2 to 3 weeks after corn-planting time.

Cowpeas or soybeans to be used for hay are harvested between late August and early October. If the crop is grown for seed, harvesting takes place some time in September. The hay is generally stored in barns and is fed to livestock. Most of the beans and peas harvested are also fed to livestock, but some of the peas are used for food.

Some cowpeas and soybeans are used for pasture, and some are turned under to improve the soil. Cowpeas sown at the time the corn is cultivated for the last time and disked in before small grain is planted should be beneficial to the less fertile soils such as some phases of the Nason, Tatum, and Fluvanna soils.

Hay.—The acreage of hay and forage crops has increased during the past few years (see table 7) because the use of fertilizers and lime became more general. The increase began about the time that lespedeza was introduced in the county. Lespedeza will make a fair growth on the poorer soils. It increases fertility by collecting nitrogen for the soil. It reseeds itself, spreads rapidly, and makes good late pasture and good hay. According to the Federal census, the average yield of lespedeza in Fluvanna County in 1949 was about 1.2 tons an acre.

Lespedeza is now a principal hay crop in the county, and timothy and clover mixed are important. Minor hay crops are alfalfa, clover grown alone, wild grasses, and small grains. Lespedeza was generally grown alone when first introduced, and much of the crop (5,365 acres in 1949) is still grown alone. In recent years, however, many farmers have found that lespedeza does not make a good cover crop during the winter. Consequently some lespedeza is now grown in mixtures with red clover, timothy, and alfalfa.

Lespedeza grows best on the well-drained soils of uplands and bottom lands. Nevertheless, it will grow on most of the somewhat poorly drained soils. It makes only a short growth on eroded soils unless it is fertilized, mulched, and limed heavily.

Generally lespedeza and clover are sown early in the spring in a small grain. The seed is broadcast or drilled. Most of the crop is harvested for hay to feed to livestock or to sell on local markets. According to the Federal census, 265 acres of lespedeza was harvested for seed in 1949.

The alfalfa acreage is small, although it increased slightly between 1939 and 1949. Only a little red clover is grown alone. According to the Federal census, 65 acres was grown for seed in 1949. Some

attempts were made to grow alfalfa, sweetclover, and red clover on soils to which they were not adapted. The resulting poor yields discouraged the wider use of the crops. They do well on soils that have well-drained, well-developed red subsoils, such as the Lloyd, Hiwassee, Wickham, Cecil, and Tatum soils. With the increased use of lime, fertilizer, and borax, legume hay production has increased.

Timothy and redtop can be grown on many soils of the county, and are generally sown in mixtures with clover and lespedeza. Small acreages of orchardgrass and Dallisgrass are grown. Johnsongrass, the seed of which is deposited on river bottoms by floodwaters, is generally considered a pest, but a little of it is cut for hay.

Ladino clover has been grown with alfalfa and grasses to some extent, but it seems to be more suitable for pasture than for hay. It is adapted to rather wet soils. It should give good yields on the Wickham, Augusta, Chewacla, and Congaree soils. It would probably not do well on Worsham, Wehadkee, or Elbert soils.

Potatoes and sweetpotatoes.—Only a small acreage is generally planted to potatoes and sweetpotatoes in Fluvanna County. These crops are grown chiefly for home use and are planted in practically every farm garden. Most of the potatoes grown for sale are sold on local markets.

Garden vegetables.—Snapbeans, waxbeans, limabeans, sweet corn, peas, tomatoes, onions, carrots, turnips, beets, cabbage, eggplant, radishes, squash, watermelons, cantaloups, peppers, lettuce, cucumbers, and kale and other greens are the usual vegetables. Nearly all of the vegetables are grown for home use. Some, chiefly tomatoes, are sold to various canneries nearby for processing. In 1949, according to the Federal census, only 19 acres was planted to vegetables harvested for sale, exclusive of potatoes and sweetpotatoes.

Tobacco.—The acreage in tobacco has decreased considerably since 1929, but the average acre yield has increased gradually. Lack of nearby markets, unfavorable prices, and Federal allotment controls have contributed to the decline in acreage.

Tobacco is grown mainly in the eastern part of the county. The best yields and the highest quality tobacco are produced on the Appling, Masada, and Durham soils. The Orinoco varieties of sun-cured tobacco are grown almost exclusively.

The young plants are started in beds early in spring. Beds are prepared by first burning over an area of new ground and then plowing or spading up a small plot and fertilizing it heavily. The bed is protected from frost and sun injury by covering with a special cloth. The small plants are transferred to tobacco fields late in May or early in June, and from 4,000 to 5,000 plants are set to an acre. The plants are cultivated three or four times, so as to leave ridges or hills.

Approximate harvest dates are September 15 to October 1. The tobacco is cut and hung on poles in open sheds, or placed on racks in the field until properly cured. It is then stripped from the stalk, graded, and taken to the Richmond market.

Orchard fruits.—Some apples and peaches are grown for home use in this county, and some surplus fruit is sold. Fruit is not grown strictly on a commercial basis, however, anywhere in the county. A few plum, pear, cherry, and quince trees and some grapes and berries are grown to supply fruit for home use.

ROTATIONS

Suitable crop rotations, consistently followed, are of major importance in the management of the soils of Fluvanna County. A good rotation will supply nitrogen and organic matter, in which many of the soils are deficient. It will include deep-rooted crops to help maintain the porosity of the clay subsoils. The selection of a rotation will depend to some extent on the acreage of tillable land on each farm, and on the relative need for feed crops or cash to operate the farm. For soils that are well suited to crops, short rotations should be chosen so as to get the best returns from the soils.

On the better managed farms, 3-, 4-, or 5-year rotations are common. A typical rotation consists of corn or tobacco the first year; wheat or other small grain the second year; hay (lespedeza, clover, or both) the third year; hay (redtop, lespedeza, and timothy) the fourth year; and hay (mostly grasses) the fifth year.

On some soils of bottom lands, a 1- to 2-year rotation consisting of corn and hay, mostly clover, is used. On other areas of these soils, a 3-year rotation is used that consists of a small grain 1 year and hay for 2 years.

Some farmers follow no definite rotation. They usually grow corn and then let the land remain idle for 3 to 8 years before they plant corn again. While the land is idle, weeds and brush grow up and have to be cleared away before another crop can be planted. Also plant nutrients are lost through accelerated erosion and leaching.

On many farms rotations are not used efficiently, even though the best ones have been selected. On the smoother soils, shorter rotations could be used to advantage. On strongly rolling and hilly soils, rotations should be lengthened in many cases. The best yields are obtained where moderately short rotations, which include legumes, are used on smooth to rolling soils that have been limed and heavily fertilized.

FERTILIZERS

Except for the Congaree, Chewacla, and Wehadkee soils, the soils of Fluvanna County are low in organic matter and in most of the essential plant nutrients. Tests indicate, however, that the soils are very poor to very good in available potassium, phosphorus, calcium, and magnesium. Potassium and magnesium are the most abundant elements, and phosphorus and calcium are the least abundant in most soils tested. Some minor elements are needed to increase crop production.

The color of the surface layer in most soils of the county reveals the low content of organic matter and nitrogen. The few soils that occupy bottom lands, terraces, and colluvial lands have more nitrogen than those on uplands. Even on the few soils that have a naturally better than average content of nitrogen, nitrogenous fertilizer helps crops that need large quantities of nitrogen.

Manure supplies much of the needed organic matter and nitrogen on livestock farms. On most farms, however, a complete high-analysis fertilizer is needed.

In applying fertilizers, the proportion of the various fertilizer ingredients should be maintained. Too much of any one nutrient—phosphorus, potassium, nitrogen, or any other element—should not

be applied. Fertilizer needs vary; consequently, before fertilizer or lime is purchased, tests should be made to help determine the needs of the soils. The county agricultural agent can be of assistance in having such tests made.

SOIL AMENDMENTS

Most of the soils are too acid, or sour, for the common crops to grow well unless lime is applied occasionally. Lime requirements vary; therefore the soils should be tested to determine their pH, and lime applied accordingly.

The amount of lime needed depends not only upon the original acidity of the soil but also on the length of time it has been cultivated, how it has been managed, and what crops are to be grown. The finer textured soils that have a silt loam surface soil and clay subsoil need, for most crops, more lime than the coarser textured sandy loam, loam, and clay loam soils.

Ground limestone has been made available to most farmers, and its use has been encouraged by government subsidies. The lime is generally hauled to the field and spread direct from motortrucks designed for that purpose.

Much of the cropland and some of the permanent pastures in the county have been limed regularly. Many farmers who practice good management lime once during a 3- or 4-year rotation. They use 1 to 2 tons an acre of ground limestone, or its equivalent. Where alfalfa or sweetclover is to be grown, heavier applications are made.

Lime is generally applied to soils that have been prepared for small grains. It can be applied almost any time as a topdressing for permanent pasture, or to soils that are to be plowed for corn. Some farmers plow under part of the lime and put some on top. The lime is most often distributed this way when alfalfa is to be planted. It is also a particularly desirable method for soils consisting of eroded heavy clay.

Most of the lime used is ground limestone. Some is burnt lime or hydrated lime.

PERMANENT PASTURES

Permanent pastures have increased in extent and improved in quality during recent years. According to the Federal census, pastures occupied 26.3 percent of the land in farms in Fluvanna County in 1949 (see table 6). Of this, about 7.3 percent of all land in farms was cropland used only for pasture, and 9.2 percent was woodland pastured. The trend has been toward converting to permanent pasture those soils that are shallow, poorly drained, frequently flooded, or otherwise unsuitable for tillage.

Before 1930, pastures were generally poorly managed and of low carrying capacity. The vegetation consisted of broomsedge, poverty oatgrass, crabgrass, bermudagrass, redtop, common lespedeza, wild carrot, yarrow, plantain, cinquefoil, sheep sorrel, sourgrass, goldenrod, ragweed, mullein, common thistle, morning-glory, smilax, blackberry, dewberry, sumac, sassafras, and young scrub pines, shortleaf pines, and cedars.

More recently the quality and carrying capacity of pastures have been improved by sowing good pasture plants on suitable pasture

soils, liming and fertilizing, and controlling grazing. Kentucky bluegrass and redtop are the plants most commonly used in permanent pastures. Ladino clover and orchardgrass are used for temporary grazing. Whiteclover will usually establish itself naturally on well-fertilized, well-managed pastures.

The most productive pastures are those that are regularly limed and fertilized and clipped to remove weeds. Some farmers burn the pastures every winter in the belief that this will destroy weeds and improve the pasture stand. As a matter of fact, the burning is damaging because it destroys organic matter in the soil and kills desirable pasture plants along with the weeds.

Meadows are used for temporary pasture after the hay crop is harvested. Such pastures consist largely of lespedeza. They have less carrying capacity, as a rule, than good permanent pastures, and they tend to become weedy unless carefully managed.

Some woodland is used for pasture, but grazing is detrimental to the forest and the carrying capacity is low.

LIVESTOCK AND LIVESTOCK PRODUCTS

The average farm has one or two cows, several calves, a team of horses or mules, and enough hogs or chickens to supply home needs. The number of livestock and beehives on farms in Fluvanna County in stated years is shown in table 8.

Feed for the livestock is usually produced on the farm, but most chickenfeed is purchased. Grain and hay sometimes are purchased. Feed is usually bought by individuals rather than by groups.

Poultry is of more importance than other livestock raised in the county. Money derived from the sale of poultry and poultry products is one of the main sources of farm income. Specified livestock and livestock products produced or sold in the county in stated years, including poultry products, is shown in table 9. Poultry and poultry products sold are generally collected direct from the farm by local buyers who use motortrucks for their collections.

TABLE 8.—*Number of livestock and beehives on farms in Fluvanna County, Va., in stated years*

Livestock	1930	1940	1950
	Number	*Number*	*Number*
Horses	1, 201	[1] 843	789
Mules	820	[1] 693	349
Cattle	3, 656	[1] 3, 871	6, 343
Sheep	1, 550	[2] 1, 086	1, 318
Goats	34	[3] 29	(4)
Swine	3, 515	[3] 2, 300	3, 828
Chickens	[1] 41, 566	[3] 50, 964	[3] 47, 447
Other poultry	(4)	[3] 1, 313	[3] [5] 56
Beehives	591	193	[6] 146

[1] Over 3 months old.
[2] Over 6 months old.
[3] Over 4 months old.
[4] Not reported.
[5] Turkeys only reported.
[6] Figure for 1949.

In 1950 there were 8 specialized poultry farms in the county. Most of the poultry, however, was raised on general or other types of farms. Chickens are raised much more extensively than other poultry, but some turkeys, and a few ducks, guineas, and geese, are raised. New Hampshire Red, White Leghorn, Barred Plymouth Rock, and Rhode Island Red are the favorite breeds of chickens.

TABLE 9.—*Specified livestock and livestock products produced or sold in Fluvanna County, Va., in stated years*

Products	1929	1939	1949
Chickens raised—number	104, 124	129, 059	[1]
Chickens sold—number	46, 136	68, 646	33, 739
Eggs produced—dozens	309, 156	399, 677	[1]
Eggs sold—dozens	205, 606	[1]	336, 774
Turkeys raised—number	1, 924	3, 016	2, 554
Milk produced—gallons	700, 468	705, 877	[2] 2, 282
Milk sold—gallons	36, 324	19, 992	[3] 230, 668
Butterfat sold—pounds	32, 259	36, 411	41, 681
Butter churned—pounds	147, 684	117, 997	[4] 1, 096
Butter sold—pounds	35, 688	22, 252	[1]
Honey produced—pounds	5, 600	2, 109	1, 153
Wool produced—pounds	3, 583	4, 962	4, 557

[1] Not reported.
[2] Day preceding enumeration.
[3] Approximate; 1,919,527 pounds in 1949.
[4] Week preceding enumeration.

Both dairy and beef cattle have increased in numbers since 1930 (see table 8). Of the 6,343 cattle in the county in 1950, according to the Federal census, 2,097 were milk cows. There were only 3,656 cattle in 1930, and of these, 2,038 were cows and heifers kept mainly for milk. Cattle are used principally for meat and dairy products on many farms, but considerable income is derived from the sale of cattle, and dairying has become second only to poultry in importance. In 1950, 38 dairy farms were in the county, but some of the dairy products were produced on other types of farms. The whole milk and cream sold are shipped daily to the dairies and creameries in Charlottesville. Farmers and dairymen are improving their herds. Dairy cattle are chiefly grade Guernsey, Holstein-Friesian, and Jersey animals or crossbreeds.

Except for a few herds of purebred cattle, the beef cattle are generally of mixed breeds in which Hereford blood predominates. Most of the beef cattle are raised on the larger farms along the Rivanna, James, and Hardware Rivers, where the soil is favorable for them.

Much of the land used for crops along the larger streams consists of the Congaree, Chewacla, Wickham, and Hiwassee soils. These soils are generally desirable for corn and hay, and good yields are usually obtained. The soils on these farms that are not well suited to crops are used mainly for pasture. The combination of good crop soils and good pasture soils makes these farms more suitable for livestock than farms that do not have productive soils on which livestock feed can be produced cheaply.

Comparatively few hogs are raised, although the number has increased slightly since 1930 (see table 8). The yearly variation in the number of hogs raised is governed largely by the corn-hog price ratio. The corn is sold as grain rather than fed to hogs if better cash returns can be obtained from the grain. Nearly all breeds and crossbreeds of lard-type hogs are raised; about half are butchered annually for home use. Most of the hogs that are sold are shipped to markets in Richmond and Orange.

Sheep raising has never been important in Fluvanna County. The number of sheep on farms in the county in stated years is shown in table 8, and pounds of wool produced in stated years, in table 9. Only 617 sheep and lambs were sold alive in 1949.

Most of the sheep are distributed throughout the county on all types of soil. A few flocks are raised on farms that contain a fairly large acreage of such wet soils as Worsham and Orange, which are not so well suited to sheep raising as the better drained soils. The principal breed of sheep is Hampshire.

Horses and mules, generally of only fair quality, are the work animals used in the county. Most of these animals are raised in the county, and the average farm has one team.

FARM POWER AND MECHANICAL EQUIPMENT

The Federal census for 1950 reported 504 automobiles on 447 farms, 276 motortrucks on 247 farms, 223 tractors on 178 farms, and 28 grain combines on 23 farms. Nevertheless, horses and mules are still the principal source of farm power.

On most of the farms, the implements and machinery consist of a two-horse walking plow, a two-horse disk harrow, a spike or spring-tooth harrow, a one-row corn planter with fertilizer attachment, and a cultivator, grain drill, mowing machine, hayrake, manure spreader, and wagon. A few farmers own cultipackers or hay loaders.

Large machinery such as grain binders, threshing machines, combines or harvesters, and pickup balers are owned either individually or cooperatively. One machine is used by many farmers in a community. A few cornpickers and binders are owned mainly by farmers who grow corn year after year on the bottom lands of the James and Rivanna Rivers. Few farmers have lime spreaders. Lime is applied on many farms by truck spreaders that haul and spread the lime. Silos are located mainly on farms that specialize in dairying or on farms where beef cattle are raised.

The tractors used on the farms are generally adapted to the topography of the land. Tractors are profitable on the larger farms that have soils that are productive and well managed and that have relief that is not too hilly or broken.

FARM TENURE

According to the 1950 Federal census, there was a gradual increase in percentage of farms operated by owners from 86.1 percent in 1930 to 94.0 percent in 1950. The percentage of all farms operated by tenants decreased during the same period from 13.2 percent in 1930 to only 5.6 percent in 1950. Managers operated 8 farms in 1930, but only 4 managers operated farms in 1950.

Of the 50 tenants operating farms in 1950, 6 were cash tenants; 10, share tenants; and 26, other and unspecified tenants. Seven were croppers, and 1 was a share-cash tenant. The most common type of share tenancy is one operated on a half-and-half basis. The tenant furnishes the equipment, work animals, labor, and half of the seed and fertilizer, and he receives half of the crop. If the tenant furnishes everything but the land, fences, and buildings, he receives two-thirds of the crops. A tenant sharecropper furnishes only his labor and receives only one-third of the crop.

A cash renter pays the owner a stipulated cash rent by the acre or by the farm. He manages the farm, and he furnishes all of the equipment, work animals, seed, fertilizer, and labor. If lime is used, it is usually supplied by the owner under any of the systems of tenancy.

Many tenants or their children work for neighbors part of the time. The supply of farm labor is usually sufficient and well distributed. About half the farms in 1950 reported expenditures for machine hire or hired labor.

Most of the tenants live on the larger farms, which are generally beef cattle farms. As a rule these farms have some of the best soils, farm machinery, and other equipment in the county. Consequently the tenant is fairly sure of receiving good returns.

MORPHOLOGY, GENESIS, AND CLASSIFICATION OF SOILS

FACTORS OF SOIL FORMATION

Soil is the product of the forces of weathering and soil development acting on the parent material deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and has existed since accumulation; (3) the plant and animal life in and on the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material.

The effects of climate, and its influence on soil and plants, depend not only on temperature, rainfall, and humidity, but also on the physical characteristics of the soil, or soil material, and on the relief, which, in turn, strongly influences drainage, aeration, runoff, erosion, and exposure to sun and wind (*6*). Fluvanna County lies in the northern part of the zone of Red and Yellow Podzolic soils (*5*, *6*).

Climate, vegetation, and animal life are the active forces that change the parent material into soil. These active forces are, in turn, influenced by relief, which in most places largely controls drainage. If climate and vegetation are uniform throughout an area, the soils that develop will have the same physical and chemical characteristics, unless there are differences in parent material and in relief. Finally, time is required for the development of all soils. If climate, vegetation, and animal life, influenced by relief, have not produced from the parent material a soil that is in near equilibrium with its environment, the soil is considered young or immature. Examples are the well-drained alluvial and recent colluvial soils, the parent materials of which have been in place such a short time that climate and vegetation

have not had time to produce any apparent morphological changes. The nature of the soil-forming forces that have produced the soils of Fluvanna County are discussed in the following pages.

PARENT MATERIALS

According to source, the parent materials of the Fluvanna County soils fall into two classes. The first class consists of residual material derived from the weathering and decay of underlying rocks in place (fig. 4). The second consists of transported soil and rock materials, removed from their original position on uplands and deposited in upland depressions and on lower slopes or near streams.

Many characteristics of the first class of soils can be traced directly to the underlying rocks from which the soils were formed. Many characteristics of the second class also can be traced to the soils or rocks from which the material was removed.

The underlying rocks of Fluvanna County have been classed by geologists as pre-Cambrian, Ordovician, and Triassic.[12] The pre-Cambrian rocks are the oldest, and the Triassic are the youngest. These geologic classifications have several recognized rock formations, which, in turn, consist of one or more rock types. Except for the alluvial and colluvial materials, the parent material that gives rise to the soils of the uplands consists of residuum from decomposed underlying igneous, metamorphic, and metasedimentary rocks.

CLIMATE

The climate of Fluvanna County is humid, warm, and continental. The average summer temperature is 74.5° F., and the average winter temperature, 37.5°. Rainfall is moderately heavy, averaging 41.24 inches annually. It is well distributed throughout the year, but is slightly greater in the spring and summer than in fall and winter. The heavy rainfall has leached plant nutrients from the surface soil. It has kept free calcium carbonate from accumulating in the soils, though some of the minerals of the underlying rocks contain calcium. The soils are low in organic matter.

The climate is so uniform throughout the county that differences among the soils cannot be explained on the basis of differences in climate. Locally some variations in temperature may be caused by differences in elevation of 200 to 550 feet. These slight variations in temperature, however, have not been great enough to affect the soil profiles.

Climatic forces act upon rocks to form the parent materials from which soils are formed, but many of the more important soil characteristics would not develop except for the activity of living organisms. Without the changes brought about by the presence of plants and animals, the soils would consist merely of residual or transported materials derived from weathered rock, though some might have definite layers formed by additions of alluvial or colluvial materials or by differential weathering or leaching.

[12] Classification of rocks of the pre-Cambrian and Ordovician periods based on data presented in a geologic map prepared by Jonas (*3*); that of the rocks of the Triassic period, on studies made in the area by A. A. Pegua, geologist of the University of Virginia; that of the alluvial soils, on studies by fieldmen who made the soil survey of the county.

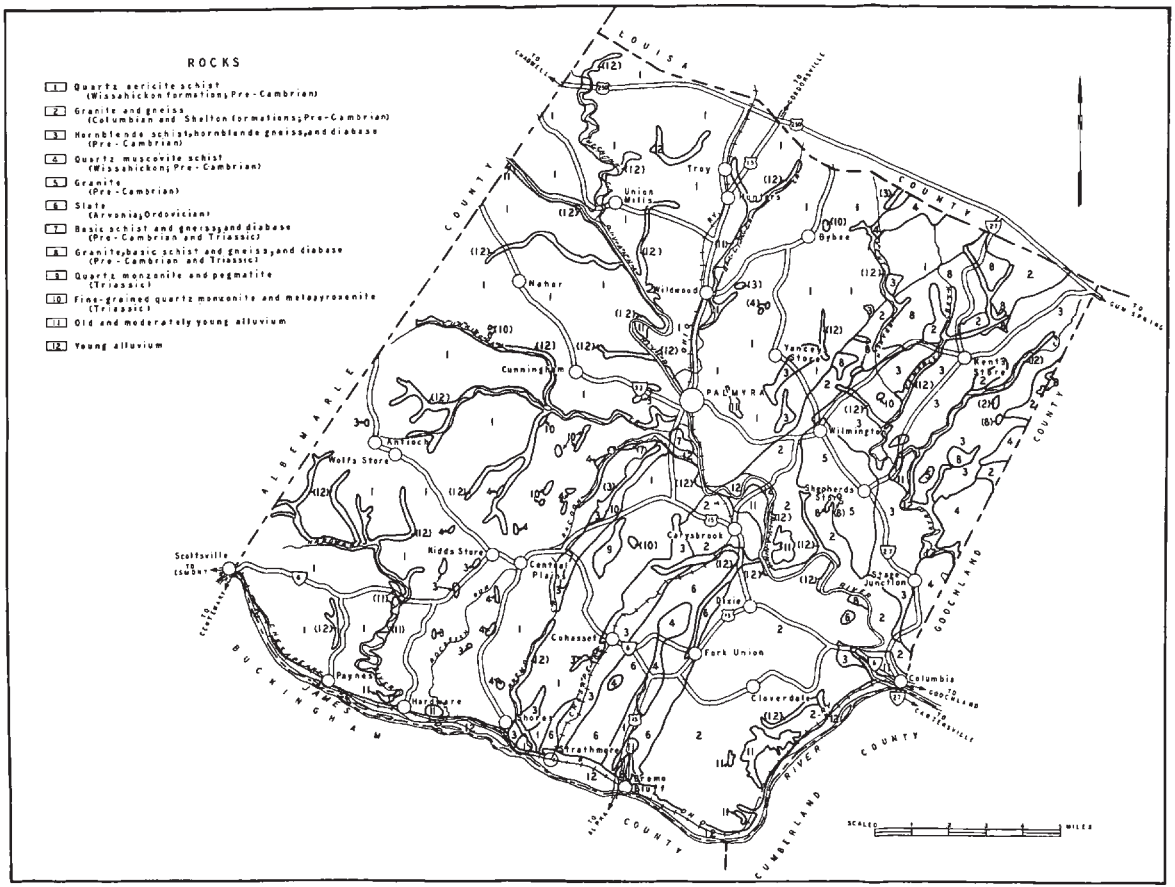

FIGURE 4.—*Map of Fluvanna County showing the distribution of the principal rocks.*

Climate, acting alone on the parent material, would be largely destructive. It would cause the soluble materials to be washed out of the soils. When combined with the activities of plants and animals, the processes of climate become constructive. A reversible cycle is established between intake and outgo of plant nutrients. Plants draw nutrients from the lower part of the soil profile; then, when the plants die, the surface soil is renewed in varying degrees by the plant nutrients that are returned to the upper part of the soil.

VEGETATION

Higher plants, micro-organisms, earthworms, and other forms of life that live on and in the soil contribute to its morphology. Bacteria and fungi are the micro-organisms that affect the soils. They cause raw plant waste to decompose into organic matter and to be incorporated into the soil. The higher plants return organic matter to the soil and bring moisture and plant nutrients from the lower part of the profile to the upper part.

The kind of vegetation that will grow is largely controlled by climate. Wherever there is a significant variation in type of vegetation, the general type of soil varies accordingly. Thus climate exerts a powerful, though indirect, influence upon soil development. A well-developed soil results from the effects of climate and living organisms acting upon the parent material.

The native vegetation of Fluvanna County consists largely of deciduous trees, but includes some conifers. Similar species grow on the various soils. The most common species are oak, hickory, poplar, and scrub pine.

A comparatively small amount of organic matter, derived from the forest, became incorporated in the soils while they were forming. In upland forested areas that have never been cleared, thin layers of forest litter and leaf mold cover the soil. A small amount of organic matter, derived from decayed leaves and twigs, is mixed through the topmost 1 or 2 inches of the surface soil. In some places such soils as the Starr, Seneca, and Worsham, which occupy positions along small drainageways and in depressions, have slightly more organic matter on the surface and in the first few inches of the surface layer than soils that occupy ridges and slopes. In the soils of first bottoms, a moderately large quantity of well-decomposed organic matter is incorporated thoroughly in the soil.

The vegetation is fairly uniform throughout the county. Differences in the soils therefore cannot be explained on the basis of differences in vegetation. Though some comparatively minor variations in the vegetation are associated with different soils, these variations are probably chiefly the result, and not the cause, of the differences in soils. A reciprocal relationship, however, might once have existed.

RELIEF

Relief, or lay of the land, varies greatly from place to place in Fluvanna County. Because of variations in relief, several different soils may have developed from the same parent material (*6*). The topographic relationships of selected soil types are illustrated in plate 5. Relief affects soil formation by affecting internal drainage,

surface runoff, erosion, and other results of water action. The following facts are evidence of the effects of relief on the development of soils in Fluvanna County:

(1) The well-developed soils that have red B horizons occur on undulating or rolling areas that are well drained;
(2) The soils that have poorly developed subsoils or that have no subsoil horizons occur mainly on hilly to steep areas that are excessively drained;
(3) The soils that have yellow B horizons occur principally on nearly level to gently undulating areas where drainage is somewhat retarded; and
(4) The soils that have mottled gray and yellow B horizons occur on level or depressed areas where drainage is poor.

It can be seen, therefore, that relief is a modifying factor in soil formation. Because of it several soils may develop from identical parent material.

TIME

Generally the longer the parent material has remained in place, the more fully developed the soil profile will be.

Because of differences in parent material, relief, and climate, however, some soils mature more slowly than others. For example, alluvial and colluvial soils are immature because the parent materials are young and new materials are deposited periodically. Soils on steep slopes are also likely to be immature because erosion removes the soil material as fast as it accumulates. Some kinds of parent rock are so resistant to weathering that soil development is very slow even though other conditions are favorable (*6*). A mature soil is one that has well-developed A and B horizons that were produced by the natural processes of soil formation (*7*). An immature soil has little or no horizon differentiation.

In Fluvanna County the soils mature fairly rapidly because of the moderately high rainfall, moderately warm temperatures, predominantly favorable relief, and uniform rate of weathering. Except for the soils on well-drained bottom lands, those on recent colluvial lands, and the shallow soils of uplands, the soils of Fluvanna County are mature or nearly so.

CLASSIFICATION OF SOILS

Table 10 shows how the soil series of Fluvanna County are classified into great soil groups, and the great soil groups into soil orders. The three soil orders—zonal, intrazonal, and azonal—are the classes in the highest category in the scheme of soil classification.

Zonal soils have well-developed characteristics that reflect the influence of the active factors of soil genesis—climate and living organisms, chiefly vegetation—upon well-drained, but not excessively drained, parent material over a long period of time. Zonal soils have distinct A and B horizons.

Intrazonal soils have more or less well-developed characteristics that reflect the dominant influence of some local factor of relief, parent material, or age over the normal effect of climate and vegetation. Intrazonal soils have well-developed profiles.

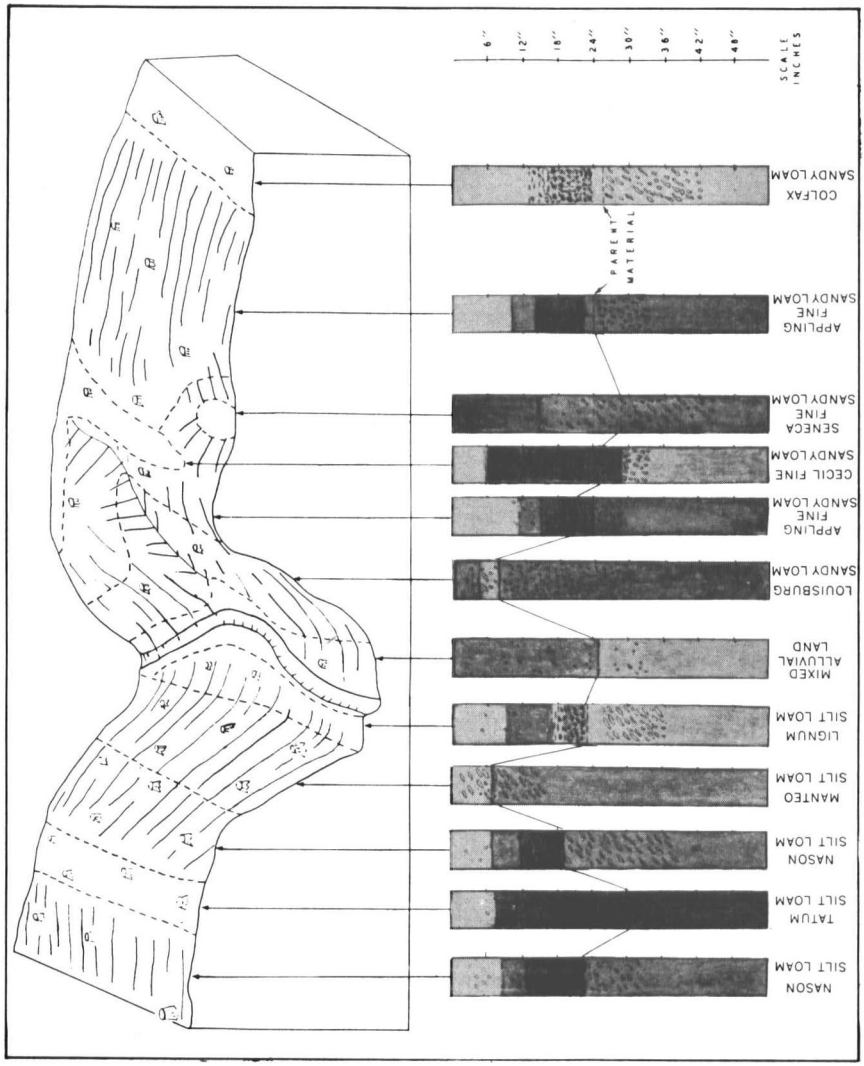

Diagram illustrating topographic relationships of selected soil types in Fluvanna County, Va.

Azonal soils, because of their youth or because of factors of parent material or relief that have prevented the development of a normal or zonal profile, do not have well-developed profile characteristics (*6*).

ZONAL SOILS

Many of the soils on undulating and rolling uplands and terraces in Fluvanna County have the well-developed profiles characteristic of zonal soils. These well-drained soils have internal physical characteristics common to soils that have similar relief and that occur in a general area in which a similar climate and vegetation prevail. Relief and parent material have been favorable for the soils to receive the maximum effects of the action of climate and vegetation. The soils have lain in place long enough so that they have become mature. They are therefore classified as zonal soils.

Virgin zonal, or normal, soils have light-colored surface layers, or A horizons, that overlie thicker, heavier textured, and darker colored subsoil layers, or B horizons. The B horizons, in turn, overlie the parent material, or C horizons. The C horizons vary considerably in texture but are generally lighter textured than the B horizons and heavier textured than the A horizons. The C horizons of the residual soils vary in thickness, depending largely on the resistance of the bedrock to weathering. The thickness of all of the horizons differs somewhat among the different soils, however, as the result of differences in age of the parent rock and in its resistance to weathering.

Texture of surface soils in the county is determined largely by the texture and mineral composition of the underlying parent rock. The A horizons of the uneroded soils are mainly silt loam, fine sandy loam, loam, and sandy loam; those of the eroded soils are mainly silty clay loam or clay loam. Rock fragments modify the texture of the surface layer of some of the soils.

The B horizons are mainly silty clay loam, silty clay, clay, sandy clay loam, and fine sandy clay loam. The texture of the C horizons depends on the degree and depth of weathering and the character of the parent rock. The soil material may be gravelly sandy loam, coarse sandy loam, sandy loam, fine sandy clay loam, sandy clay loam, light clay, or silty clay loam. Rock fragments in various stages of decomposition may be mixed with the soil material in places.

AZONAL SOILS

Some of the upland soils in Fluvanna County have such steep slopes that a large part of the soil material, formed through the processes of soil development, has been removed by geologic erosion. Much of the rainfall has run off instead of percolating downward through the soil profile. The normal, or maximum, effects of the action of climate and vegetation have been modified or overcome by the influence of relief. These soils, therefore, do not have well-developed profiles. They have few of the characteristics of zonal, or normal, soils, but they have reached the stage where soil-forming processes are in equilibrium with natural erosion. Such immature soils are classified as azonal soils.

Also classified as azonal soils are soils that have formed from recent alluvial or colluvial material and have lain in place for only a comparatively short time. These soils do not have clearly developed

TABLE 10.—*Soil series of Fluvanna County, Va., classified by higher categories, and the relief, parent material, and degree of profile development for each*

ZONAL

Great soil group and series	Relief	Parent material	Degree of horizon differentiation
Red-Yellow Podzolic soils:			
Tatum	Undulating to rolling	Residuum from weathering of— Quartz sericite schist	Very high.
Cecil	do	Granite and gneiss	Very high.
Madison	do	Quartz muscovite schist	Very high.
Lloyd	do	Hornblende schist and hornblende gneiss, chiefly	High.
Wickham	Undulating	Moderately young alluvium derived from uplands underlain by basic and acidic rocks.	Very high.
		Residuum from weathering of—	
Nason	Undulating to rolling	Quartz sericite schist	High.
Appling	do	Granite	High.
Fluvanna	do	Hornblende schist mixed in places with granite	High.
Vance	Undulating	Granite, acidic gneiss, and acidic schist mixed with basic rocks.	High.
Masada	do	Old alluvium derived from upland underlain mainly by acidic rocks.	Very high.
Durham	do	Residuum from weathering of granite and gneiss	Medium.
Altavista	do	Moderately young alluvium derived from uplands underlain by acidic and basic rocks.	Medium.
Reddish-Brown Lateritic soils:			
Hiwassee	Undulating to rolling	Old alluvium derived from uplands underlain by basic and acidic rocks.	High.

INTRAZONAL

Planosols:			
Orange	Undulating	Residuum from weathering of— Basic quartzite, hornblende schist, and quartz monzonite.	Very high.
Zion	do	Metapyroxenite and diorite	Very high.
Goldvein	Undulating to rolling	Granitelike rock that may be quartz monzonite	Very high.
Lignum	Undulating	Quartz sericite schist mixed in places with basic rock.	Very high.

Helena	Undulating to rolling	Granite, acidic gneiss, and acidic schist mixed with basic rocks.	Very high.
Colfax	Undulating	Granite; in places local wash from uplands underlain by granite or gneiss.	High.
Elbert	Level to undulating	In part, local colluvium and local alluvium, and, in part, residuum from weathering of basic schist and basic quartzite.	Very high.
Worsham	do	Colluvium derived from uplands underlain by granite, acidic gneiss, and acidic schist; in places, from residuum derived from these rocks.	Medium to high.
Augusta	Undulating	Moderately young alluvium derived from uplands underlain by acidic and basic rocks.	Medium to high.
Roanoke	Level to undulating	Moderately young alluvium derived from uplands underlain by acidic and basic rocks.	Very high.
Low-Humic Gley soils:			
Wehadkee	Level to nearly level	Young alluvium derived from uplands underlain by granite, gneiss, schist, and basic igneous rocks.	Very low.
AZONAL			
Lithosols:		Residuum from weathering of—	
Manteo	Undulating to steep	Slate and sericite schist	Very low.
Louisa	Rolling to steep	Quartz muscovite schist	Low to medium.
Louisburg	do	Granite or gneiss	Very low.
Bremo	Undulating to hilly	Mainly hornblende schist and hornblende gneiss	Very low.
Wilkes	Rolling to steep	Granitic rock and basic schist mixed	Low to medium.
Alluvial soils:			
Seneca	Undulating	Local colluvium and alluvium derived from uplands underlain by acidic rocks.	Low.
Starr	do	Local colluvium derived from uplands underlain chiefly by hornblende schist and hornblende gneiss.	Low.
Congaree	Level to nearly level	Young alluvium derived from uplands underlain by granite, gneiss, schist, and basic igneous rocks.	Low to very low.
Buncombe	do	do	Very low.
Chewacla	do	do	Low.

profiles. They possess only a few of the characteristics of zonal soils. Their lack of profile development results largely from insufficient time or from the effects of relief on drainage.

INTRAZONAL SOILS

Some of the soils have lain in place for a comparatively long time and have well-developed profiles. They have been excessively influenced, however, by the character of their parent material, by relief that inhibited drainage, or by age. Although these soils are mature, they possess few characteristics of zonal soils and are called intrazonal soils. The dominating factor in their development has been their nearly level or slightly depressed relief that has retarded drainage and has been a stronger influence than the effects of climate and vegetation.

SOIL CATENAS AND FAMILIES

A soil catena is a group of soils within a single climatic area, developed from similar parent materials but differing in profile characteristics because of differences in relief or drainage. A soil family, which is composed of one or more distinct soil series, is a taxonomic group of soils that have similar profiles; the soil family is a category in soil classification between the soil series and the great soil groups (*6*). Grouping by catenas and families helps to show the relationship of a soil series to the great soil groups.

In table 11 the soil series of Fluvanna County are grouped into catenas and families and their relationship to the great soil groups is shown. This grouping was made on the basis of parent material and natural drainage of the soils.

MORPHOLOGY OF SOILS REPRESENTING THE GREAT SOIL GROUPS

RED-YELLOW PODZOLIC SOILS

The Red-Yellow Podzolic soils [13] are a group of well-developed, well-drained acid soils. They generally occupy ridgetops and have undulating to rolling relief. These soils have developed under a deciduous, coniferous, or mixed forest in warm-mesothermal to tropical humid to perhumid climates. Associated with the Red-Yellow Podzolic soils are other well-developed, well-drained red and yellow soils. These associated soils do not have distinct A_2 horizons, however, so were not classified as Red-Yellow Podzolic soils.

The soils of Fluvanna County that belong to the Red-Yellow Podzolic group are members of the following series:

Tatum	Fluvanna
Cecil	Vance
Madison	Masada
Wickham	Durham
Lloyd	Altavista
Nason	Appling

[13] The term, Red-Yellow Podzolic soils, was used in the 1938 U. S. Department of Agriculture Yearbook (*6*) in describing the soils. Marbut used the term, Red and Yellow soils (*5*).

The Red-Yellow Podzolic soils have thin organic (A_0) and organic-mineral (A_1) horizons over a light-colored bleached (A_2) horizon. The bleached horizon, in turn, overlies a red, yellowish-red, or yellow more clayey (B) horizon. The parent materials are all more or less siliceous. Coarse reticulate streaks, or mottles, of red, yellow, brown, and light gray occur in deep horizons where the parent materials are thick.[14] These streaks generally occur higher in the profiles that have yellow B horizons than in those in which the B horizon is red. In a few of the soils, especially the very sandy ones, the streaks may be absent.

Most of the well-developed soils of uplands and terraces in Fluvanna County have characteristics that are typical of Red-Yellow Podzolic soils. The soils vary somewhat in maturity, but all are old enough to have at least a moderately well developed Red-Yellow Podzolic profile. The soils generally occupy ridgetops and have undulating to rolling relief. They have the best drainage of any of the mature soils of the uplands.

In cultivated areas the A_0 and A_1 horizons of these soils are incorporated in the plow layer. Accelerated erosion has removed all, or nearly all, of the A horizon in some places and has left the B horizon exposed. In the more clayey horizon, the clay fraction is dominated by kaolinite and vermiculite. It contains considerable free ferric oxides or hydroxides, however, and, in places, a relatively small proportion of aluminum hydroxide. Hydrous mica and montmorillonite dilute the clay fraction in some of the soils, but they do not occur to the extent that they can be considered typical.

The Red-Yellow Podzolic soils are very low in bases, particularly in calcium and magnesium, and all are low in phosphorus. They are strongly to extremely acid. Because of fairly high prevailing temperatures and rainfall, organic matter decomposes fairly rapidly, and the plant nutrients and organic matter leach out. Fluvanna County is located in the northern part of that section of the United States in which the zonal soils are largely represented by the Red-Yellow Podzolic great soil group.

TATUM SERIES

Next to the Nason soils, the Tatum soils are the most extensive of the Red-Yellow Podzolic soils in Fluvanna County. Formed from weathered products of quartz sericite schist, they are closely associated with Nason, Manteo, Lignum, and Worsham soils. They occupy ridgetops and a few ridge slopes where drainage is good and relief is mostly undulating. Locally small quartz and stone fragments occur on the surface and in the upper soil layers. Erosion has removed the A horizon in places and exposed the red subsoil.

[14] Description from report of Subcommittee on Red and Yellow Soils, U. S. Dept. Agr., Soil Survey, Lincoln, Nebr., Mar. 17, 1948.

TABLE 11.—*Soil series of Fluvanna County, Va., arranged by catenas and families, and their profile development, natural drainage, and great soil group*

[The series on each horizontal line make up a catena; those in each column make up a soil family]

Profile development	Azonal							Zonal		
Great soil group	Lithosols		Alluvial soils					Red-Yellow Podzolic soils		
Natural drainage	Somewhat excessive to excessive	Good to excessive	Excessive	Good	Moderately good	Somewhat poor	Poor	Good to excessive	Good to somewhat excessive	Good
	SERIES									
Parent material:										
Residuum from the weathering of—										
Granite, gneiss, or both	Louisburg							Cecil	Appling	Durham
Quartz muscovite schist	Louisa							Madison		
Quartz sericite schist, mainly		Manteo[1]						Tatum	Nason	
Granitic and basic rocks mixed	Wilkes									
Hornblende schist, hornblende gneiss, or both mixed with acidic rock in places.		Bremo						Lloyd	Fluvanna	
Granitelike rock, probably quartz monzonite										
Basic quartzite, hornblende schist, or quartz monzonite.										
Metapyroxenite and diorite										
Local colluvium and alluvium originating mainly from acidic rocks; residual material from such rocks in places.					Seneca					
Local colluvium originating mainly from basic rocks.					Starr					
Old alluvium derived from—										
Uplands underlain mainly by acidic rocks										
Uplands underlain by basic and acidic rocks										
Moderately young alluvium										
Young alluvium			Buncombe	Congaree		Chewacla				

[1]Slate has contributed largely to the parent material of this series.

Profile development	Zonal—Continued		Intrazonal				
Great soil group	Red-Yellow Podzolic soils—Con.		Reddish-Brown Lateritic soils	Planosols			Low-Humic Gley soils
Natural drainage	Good to moderately good	Moderately good	Good to somewhat excessive	Moderately good	Somewhat poor	Poor	Poor
SERIES							
Parent material:							
Residuum from the weathering of—							
Granite, gneiss, or both					Colfax		
Quartz muscovite schist							
Quartz sericite schist, mainly					Lignum		
Granitic and basic rocks mixed		Vance			Helena		
Hornblende schist, hornblende gneiss, or both; mixed with acidic rock in places.							
Granitelike rock, probably quartz monzonite					Goldvein		
Basic quartzite, hornblende schist, or quartz monzonite.					Orange	Elbert [1]	
Metapyroxenite and diorite				Zion			
Local colluvium and alluvium originating mainly from acidic rocks; residual material from such rocks in places.						Worsham	
Local colluvium originating mainly from basic rocks.							
Old alluvium derived from—							
Uplands underlain mainly by acidic rocks	Masada						
Uplands underlain by basic and acidic rocks			Hiwassee				
Moderately young alluvium	Wickham	Altavista			Augusta	Roanoke	
Young alluvium							Wehadkee.

[1] Local colluvium and alluvium have contributed largely to the parent material of this series.

Profile of Tatum silt loam, undulating phase, on about a 4-percent slope in woodland about ¾ mile northeast of Antioch and 150 feet north of State Highway No. 637:

A_{00} ½ to 0 inch, dark-gray (2.5YR 4/1) forest litter, mainly partly decomposed oak leaves and twigs.

A_1 0 to 3 inches, yellowish-brown (10YR 5/4) very friable silt loam; weak fine granular structure; very light gray and soft when dry; contains a few small angular quartz stones and pebbles.

A_2 3 to 8 inches, brownish-yellow (10YR 6/8) very friable silt loam; weak fine granular structure; contains a few quartz stones and pebbles.

B_1 8 to 13 inches, yellowish-red (5YR 5/8) friable light silty clay loam; moderate medium blocky structure; contains a very few pebbles; insect channels numerous.

B_2 13 to 32 inches, red (2.5YR 4/8) friable clay that is firm when less moist; moderate medium subangular blocky to moderate coarse blocky structure; hard when dry, but slightly sticky when wet; contains some very fine mica flakes.

C 32 to 41 inches, mingled red (2.5YR 4/8), yellow, and brown clay soil material intermixed with streaked red, yellow, and brown partly weathered quartz sericite schist fragments that make up 50 to 75 percent of material in layer; more friable than material in B_2 horizon; structure indefinite but ranges from blocky to platy.

The A_{00} horizon is extremely acid, and the other horizons are very strongly acid. Tree roots penetrate the entire solum.

CECIL SERIES

The Cecil soils, associated geographically with the Appling, Louisburg, Colfax, and Worsham soils, were derived from weathered granitic rock. Their texture is coarser throughout than that of the Tatum soils.

The A horizon of the Cecil soils is generally yellowish-brown to brownish-yellow very friable fine sandy loam or sandy loam about 8 inches thick. The upper B horizon, or transitional layer, in most places is yellowish-red friable clay loam or sandy clay loam, 2 to 5 inches thick. The lower B horizon consists of red firm clay that has a moderate medium to coarse blocky structure. The parent material is mingled red, yellowish-red, yellowish-brown, and whitish sandy clay loam mixed with granitic material of similar colors.

The soils are comparatively high in potassium. They are not quite so acid as the Tatum soils but are more acid than the Lloyd soils. The coarser textured parent material is probably largely responsible for the lighter colored surface soil.

MADISON SERIES

The Madison soils resemble the Tatum soils closely in texture, depth, and consistence. Their surface soil is a little darker colored. They were derived from a different parent material, a weathered quartz muscovite schist that contains some garnets. Also more mica occurs throughout the profile.

The Madison soils are well drained. They occupy positions on uplands similar to those occupied by the other Red-Yellow Podzolic soils. The A horizon is a yellowish brown to brown; the upper B horizon is yellowish red; and the lower B horizon is red.

The mica content of these horizons and the subsoils varies considerably. In some places partly weathered parent rock occurs at about 24 inches, but in others it is at a much greater depth.

WICKHAM SERIES

The Wickham soil has formed on terraces. It has developed from moderately young alluvial material that appears to be fairly high in bases. In most places the soil is almost free of gravel and stone.

Profile of Wickham loam, undulating phase, in a pasture about 1 mile south of the junction of State Highways Nos. 656 and 624 and about 300 feet east of State Highway No. 656:

A_2 0 to 9 inches, brown (7.5YR 5/4) very friable loam; weak fine granular or crumb structure; pale brown when dry; many grass roots and moderate amount of decayed organic matter in topmost 2 inches.

B_{21} 9 to 28 inches, yellowish-red (5YR 4/8) friable heavy clay loam; medium fine blocky structure; reddish yellow and hard when dry.

B_{22} 28 to 34 inches, predominantly yellowish red (7.5YR 5/6) friable clay loam, mingled with reddish yellow; weak fine blocky structure; predominantly reddish yellow when dry; slightly sticky when wet; small number of quartz pebbles.

C 34 to 48 inches, mingled yellowish-red (7.5YR 5/6), very pale brown (10YR 7/4), and light-gray friable light clay loam material; indefinite structure; sandy strata; contains some mica flakes.

This soil is medium acid throughout. It is moderately permeable to air, moisture, and plant roots. Its supply of organic matter is moderate as indicated by the color of the surface soil. The profile of this soil in areas along the Rivanna River has a browner surface horizon and in most places a redder subsoil than elsewhere.

LLOYD SERIES

The Lloyd soils differ from the Tatum soils in having browner A horizons higher in organic matter and a different parent material. They are also deeper over bedrock, more friable, and less acid. The B horizon is slightly redder and thicker than that of the Tatum soil. In most places the structure of the B_2 horizon is slightly finer than in either the Tatum or Cecil soils.

In profile characteristics, the Lloyd soils are intermediate between the Reddish-Brown Lateritic and the Red-Yellow Podzolic groups. They lack the distinct A_2 horizons common to the Red-Yellow Podzolic soils. They are less friable in the B horizon than the Reddish-Brown Lateritic soils and have greater differentiation in texture. The deeper part of the profile of the Lloyd soil has more similarity to the typical Red-Yellow Podzolic soils than to the typical Reddish-Brown Lateritic soils. Consequently, the Lloyd series is classified a Red-Yellow Podzolic, and is considered an intergrade to the Reddish-Brown Lateritic group.

NASON SERIES

The Nason soils and the Appling, Fluvanna, Vance, and Masada soils are closely related morphologically. The principal differences result largely from differences in parent material. The Nason soils are the most extensive of this closely related group.

The following describes a profile of Nason silt loam, undulating phase, on about a 4-percent slope in woodland ½ mile east of State Highway No. 620 and 2½ miles north of Kidds Store:

A_{00} ½ to 0 inch, very dark gray (5YR 3/1) forest litter, mostly oak leaves and twigs; bottom part decomposed.

A_2 0 to 9 inches, yellowish-brown (10YR 5/4) very friable silt loam that is nearly white when dry; topmost 2 inches slightly darker; weak fine granular structure; many small roots and numerous small white, brown, and gray quartz pebbles; insects have removed clay material from lower part of horizon.

B_1 9 to 13 inches, reddish-yellow (7.5YR 6/8) friable clay loam or light silty clay loam; hard when dry; weak fine blocky structure; contains a few quartz pebbles and many small roots.

B_2 13 to 22 inches, yellowish-red (5YR 6/6) friable clay or silty clay that is hard when dry; moderate medium blocky structure; contains a few roots and some schist fragments and quartz pebbles.

C 22 to 36 inches, mottled red (2.5YR 4/6) and reddish-yellow (7.5YR 6/8) friable soil material, mainly quartz sericite schist fragments in different stages of decomposition; structure somewhat indefinite, but mostly platy or resembling that of the original schist; no roots or insect casts noticeable.

DURHAM SERIES

The Durham and Altavista soils are somewhat similar morphologically. The Durham soil was derived from medium- to coarse-grained light-colored weathered granitic material. Its profile is fairly well developed.

The Durham soil is well drained. It occurs on ridges and in depressions around drainage heads. Like the Altavista soil, the soil has developed under a vegetative cover that consisted largely of deciduous trees, but included some small vegetation. In Fluvanna County relief and drainage are the two probable main causes for the development of this soil. The high content of siliceous material (quartz) in the parent material may also have been a contributing factor.

In places the lower part of the profile is mottled with gray, reddish brown, and yellowish red. The mottling is probably caused by the slow movement of water through the slightly heavier textured and slowly permeable subsoil layer. This process apparently was responsible for the development of a profile with some features suggestive of an intrazonal soil.

The following describes a profile of Durham fine sandy loam, undulating phase, in a cutover wooded area about 100 feet west of State Highway No. 655:

A_{00} ½ to 0 inch, dark-gray (10YR 4/1) forest litter, mostly partly decomposed oak leaves and twigs.

A_1 0 to 1 inch, light brownish-gray (2.5YR 6/2) very friable fine sandy loam; weak very fine granular structure.

A_2 1 to 10 inches, pale-yellow (2.5YR 7/4) very friable fine sandy loam; weak fine granular structure; white and soft when dry; contains a few quartz pebbles and stones.

A_3 10 to 14 inches, light yellowish-brown (2.5YR 6/4) very friable heavy fine sandy loam; weak fine granular structure; lighter colored and slightly hard when dry; faint gray and yellow or brown mottling.

B_2 14 to 30 inches, yellowish-brown (10YR 5/8) friable sandy clay loam; very weak fine blocky structure; hard when dry; lower part faintly mottled with gray and yellow.

C 30 to 52 inches, mottled yellowish-brown (10YR 5/8), pale-yellow (2.5YR 7/4), and white (10YR 8/2) compact fine sandy loam soil material, largely partly decomposed granite or gneiss fragments; grades to disintegrated granite and gneiss.

The soil is strongly to very strongly acid. It is low in most of the essential plant nutrients and in content of organic matter. Permeability is moderately rapid to rapid in the A horizon, and moderate to

moderately slow in the B horizon. The texture of the surface soil ranges from fine sandy loam to coarse sandy loam. Locally, many quartz stones and pebbles occur on the surface and in the soil horizons, and thin rock strata occur in the subsoil horizons. Permeability to air, moisture, and roots is moderate, but drainage is slower in the lower horizons than in the lower horizons of the Tatum soils.

ALTAVISTA SERIES

The Altavista soil, an intergrade to the Low-Humic Gley soils, is somewhat similar morphologically to the Durham soil, but it was derived from alluvium. The A and B horizons of the Altavista soil are slightly browner than those of the Durham soil. The Altavista soil has developed under a similar vegetative cover that consisted largely of deciduous trees, but included some small vegetation. The soil occupies low terraces. It is moderately well drained. As with the Durham soil, relief and drainage have been important factors affecting the development of the soil. The high content of siliceous material (quartz) in the parent material, however, may also have been a contributing factor.

The A horizon of the Altavista soil is brown, yellowish brown, or brownish yellow and is about 9 inches thick. The friable to firm upper B horizon is yellowish-brown to yellowish-red silty clay loam to clay loam about 16 inches thick. The lower B horizon is friable to firm, mottled yellowish-brown, brown, and gray clay to clay loam about 10 inches thick. The C horizon consists of conspicuously mottled fine sandy clay. It contains sandy strata, and also a few rounded stones and pebbles that increase in number as the depth increases. The parent material consists of sand, silt, and clay that has washed from uplands that are underlain mainly by acidic rock but to some extent by basic rock.

REDDISH-BROWN LATERITIC SOILS

The Reddish-Brown Lateritic soils are a group of zonal soils that have dark reddish-brown granular surface soils, red friable clay B horizons, and red or reticulately mottled lateritic parent material. They have developed in a humid tropical to subtropical climate and under a forest cover (*6*). The Hiwassee soils in Fluvanna County have characteristics like those of Reddish-Brown Lateritic soils and are placed in that group.

The Reddish-Brown Lateritic soils were derived from parent materials that are relatively low in quartz, comparatively high in bases, and that have been in place for a long time. The well-developed profiles have a uniformly red or dark-red B horizon that is comparatively thick.

HIWASSEE SERIES

The well-drained Hiwassee soils occur chiefly on high terraces, where they are closely associated with Masada, Wickham, Altavista, Augusta, and Roanoke soils. Their relief is similar to that of Red-Yellow Podzolic soils on uplands.

The Hiwassee soils vary greatly in physical characteristics. They have formed from old alluvium that consists of sediments derived from uplands underlain by many kinds of acidic and basic rock. The

redder Hiwassee silt loam type has developed mainly from fine-textured basic rock. The light-colored Hiwassee fine sandy loam originated from coarse-textured acidic material.

The profiles of the Hiwassee soils are well developed. The A horizons are reddish-brown, dark-brown, or brownish-yellow very friable silt loam to sandy loam; the B horizons are red to dark-red friable clay loam, silty clay, or clay. The B horizons are about 50 inches thick in many places, especially on the fine sandy loam types. The texture and consistence of the substratum vary considerably from place to place, and depth to the substratum is 3 to 12 feet.

PLANOSOLS

Planosols are intrazonal soils having one or more horizons abruptly separated from and sharply contrasting with an adjacent horizon. The contrast is due to the presence of a restrictive layer in the deeper profile. This restrictive layer may be high in clay (claypan), dense and brittle (fragipan), or cemented (hardpan). Claypans are usually B_2 horizons very high in clay (*7*). In occasional profiles, claypans may be, in part, a result of stratification of sediments. Fragipans are commonly of intermediate texture, dense and compact, generally low in clay and the coarser sand separates, and changeable in consistence as they become wet or dry. Distinct fragipans interfere with penetration of water and plant roots. In many profiles they underlie a well developed or moderately well developed B horizon (*7*).

Planosols formed under forest or grass vegetation in mesothermal to tropical humid or subhumid climates (*6*). These soils generally have fluctuating water tables, though it is common for drainage to be restricted to some degree.

The Planosols of Fluvanna County are of the following series:

Worsham	Colfax
Roanoke	Lignum
Augusta	Goldvein
Helena	Elbert
Orange	Zion

Some of these soil series have distinct claypans. Others have evident fragipans. Still others have restrictive layers in the deeper profiles that are intermediate in character between claypans and fragipans. None of the Planosols in this county has a hardpan in the profile.

The Orange, Zion, Goldvein, Lignum, Helena, Colfax, and Augusta series are somewhat poorly drained Planosols. Horizon differentiation in all of these soils seems to have been controlled in part by restricted drainage, caused by level relief and the nature of the parent materials.

These soils have various kinds of pans within their profiles. The Orange and Helena soils have B_2 horizons which are distinct claypans. The Goldvein soils have a subsoil layer relatively high in both gravel and clay, which seems to be a B_2 horizon and also functions as a claypan. The Colfax and Lignum soils have dense brittle subsoil layers, as a rule, and these layers are thought to be fragipans. In some profiles, the properties of the restrictive layers may be intermediate between those of typical fragipans and those of typical claypans.

The Zion soils have a concretionary layer immediately below the A horizon, which in turn overlies finer textured materials. This concretionary layer also seems to function as a pan that hinders root growth and water movement.

The Elbert, Worsham, and Roanoke soils are poorly drained Planosols. All of these soils are level to very gently sloping, and all of them are wet an appreciable part of each year. Drainage is restricted because of low relief, the position of the soil in the landscape, the nature of the underlying materials, or some combination of these.

Like the somewhat poorly drained Planosols, these three series also differ in the nature of the pans within their profiles. The Elbert series has a B_2 horizon high in clay, which is comparable to the claypan in the Orange and Helena series. The Worsham series may have fine-textured layers in the deeper profile, but more often the slowly permeable horizon seems to be a fragipan. The Roanoke soils are less fine textured than Elbert soils, on the whole, although the pans may be combinations of fragipans and claypans.

ORANGE SERIES

The Orange soils are fairly typical of the Planosols in which development has been affected by drainage or age. They have developed in areas where relief is mainly very gently undulating.

The following describes a profile of Orange silt loam, undulating phase, in an area of cutover forest about 1 mile west of Kidds Store and 200 feet south of State Highway No. 6:

A_{00} ¼ to 0 inch, dark-gray (10YR 4/1) forest litter, mainly partly decomposed hickory leaves and twigs held together by fine roots.

A_1 0 to 1 inch, yellowish-brown (10YR 5/4) very friable silt loam; weak fine granular structure; gray when dry; moderate organic-matter content; many small quartz pebbles, roots, and insect holes.

A_2 1 to 7 inches, brownish-yellow (10YR 6/6) very friable silt loam; weak fine granular structure; very pale brown (10YR 7/3) and hard when dry.

B_1 7 to 13 inches, brownish-yellow (10YR 6/8) firm heavy clay loam or light silty clay loam; moderate medium blocky structure.

B_{21} 13 to 15 inches (pan layer) yellowish-brown and gray gravelly silty clay loam to gravelly light clay; the gravel composed of quartz; mainly pale yellow and hard when dry.

B_{22} 15 to 34 inches, predominantly yellowish brown (10YR 5/6) very plastic clay faintly mottled with gray, but mottling more prominent in lower part; generally brownish yellow and extremely hard when dry; massive structure when wet and very coarse blocky to massive when dry.

C 34 to 44 inches, mottled yellowish-brown (10YR 5/6), brownish-yellow (10YR 6/6), and shades of gray, red, and olive friable coarse sandy loam soil material; chiefly soft disintegrated basic-rock particles in lower part.

The A_2 horizon of this soil is very strongly acid, but the substratum, or C horizon, is medium acid. The forest duff is medium acid. Roots, moisture, and air do not penetrate the soil readily, and crops are greatly affected by either dry or wet spells.

A gravelly subsoil phase of Orange silt loam has formed in Fluvanna County. It differs from Orange silt loam, undulating phase, in having a gravelly horizon at depths of 12 to 18 inches.

ZION SERIES

The Zion soil has a slightly browner surface soil and subsoil than most of the other somewhat poorly drained Planosols. It resembles the gravelly subsoil phase of Orange silt loam more than it does any of the other soils of the Planosols group. Normally the relief is gently undulating. Numerous pebbles and stones lie on the surface, and a mineral concretion layer occurs in the profile.

The A horizon, in pastured areas, consists of yellowish-brown to brown loam or silt loam about 10 inches thick. The concretion layer, 2 to 12 inches thick, is generally immediately below the A horizon. It consists of small black and brown concretions in a matrix of silt loam to clay soil material. In places the concretion layer lies immediately below the B horizon, which generally is yellowish-brown to yellowish-red plastic clay about 6 inches thick. The substratum is yellowish-brown, yellow, and yellowish-red silty clay loam to clay mixed with many black, yellow, and brownish partly weathered basic-rock fragments. Most of the D horizon consists of metapyroxenite, a moderately coarse grained ultrabasic rock in which the content of iron and manganese is large.

GOLDVEIN SERIES

The Goldvein soils resemble the other soils of the group in color of the profile. They differ mainly in having a thick strongly compacted gravelly B horizon and in having a different parent material that consists of weathered products of coarse-grained quartz monzonite.

The A horizon of the Goldvein soils is pale-yellow gritty silt loam or loam about 11 inches thick. The B horizon is hard and gravelly and part of it is plastic in a few places. The very coarse grained parent rock resembles granite or pegmatite but is sometimes called quartz monzonite. It contains many fine quartz particles and some feldspar, but very little mica.

LIGNUM SERIES

The Lignum soils were derived chiefly from material weathered from quartz sericite schist. In places they have received local wash or slough from the associated Nason, Tatum, and Worsham soils. The Lignum soils resemble the Orange, Helena, and Colfax soils in color, and the Colfax soil in depth and relief. Generally a brittle pan layer occurs in the Lignum soils.

In forested areas the Lignum soils are covered by a thin layer of forest litter, and organic matter stains the A horizon somewhat dark to a depth of about 1 inch. Below this thin layer, the A horizon is light yellowish-brown to pale-yellow very friable silt loam to loam about 9 inches thick. The B horizon consists of yellowish-brown friable to firm clay loam to clay about 14 inches thick. Below the B horizon, as a rule, is a brittle pan that is mottled gray, yellow, and yellowish red. In places the brittleness is in the heaviest upper part of the B horizon. The substratum is composed of sandy loam to clay soil material mixed with a large proportion of quartz sericite schist fragments. Locally, a thin plastic layer occurs in the lower part of the B horizon.

HELENA SERIES

The Helena soils have formed from a mixture of acidic and basic rock materials. As a rule the Helena soils resemble the Orange soils in color and depth. They commonly have a light-textured surface soil over a very plastic subsoil or claypan. The Helena soils generally occupy very gently undulating uplands. In relief and drainage they resemble the Orange soils.

The A horizon is brownish-yellow to pale-olive fine sandy loam about 9 inches thick. The B horizon is very plastic clay, about 18 inches thick, streaked and mottled with gray, yellow, red, and olive yellow. The substratum consists of highly mottled yellow, olive-yellow, gray, and reddish-yellow soil material. It contains strata or narrow parallel bands of acidic and basic rock materials.

COLFAX SERIES

These soils resemble the Orange series in general appearance, at least at first glance. The Colfax soils, however, have a fragipan within the profile and have been formed very largely from granitic materials. In some profiles the fragipan is partially replaced by a plastic layer that is high in clay and is much like a claypan in its characteristics. Generally, Colfax soils occupy depressions or foot slopes that have gently undulating relief.

In wooded areas, the A_1 horizon is dark grayish-brown very friable sandy loam about 2 inches thick. The A_2 horizon is grayish-brown to yellowish-brown very friable sandy loam about 8 inches thick. The upper B horizon is mottled gray, yellowish-brown, and white gravelly sandy loam to fine sandy loam which is very hard when dry and friable when moist. The lower B horizon consists of yellowish-brown friable light clay loam mottled with brown and gray. This is also hard when dry, slightly plastic and sticky when wet, and friable when moist. The B horizon seems to be the restricting layer within the profile. It has a number of the characteristics of fragipans. The C horizon is mottled gray, yellow, and red in color and ranges in texture from coarse sandy clay loam to clay loam.

AUGUSTA SERIES

The Augusta soils have been formed from alluvial sediments under restricted drainage. Although relief is commonly undulating, the drainage of the soils is somewhat poor. Augusta soils are comparable in a number of ways to the Colfax soils.

In cultivated fields the A_p horizon is grayish-brown to light yellowish-brown very friable fine sandy loam 8 inches thick. The B horizon consists of moderately to highly mottled clay loam or silty clay loam in the upper part and highly mottled sandy clay loam in the lower part. This horizon, which is about 22 inches thick, is firm to friable when moist but becomes hard or very hard when dry. The entire B horizon in the profile seems to have a number of characteristics common to fragipans.

ELBERT SERIES

The Elbert series illustrates soils in which development has been dominated by wetness. The soil has developed partly from local

colluvial and alluvial material and partly from weathered products of basic rock. The following describes a profile of Elbert silt loam in a pastured area:

A_2 0 to 9 inches, faintly mottled light brownish-gray (10YR 6/2) and reddish-yellow (7.5YR 5/8) friable to firm heavy silt loam; weak fine granular structure; hard when dry, slightly sticky when wet. (In forested areas the 2-inch A_1 horizon is brownish gray.)

B_1 9 to 17 inches, moderately mottled gray (10YR 5/1) and yellowish-brown (10YR 5/8) very firm to plastic light clay; strong coarse blocky structure; extremely hard when dry.

B_2 17 to 35 inches, highly mottled gray (10YR 6/1), light-gray (7.5YR 6/0), and yellowish-brown (10YR 5/8) very plastic clay; massive structure when wet and coarse blocky to massive when dry; some basic rock fragments in lower part.

C 35 to 48 inches, highly mottled yellowish-brown (10YR 5/8), olive-gray (5YR 5/2), and gray (10YR 6/1) very friable clay loam; consists largely of partly decomposed basic rock fragments.

The A horizon is medium acid; the B horizon is slightly acid; and the C horizon is neutral in Elbert silt loam. The water table is high most of the year, and permeability to roots and air is slow to very slow.

WORSHAM SERIES

Like the Elbert soils, the Worsham soils were formed partly from colluvial and alluvial sediments. The Worsham soils differ, however, in texture of profile and in the original sources of sediments. Parent materials for the Worsham soils have come from acidic rocks, including the Columbia granite and Wissahickon formations.

The A horizon consists of faintly mottled grayish-brown, gray, and yellowish-red friable sandy loam to silty clay loam about 10 inches thick. The B horizon is commonly a clay loam in texture, is grayer in color than the A horizon, and seems to have a number of the properties common to fragipans. The underlying materials have been weathered from granite in most places, but in some places they have been derived from schist and quartzite. These underlying materials are generally highly mottled with gray, yellow, and reddish-brown.

Worsham soils generally have less distinct B horizons than do the Elbert soils. Consequently, there is some question whether the series should be included with the poorly drained Planosols. They are included in the group because the B horizon has a number of the characteristics of fragipans, although it is recognized that, in this county, the series seems to grade toward the Low-Humic Gley group.

ROANOKE SERIES

Roanoke soils differ from the Elbert and Worsham soils in position and in having been formed from alluvial sediments washed from a wide variety of rocks. The parent materials, consisting of general alluvium laid down by streams, have come from both acidic and basic rocks of the igneous and metamorphic groups. Terraces occupied by Roanoke soils are commonly level to nearly level.

The A horizon is faintly mottled gray, yellow, and yellowish-red silt loam about 7 inches thick. The upper B horizon is commonly mottled light-gray, gray, and yellowish-red silty clay loam about 10 inches thick. The lower B horizon, usually 12 inches thick, is mottled red, gray, and yellowish-red clay that is commonly plastic

and sticky when wet. The upper B horizon has a number of the characteristics of fragipans; the lower B horizon is much higher in clay and is much like a claypan in many profiles. Materials underlying the solum are stratified. The strata have a wide range in texture. Some rounded pebbles may be present in the deeper part of the profile.

LOW-HUMIC GLEY SOILS

"Low-Humic Gley" is a name proposed for a poorly drained intrazonal group of soils that have thin A_1 horizons, are poorly drained, and lack abrupt boundaries between horizons. The profiles show, by the dominance of gray colors or by mottling, marked effects of gleying. The layers in the profile may or may not differ appreciably in texture. Most of the soils are medium to very strongly acid, but a few are neutral to alkaline in reaction. They are characteristically formed under a cover of swamp forest.

The Wehadkee series is the only Low-Humic Gley soil in Fluvanna County. These soils occupy first bottoms subject to intermittent flooding.

WEHADKEE SERIES

Wehadkee silt loam, the only type of this series mapped in the county, is a member of the Low-Humic Gley group derived from alluvial sediments. It is a poorly drained soil that occurs on the lowest parts of the first bottoms.

A_g 0 to 10 inches, mottled brown, yellowish-brown, and grayish-brown silt loam; mottles are fine and medium, faint, and common; moderate fine granular structure; friable when moist; medium acid.

C_{g1} 10 to 36 inches, mottled light-gray, yellowish-gray, and white clay or silty clay; mottles are fine and medium, distinct, and many; weak medium blocky structure; very hard when dry, friable when moist, and slightly plastic when wet; medium acid.

C_{g2} 36 to 48 inches, mottled gray, brown, and brownish-yellow clay loam; mottles are fine and medium, distinct, and many; massive; very hard when dry, friable when moist, and plastic when wet; medium acid.

The Wehadkee profile shows the effects of gleying but is otherwise little different from the Alluvial soils. It is therefore considered a member of the Low-Humic Gley group intergrading toward the Alluvial group.

LITHOSOLS

Lithosols are a group of azonal soils that have weakly developed profiles (*6*). The soils commonly include relatively fresh and slightly weathered rock fragments. In Fluvanna County they have formed from residuum of igneous and metamorphic rocks, including granite, gneiss, schist, and quartzite. These soils generally occupy areas of hilly and steep relief. The soils of this group in Fluvanna County belong to the following series:

Manteo	Bremo
Louisa	Wilkes
Louisburg	

The Lithosols in Fluvanna County are closely related to the rock from which their parent material was derived. Their development is

marginal between that of zonal and azonal soils. In favorable places thin ABC profiles have formed. Generally, however, the soils consist of an A horizon that grades downward into the C horizon or parent material.

The parent materials are in various stages of decomposition. The bedrock is almost completely decayed in the C horizon of some of the soils, but is only slightly altered in others. As a rule the soils have distinct color profiles, but the texture profiles are very weak. Structure aggregates have formed in the C horizon of most of the soils. The Louisburg soils, in which a thin B horizon has developed in some places, are the deepest soils of the group. The Manteo soils, which are the shallowest, have the least distinct horizons.

MANTEO SERIES

The following describes a profile of Manteo silt loam, undulating phase, in a wooded area about ½ mile east of Scottsville and 200 feet south of State Highway No. 6:

A_{00} 1 to 0 inch, dark-gray (5YR 4/1) forest litter, mostly partly decomposed oak leaves and twigs.

A_1 0 to 7 inches, yellowish-brown (10YR 5/6) very friable silt loam; weak fine granular structure; from 10 to 20 percent consists of platy multicolored schist fragments.

C 7 to 15 inches, predominantly yellowish red (7.5YR 5/6) friable silt loam soil material, about 75 percent consisting of brown, pink, yellow, and reddish-brown platy quartz sericite schist fragments; moderately hard rock immediately below.

The undulating phase of Manteo silt loam is extremely acid throughout. In places hard rock is nearer the surface than is typical of this soil, and many schist fragments occur on the surface or mixed throughout the surface layer. In some areas Manteo soil occurs in complex with Bremo soil.

LOUISA SERIES

The Louisa soils differ from the Manteo soils mainly in having a slightly browner surface layer and in being derived from quartz muscovite schist containing garnets, rather than from a quartz sericite schist.

LOUISBURG SERIES

The Louisburg soils differ from the Manteo and Louisa soils mainly in being derived from granitic parent materials; in being lighter colored; and in being coarser textured throughout. The A horizon is grayish-brown to yellowish-brown fine sandy loam or sandy loam. In eroded areas the plow layer is reddish yellow in some places. In places some semblance of a B horizon appears. The C horizon consists of very friable brownish-yellow to highly mingled reddish-yellow, yellowish-red, and white sandy loam or coarse sandy loam that is comparatively thick over hard rock. The structure is fairly well developed in the C horizon.

BREMO SERIES

The Bremo soils have formed from material weathered from hornblende schist and hornblende gneiss. They have a brown very friable A horizon. In most places their C horizon is yellowish brown and consists largely of dark-colored basic rock fragments in various

stages of decomposition. A faint B horizon is present in places, especially those where the subsoil contains some red clay. Depth to bedrock is generally shallower than in the Louisburg soils, but is greater than in the Manteo soils. The Bremo soils are slightly acid to medium acid. They sometimes occur in complexes with Manteo soils and Orange soils.

WILKES SERIES

The Wilkes soils in Fluvanna County consist of areas in which thin bands of granite and hornblende gneiss are closely and intricately associated. Generally, the rocks occur as narrow parallel bands which cannot be mapped separately. Wilkes soils have been mapped where slopes are mainly hilly and steep.

ALLUVIAL SOILS

Alluvial soils are a group of azonal soils that have developed from transported material, or alluvium, that has been deposited comparatively recently. The original material of the alluvial soils has been modified only slightly by soil-forming processes or has not been modified at all (*6*). The Alluvial soils in Fluvanna County belong to these series:

Seneca	Buncombe
Starr	Chewacla
Congaree	

The soils of this group are all young or very young. Their characteristics are closely related to those of the parent material. Differentiation among the soil series, therefore, is made largely on the basis of characteristics that have been determined by the composition of the parent material and by drainage.

SENECA SERIES

The Seneca soils have formed from local alluvium and colluvium consisting of materials washed mainly from Appling, Nason, Louisburg, and Fluvanna soils. The profiles of these soils are generally not well developed. These soils occupy depressions at the heads of drainageways and positions at the bases of foot slopes. They are moderately well drained. The Seneca soils are closely associated with Worsham, Nason, and Appling soils.

The A horizon of these soils is yellowish brown to brown and is very friable fine sandy loam or silt loam. It is about 10 inches thick. The weakly developed subsoil is yellowish brown to brownish yellow and is about 20 inches thick. The parent material is mottled gray, yellowish-red, and white friable colluvial material that contains many very small granite and schist fragments.

STARR SERIES

The poorly developed Starr soil resembles the Lloyd soils in reaction and fertility. It has a darker brown and deeper surface soil, however, a lighter colored subsoil, and a more plentiful supply of organic matter. The Starr soil contains less clay and is more open and permeable to roots, water, and air than the Lloyd soils. It occupies areas of undulating relief in depressions and at the foot of slopes. It

has formed from recent local alluvium and colluvium that has washed chiefly from Lloyd, Tatum, and Cecil soils. Drainage is moderately good in the Starr soil. If the season is wet, the soil receives considerable seepage from surrounding slopes.

The Starr soil has a brown to dark reddish-brown very friable granular A horizon. The friable subsoil is yellowish brown to red. Generally, the surface soil and subsoil are not distinctly differentiated, because their texture and consistence are similar. The substratum contains many black mineral concretions and a great deal of black mineral film. It is generally as friable and almost as light in texture as the A horizon. Some Starr profiles seem to have faint B horizons. This fact suggests that the series is intergrading toward the Reddish-Brown Lateritic group.

CONGAREE SERIES

The Congaree soils, along with the Buncombe, Chewacla, and Wehadkee soils, are members of a catena in which the Buncombe soil is excessively drained, the Congaree soils well drained, the Chewacla soil somewhat poorly drained, and the Wehadkee poorly drained.

The Congaree soils have formed from alluvial materials deposited near streams. These materials were derived from uplands underlain by both basic and acidic rocks. In places rounded pebbles and small cobblestones underlie the Congaree soils at depths of 3 to 8 feet.

A profile of Congaree silt loam in a cultivated field about three-fourths mile north of Carysbrook:

A_2 0 to 14 inches, brown (7.5YR 5/4) very friable light silt loam; very weak fine granular structure; soft when dry; moderate organic-matter content; shows considerable insect activity; contains many small mica flakes.

A_3 14 to 50 inches, brown (7.5YR 5/4) very friable heavy silt loam; weak medium granular structure; slightly heavier textured at 20 to 30 inches; contains many small mica flakes.

C_1 50 to 63 inches, brown (7.5YR 5/4) when dry to brownish-yellow (10YR 6/6) loam to fine sandy loam soil material; contains yellowish, greenish, and light-brown sand strata, small quartz pebbles, and basic rock fragments; strata more numerous at greater depths; mica flakes abundant.

Insects have carried material downward from the A_2 horizon of Congaree silt loam into the lower part of the A_3 horizon, and upward from the C_1 into the A_2 horizon. The A horizon is medium acid; the pH is 5.6 in the A_2 horizon and 5.8 in the A_3.

BUNCOMBE SERIES

The Buncombe soil differs from the Congaree soils mainly in having a coarser texture throughout. It consists mainly of a layer of brown to yellowish-brown loamy fine sand over river material that occurs at a comparatively shallow depth. The soil occurs near streambanks and is subject to flooding.

CHEWACLA SERIES

Chewacla soils are intermediate between the Congaree and Wehadkee soils in drainage and in profile features. All three formed from the same kinds of parent materials. Chewacla soils have some

characteristics of the Alluvial group but show evidence of gleying in the deeper part of the profile. The Chewacla series is therefore classified as Alluvial and considered an intergrade toward the Low-Humic Gley group.

The surface layer is light yellowish-brown to brown friable silt loam about 9 inches thick. Below this the profile consists of mottled materials, usually finer in texture, which may grade into stratified sediments at depths of several feet.

SOIL SURVEY METHODS AND DEFINITIONS

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

Field study.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern, but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart, and sometimes they are much closer. In most soils such a boring, or hole, reveals several distinct layers, called horizons, which collectively are known as the soil profile. The surveyor studies each layer to see how it differs from others in the profile and to learn the things about this soil that influence its capacity to support plant growth. He notes its thickness, color, texture, structure, and consistence. General definitions of all of these terms, as well as definitions for tilth, productivity, and drainage, are given in the subsection, Soil Layers.

Other characteristics observed in the course of the field study and considered in classifying the soil include the following: The depth of the soil over bedrock or compact layers; the presence of gravel or stones in amounts that will interfere with cultivation; the steepness and pattern of slopes; the degree of erosion; the nature of the underlying parent material from which the soil has developed; and acidity or alkalinity of the soil as measured by chemical tests.

Classification.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified into phases, types, and series. The soil type is the basic classification unit. A soil type may consist of several phases. Types that resemble each other in most of their characteristics are grouped into soil series.

As an example of soil classification, consider the Fluvanna series of Fluvanna County. This series is made up of two soil types, subdivided into phases, as follows:

Series	*Type*	*Phase*
Fluvanna	Fine sandy loam	Rolling phase.
		Undulating phase.
	Silt loam	Eroded rolling phase.
		Rolling phase.
		Undulating phase.

Soil type.—Soils similar in kind, thickness, and arrangement of soil layers are classified as one soil type.

Soil phase.—Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variations, frequency of rock outcrops, degree of erosion, depth of soil over the substratum, or natural drainage, are

examples of characteristics that suggest dividing a soil type into phases.

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

Soil Series.—Two or more soil types that differ in surface texture, but are otherwise similar in kind, thickness, and arrangement of soil layers, are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which it was first mapped.

Miscellaneous land types.—Fresh stream deposits, or rough, stony, and severely gullied land that have little true soil are not classified into types and series; they are identified by descriptive names, such as Riverwash, or Rough gullied land.

Soil complex.—When two or more soils are so intricately associated in small areas that it is not feasible to show them separately on the soil map, they are mapped together and called a soil complex. Manteo-Bremo silt loams, hilly phases, is a soil complex mapped in Fluvanna County.

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U. S. GOVERNMENT PRINTING OFFICE: 1958

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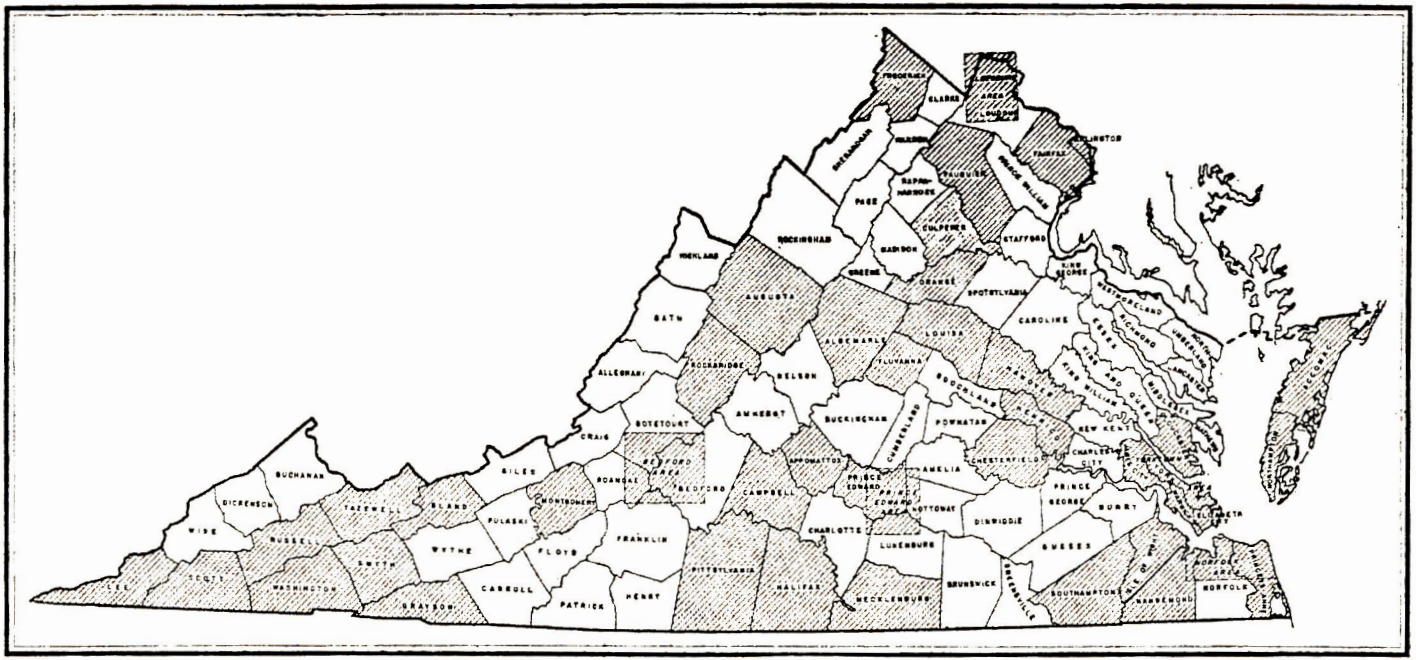

Areas surveyed in Virginia shown by shading.

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