
Soil Survey

Clay County North Carolina

By

S. O. PERKINS, United States Department of Agriculture, in Charge
and

WILLIAM GETTYS and E. F. GOLDSTON
North Carolina Department of Agriculture and
North Carolina Agricultural Experiment Station



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BUREAU OF PLANT INDUSTRY
E. C. AUCHTER, *Chief*
DIVISION OF SOIL SURVEY
CHARLES E. KELLOGG, *Principal Soil Scientist, in Charge*
NORTH CAROLINA DEPARTMENT OF AGRICULTURE
W. A. GRAHAM, *Commissioner*
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
R. Y. WINTERS, *Director*
C. B. WILLIAMS, *in Charge Soil Survey*

SOIL SURVEY OF CLAY COUNTY, NORTH CAROLINA

By S. O. PERKINS, Soil Survey Division,¹ Bureau of Chemistry and Soils, United States Department of Agriculture, in Charge, and WILLIAM GETTYS and E. F. GOLDSTON, North Carolina Department of Agriculture and North Carolina Agricultural Experiment Station

Area inspected by W. EDWARD HEARN, Inspector, District 2

United States Department of Agriculture in cooperation with the North Carolina Department of Agriculture and the North Carolina Agricultural Experiment Station²

CONTENTS

	Page		Page
County surveyed.....	1	Soils and crops—Continued.	
Climate.....	4	Third-class soils—Continued.	
Agricultural history and statistics.....	5	Hayesville clay loam, eroded hill phase.....	26
Soil-survey methods and definitions.....	7	Hiwassee silt loam, slope phase.....	26
Soils and crops.....	9	Fannin clay loam, eroded hill phase.....	27
First-class soils.....	11	Fannin loam, hill phase.....	28
Hayesville loam.....	12	Hiwassee fine sandy loam, eroded gravelly phase.....	28
Hiwassee silt loam.....	13	Fletcher silt loam.....	29
Congaree silt loam.....	13	Fourth-class soils.....	30
Tusquitee loam.....	14	Hayesville loam, steep phase.....	30
Fannin loam, colluvial phase.....	15	Porters loam.....	31
Second-class soils.....	16	Porters stony loam.....	32
Hayesville clay loam.....	16	Rabun stony clay loam.....	33
Worsham fine sandy loam.....	17	Burton stony loam.....	33
Worsham fine sandy loam, gravelly phase.....	18	Ranger slaty silt loam.....	34
Congaree fine sandy loam.....	18	Talladega silt loam.....	35
Fannin loam.....	19	Fifth-class soils.....	35
Porters loam, hill phase.....	19	Stony colluvium (Porters soil material).....	35
Hiwassee fine sandy loam.....	21	Rough stony land (Porters soil material).....	36
Toxaway silt loam.....	21	Rock outcrop.....	37
Warne loam.....	22	Land uses and agricultural methods.....	37
Congaree-Toxaway silt loams.....	23	Productivity ratings and land classification.....	40
Porters stony loam, hill phase.....	23	Morphology and genesis of soils.....	46
Third-class soils.....	24	Summary.....	51
Hayesville loam, hill phase.....	25	Map.....	25

COUNTY SURVEYED

Clay County is in the southwestern corner of North Carolina; only one county lies between it and the North Carolina-Tennessee State line on the west (fig. 1). The southern boundary coincides with the straight east-west boundary between North Carolina and Georgia. The other boundaries, for the most part, follow mountain ranges, giving the county a very irregular outline, forming roughly a semi-circle. Hayesville, the county seat, is about 80 miles by air line southwest of Asheville, N. C., 140 miles north of Atlanta, Ga., 120 miles east of Chattanooga, Tenn., and 135 miles southeast of Knoxville, Tenn. The county has an area of 220 square miles, or 140,800 acres.

Clay County consists of mountain ranges with sharp narrow ridges and peaks surrounding the foothills. Low mountains and narrow

¹ The Soil Survey Division was transferred to the Bureau of Plant Industry July 1, 1939.

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

valleys form the central and western parts. The conspicuous mountain ranges include the Valley River Mountains along the northern boundary and the Tusquitee Mountains lying a few miles south of the Valley River Mountains, from which they are separated by the deep



FIGURE 1.—Sketch map showing location of Clay County, N. C.

narrow gorge of Fires Creek. The other important ranges are Vineyard Mountain, Chunky Gal Mountain, Yellow Mountain, and the Blue Ridge. Spurs from these ranges extend in all directions. In general, the mountains are narrow-crested and have very steep slopes. In places, however, small stretches of level land are on top of the mountains, near their bases, and in coves. The relief of the foothills, along the Hiwassee River and along Shooting, Tusquitee, Sweetwater, Brasstown, and Crawford Creeks, and along other small creeks, contrasts strikingly with that of the rough, mountainous country. These intermountain areas have a rolling to hilly relief somewhat resembling that of the foothills of the Piedmont Plateau.

The smoother areas are in the vicinities of Elf School, Hayesville, and the villages of Shooting Creek, Brasstown, and Warne. Almost level strips of first bottoms and, in places, of old high alluvium border most streams. The first bottoms range in width from a few feet to one-half mile, whereas the old high second bottoms, or terraces, are as much as a mile wide in places but are not long.

The elevation in Clay County, as given by the United States Geological Survey, ranges from about 1,600 feet above sea level in the western part to about 5,600 feet on Standing Indian on the Macon-Clay County line. The elevation at Brasstown is 1,650 feet; at Warne, 1,700; Hayesville, 1,850; Elf School, 1,895; village of Shooting Creek, 2,052; and Black Gap, 3,842. The higher elevations are Standing Indian, 5,600 feet; Signal Bald, 5,275; Boteler Peak, 5,002; Weatherman Bald, 4,950; Kimsey Bald, 4,990; Big Stamp Knob, 4,400; and Peachtree Knob, 4,200. The elevations along the Hiwassee River average about 1,850 feet. The general slope of the county is westward.

Drainage is provided through the Hiwassee River, Shooting Creek, Fires Creek, and their tributaries, and it is mainly westward. Buck Creek flows northward into the Nantahala River; the Tallulah River rises near Standing Indian and flows into Georgia. The Hiwassee River rises in the Blue Ridge in Georgia and flows northward into this county to a point within about a mile of the mouth of Tusquitee Creek and thence westward out of the county. Shooting Creek, rising on the eastern side of Chunky Gal Mountain, Tusquitee Creek, rising south of Tusquitee Gap in the northern part of the county, and Fires Creek, between Valley River and Tusquitee Mountains, all flow westward into the Hiwassee River. Small creeks, branches, and draws extend into all parts of the county, so that drainage is well established everywhere except in a few flat spots in the first bottoms. On the slopes of the

intermountain section—that section resembling the piedmont section of North Carolina—excessive run-off causes considerable sheet erosion and gulying in the areas devoted to clean-cultivated crops. Scattered throughout the county are numerous springs of cool, sparkling water.

All the stream valleys are narrow and deep, and the streams are actively deepening their channels. Water power can be developed on a rather large scale. One hydroelectric power dam is about 10 miles west of Hayesville, and probably other good dam sites exist on the Hiwassee River, as it falls about 250 feet from the point where it enters the county to the point where it leaves. Water power is used to operate small gristmills and sawmills along the smaller streams.

Chestnut, chestnut oak, and mountain red oak constitute from 50 to 60 percent of the original tree growth in the mountainous parts of the county. Yellow poplar or tuliptree, hemlock, red oak, and some black or common locust, black walnut, and maple compose the chief tree growth along the streams. The common tree growth along the lower slopes is yellow poplar, ash, basswood, maple, black walnut, butternut, and some hickory and Virginia (scrub) pine (*Pinus virginiana*). On the upper slopes the principal tree growth is chestnut, chestnut oak, red oak (mountain oak), white oak, post oak, sourwood, buckeye, sugar maple, locust, hickory, cucumbertree, and mountain birch. The sugar maple usually grows in coves at an elevation of about 4,000 feet. On the higher mountain slopes are a few mountain pines (table-mountain pines). The principal undergrowth is laurel, dogwood, rhododendron, and galax or coltsfoot. The tree growth on the hilly or low intermountain areas consists mainly of white oak, post oak, some pine, locust, scarlet oak, hickory, and southern red oak (Spanish oak), and the undergrowth is mostly dogwood and laurel.

Practically all of the chestnut trees are dead, and in the areas where these trees have been removed for acid wood and pulpwood they are being replaced by yellow poplar and a few white pines. Several high peaks, or balds, on the higher mountains probably never have supported any tree growth. A short growth of wild grass occurs on these treeless balds. The more common plants are redbud, orchard grass, timothy, broomsedge, and crabgrass.

Clay County, named for Henry Clay, was formed in 1861, when it was cut off from Cherokee County. In 1872 it was enlarged by annexing a small part of Macon County. The first white settlers were mostly natives of North Carolina, coming mainly from Rutherford and Burke Counties, and later settlers came from Buncombe and Haywood Counties and from nearby counties in Georgia. They were mainly of Scotch, Irish, and English descent, and nearly all of the present inhabitants are descended from the original settlers. A few Negroes were brought in during the early days. The Negro population has not increased proportionately with the white population, however, and only a few hundred are now living in the county. The former native Indian population, members of the Cherokee Nation, were segregated to the Cherokee Reservation in Swain County in 1839, and there are none in Clay County at present. The population is fairly evenly distributed throughout the valleys, the smoother accessible uplands, and the intermountain areas. The central and

southwestern parts of the county are the most thickly populated parts. According to the 1930 census the population is 5,434, all classed as rural. The density of the population is given as 24.7 persons a square mile.

Hayesville, the county seat, with a population of 305, is the only incorporated town in the county. Other small towns and trading points are Brasstown, Warne, Tusquitee, Elf School, and Shooting Creek.

The only industry is the valley creamery located at Brasstown.

The one railroad in the county is a freight line, the Tennessee & North Carolina Railway, which extends from Andrews in Cherokee County to Hayesville in Clay County. United States Highway No. 64, a hard-surfaced highway, passes through the valley from west to east, and a hard-surfaced highway extends from the main highway to the Georgia State line. These form the main routes of transportation by means of truck and bus lines. A few of the county roads are graveled, but most of them are dirt roads and are difficult to travel during rainy weather and during the winter. Murphy, in Cherokee County, is the nearest outside shipping point. Telephone service is fairly good, and nearly all of the populated areas are served by rural mail routes and local post offices.

Three consolidated schools are in the county, with bus service for the pupils; one is in Hayesville, the other two are at Ogden School and Elf School. Rural schools and churches are conveniently located.

Almost all the products of the county, including poultry and hogs, are hauled out and sold elsewhere. Some lumber, tanbark, acid wood, and pulpwood is hauled, mostly by truck to Andrews.

CLIMATE

Clay County has a continental climate; in other words, the climate is not affected by the ocean or any other large body of water. Both the temperature and the rainfall throughout the valleys, which include practically all of the arable land in Clay County, are influenced by the high altitude of the surrounding mountains. The difference in temperature between the tops of the mountains and the valleys is great. During the comparatively short summers, days are not excessively hot and nights are prevailingly cool. The winters are not severely cold, and outdoor work can be carried on for the greater part of the season. The climate is very healthful.

No Weather Bureau station is located in Clay County. The nearest station is at Andrews, in Cherokee County, just across a mountain range from Clay County and at about the same elevation as Hayesville. Therefore the data from this station are fairly representative of the valley part of Clay County.

The mean annual precipitation is 60.40 inches. The bountiful rainfall is well distributed throughout the growing season, being heaviest in winter, spring, and summer. The average annual snowfall is 10.2 inches. Probably the amount of rainfall and the temperature vary widely from one part of the county to the other, but the rainfall everywhere is sufficient for the crops commonly grown.

The mean annual temperature is 57.3° F. The summer mean is 72.6°, and the winter mean is 41.9°. The highest recorded temperature

is 99° in both June and July, and the lowest recorded temperature is -6° in January. The date of the latest recorded killing frost is May 17, and the earliest is October 2. The average date of the last killing frost is April 25, and the first is October 19, giving an average frost-free season of 177 days.

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

TABLE 1.—Normal monthly, seasonal, and annual temperature and precipitation at Andrews, Cherokee County, N. C.

[Elevation 1,800 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1933)	Total amount for the wettest year (1932)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December.....	42.2	73	-1	6.80	3.57	16.83	2.1
January.....	41.3	78	-6	5.40	3.39	6.88	2.5
February.....	42.1	80	-4	4.50	8.62	9.83	2.6
Winter.....	41.9	80	-6	16.70	15.58	33.54	7.2
March.....	48.6	86	6	6.60	4.42	5.44	2.6
April.....	56.9	88	15	4.70	4.84	4.52	(1)
May.....	64.0	95	27	5.00	6.38	3.01	.0
Spring.....	60.5	95	6	16.30	15.64	12.97	2.6
June.....	71.2	99	38	5.10	2.09	5.36	.0
July.....	73.8	99	44	6.10	4.08	6.16	.0
August.....	72.9	98	44	5.00	4.49	4.16	.0
Summer.....	72.6	99	38	16.20	10.66	15.68	.0
September.....	69.5	95	33	3.80	.48	3.71	.0
October.....	58.0	90	18	3.40	2.00	6.63	(1)
November.....	47.4	83	8	4.00	1.29	5.04	.4
Fall.....	58.3	95	8	11.20	3.77	15.38	.4
Year.....	57.3	99	-6	60.40	45.65	77.57	10.2

¹ Trace.

AGRICULTURAL HISTORY AND STATISTICS

The earliest inhabitants in Clay County settled near the creeks and rivers and along the foot of the mountain slopes, and they cultivated the more easily tillable soils. The level bottom land was heavily forested and was not cleared until several years later. These early settlers bought and sold little, mainly because of isolation and great distance to markets over very poor roads. They raised sheep for wool, spun it to make cloth, tanned cowhides, and made their own shoes. At this time farm tools were very few and primitive. The people produced only enough vegetables for home consumption and depended a great deal on hunting and fishing to supply their fresh meats.

The main source of income was the sale of cattle, sheep, and hogs. The mountain slopes were burned over every winter, and in spring wild peas and grass came up, affording excellent pasture for the live-

stock, which was marked and turned out to forage in the mountains. Different-shaped cuts in the ear were the customary way of marking. The only fences used were those around the gardens and farm lots. The cattle and hogs were driven to markets in South Carolina and Georgia. The crops grown on the farm lots consisted of corn, potatoes, rye, and cabbage.

In 1879 corn was the most important crop, followed by wheat, oats, rye, and hay. In the same year 434 bushels of Canada peas, 685 bushels of dry beans, and 9,875 gallons of sorgo sirup were produced. Orchard products were valued at \$1,246 and forest products at \$16,314. The change that has taken place in agriculture can best be shown by the data in table 2, compiled from census reports, giving the acreage of the important crops from 1879 to 1934, inclusive.

TABLE 2.—Acreage of principal crops in Clay County, N. C., in stated years

Crop	1879	1880	1899	1909	1919	1929	1934
	<i>Acres</i>						
Corn for grain.....	7,810	9,139	10,786	9,109	9,289	8,120	9,042
Wheat.....	3,282	3,107	1,609	1,491	3,433	1,462	1,687
Rye.....	854	362	353	980	1,358	1,210	1,220
Oats.....	1,230	1,842	498	131	64	21	6
Sweetpotatoes.....	109	113	110	198	70	128	175
Potatoes.....	-----	90	92	140	80	205	199
Hay and forage.....	532	1,455	1,571	2,439	5,586	1,494	1,323
Sorgo for sirup.....	-----	155	226	178	346	78	-----
	<i>Trees</i>	<i>Tress</i>	<i>Trees</i>	<i>Trees</i>	<i>Trees</i>	<i>Trees</i>	<i>Trees</i>
Apples.....	-----	16,153	29,498	20,458	16,512	16,632	14,304
Peaches.....	-----	4,424	6,223	3,972	2,746	6,306	3,740

In 1880 there were 544 farms with an average of 32.5 acres of improved land per farm. The total number of farms increased to 898 in 1930 and to 1,008 in 1935. The total acreage of all land in farms in 1930 was 60,525 acres, as compared with 64,480 acres in 1935; but the value of all farm land and buildings decreased from \$1,741,340 in 1930 to \$981,531 in 1935. The average acre value of land and buildings was \$15.22 in 1935.

According to the 1930 census, 50.4 percent of the farms reported an expenditure of \$8,924 for fertilizer in 1929, or an average of \$19.70 per farm; an expenditure of \$19,843 for feed, or \$44.99 per farm, was reported by 49.1 percent of the farms; and 25.3 percent of the farms reported an expenditure of \$9,000 for labor, or an average of \$39.65 per farm reporting. Most of the fertilizer used is 16-percent superphosphate. Most of the farm labor is supplied from the local white population, and in general it is adequate for the farm needs. Farm hands generally are paid an average of \$1 a day or \$25 a month. Farms range in size from 3 to 300 acres, most of them ranging from 15 to 98 acres. The finer homes are located on the better agricultural land along the bottoms and on the smoother improved uplands, and the poorer houses are on the poor intermountain areas and in the mountains. A few large landholdings comprise chiefly mountain forest land. In 1930, 72.5 percent of the farms were operated by owners and 27.5 percent by tenants; in 1935, 69.7 percent were operated by owners and 30.3 percent by tenants. Most of the tenants operate on a share system, the landlord furnishing the land, imple-

ments, and work animals, and the crop being divided equally, except on farms on the more fertile bottoms, where the landlord receives three-fourths of the crop.

Most of the farmhouses are roomy and well built, as are also the shelters for the work animals and implements, except in some of the mountainous districts, where the houses, barns, and outbuildings are small and inadequate.

Farmers on the smoother or more level areas have improved equipment and machinery, but those on the steep and rough areas use one-horse cultivators and one-horse implements. Mowing machines, drills, binders, corn harvesters, and tractors are used on the smoother areas. The work animals consist of mules and horses, mostly mules. Every farm has at least one cow, a few hogs, and some chickens. In a few of the rougher districts, oxen are used for farming, logging, and pulling sleds.

The 1935 census reports 291 horses, 541 mules, 4,472 cattle, 768 sheep, 3,498 swine, and 31,332 chickens in the county on January 1 of that year. Of the cattle reported, 1,697 were cows milked in 1934, producing 494,515 gallons of milk and 141,809 pounds of butter made on farms. The chickens produced 151,937 dozens of eggs in 1934, and 52,022 chickens were raised in that year. The value of all vegetables grown in 1934, excluding potatoes and sweetpotatoes, was \$49,324. Forest products sold in 1934 were valued at \$12,883.

SOIL-SURVEY METHODS AND DEFINITIONS

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

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road or railroad cuts, are studied. Each excavation exposes a series of distinct soil layers, or horizons, called, collectively, the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, is studied in detail, and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil³ and its content of lime and salts are determined by simple tests.⁴ Drainage, both internal and external, and other external features, such as relief, or lay of the land, are taken into consideration, and the interrelation of soils and vegetation is studied.

The soils are classified according to their characteristics, both internal and external, special emphasis being given to those features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics, soils are grouped into mapping units. The three principal ones are (1) series, (2) type, and (3) phase. In places two or more of these principal units may be in such intimate or mixed pattern that they cannot be clearly shown separately on a map, but must be mapped as (4) a com-

³ The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality; higher values indicate alkalinity, and lower values indicate acidity.

⁴ The total content of readily soluble salts is determined by the use of the electrolytic bridge. Phenolphthalein solution is used to detect a strong alkaline reaction.

plex. Areas of land, such as coastal beach or bare rocky mountainsides that have no true soil, are called (5) miscellaneous land types.

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

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

A phase of a soil type is a variation within the type, which differs from the type in some minor soil characteristic that may have practical significance. Differences in relief, stoniness, and the degree of accelerated erosion frequently are shown as phases. For example, within the normal range of relief for a soil type there may be areas that are adapted to the use of machinery and the growth of cultivated crops, and others that are not. Even though there may be no important difference in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, there may be important differences in respect to the growth of cultivated crops. In such an instance the more sloping parts of the soil type may be segregated on the map as a slope or hill phase. Similarly, soils having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil profile or in the growth of native plants.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

In the mapping of the soils of Clay County, the relief, or the percentage of slope was given due consideration, and several hill phases and steep phases of the soils are delineated on the map. Slopes are designated A to F, according to the following classification:

A=0 to 2½ percent, level to nearly level.

B=2½ to 7½ percent, undulating to gently sloping.

C=7½ to 15 percent, rolling to very sloping.

D=15 to 30 percent, hilly.

E=30 to 60 percent, steep.

F=60 percent +, very steep.

The slope of the Porters soils is classed as a D slope, even though it ranges from 15 to 40 percent, as the Porters soils do not erode very readily.

SOILS AND CROPS⁵

The soils and the agriculture of Clay County are similar in many respects to those in many of the mountainous counties in western North Carolina. Approximately 85 percent of the county is so rough and mountainous that it cannot be used for general farming purposes. Much of the rougher area in the northern and eastern parts of the county is in the Nantahala National Forest, and this area is administered by the United States Forest Service.

Practically all of the mountainous area is forested, and observation indicates that the mountains in Clay County support a more even and uniform forest growth and more merchantable timber than any other mountainous county in the State. Among the great variety of trees in this county, the more important species are white oak, post oak, southern red oak (Spanish oak), hickory, hemlock, poplar, chestnut, chestnut oak, maple, yellow poplar (tuliptree), beech, gum, yellow birch, table-mountain pine, white pine, sugar maple, black walnut, white walnut or butternut, black locust, cucumbertree, sycamore, river birch, wild cherry, white ash, some old-field pine, dogwood, sourwood, ironwood, and hornbeam. The undergrowth is mainly mountain-laurel, rhododendron, and galax, and there is a variety of other plants and shrubs.

Practically all of the agricultural land in use in Clay County is in the Hiwassee River and Shooting Creek Valleys, on the intermountain rolling uplands and the more gentle mountain slopes, in the coves, and on a few of the flat tops on the lower mountains. Cultivated areas and areas devoted to the production of pasture grasses throughout the mountainous area are small.

The population is not uniformly distributed. Most of the people live in the valleys and on the lower slopes of the mountains. In the more rolling intermountain areas, where the steep slopes were cleared and used for clean-cultivated crops, both sheet and gully erosion are pronounced in many places, and some of the farmers have abandoned their farms and moved to land of more favorable relief, or have given up farming altogether.

The agriculture of Clay County is mainly of a self-sufficing type. The soils and climatic conditions in the valleys and in the intermountain areas allow the growing of corn, wheat, oats, soybeans, potatoes, and cabbage and are suited for the production of apples. Potatoes and cabbage, as well as other garden vegetables, return yields of excellent quality. Very few of these crops, however, are grown in sufficient quantities to be considered cash crops. A few cattle are raised.

Corn is the most important crop, and according to the 1935 Federal census, 9,042 acres were planted in 1934, with a yield of 132,997 bushels. Most of the corn is used on the farm to feed work animals or to fatten cattle and hogs; some is ground into meal for consumption in the home; and a small quantity is sold on the local markets. Corn probably occupies 60 percent of the cultivated acreage of farming land and is grown

⁵In Clay County, Porters stony loam is mapped against rough stony land along the Macon County line. This is probably due to the fact that the eastern escarpment of the mountain is steeper than the true mountainous country.

on practically every farm. Wheat ranks next to corn in acreage. It was grown on 1,687 acres in 1934, but the quantity of wheat produced is not sufficient to supply the local demand for flour. Hay of all kinds, including sorghum used for forage, is the third crop of importance. In addition to the above-mentioned crops, small acreages are devoted to the production of rye, potatoes, sweetpotatoes, tobacco, oats, soybeans, and cowpeas. Forty or fifty years ago apples were a rather important crop, but only a few young trees have been planted in recent years, and in many places the old trees have been neglected and become diseased.

Probably more than one-half of the annual net income of the more successful farmers is from the sale of dairy products, eggs, and poultry, together with a small amount from the sale of cattle and hogs. Nearly every well-established farmer has from one to five milk cows. Some butterfat is produced and sold to the creamery at Brasstown. Poultry raising is becoming an important source of income. Some hogs and cattle are pastured on the mountain slopes, and the cattle to be slaughtered and sold are brought down from the mountains in the fall and sold on outside markets. Some of them are driven to market, and others are hauled by truck to Asheville.

Considerable revenue is derived from the sale of timber, acid wood, cross ties, pulpwood, staves, telephone poles, and tanbark. In some sections of the county these forest products are the main sources of cash income, especially for the people living in the mountains. Some medicinal herbs and galax leaves, the latter used for decorative purposes, are gathered from the mountains and sold. In a few places some goldenseal and ginseng are grown under shade or in the shaded coves.

In Clay County the relationship between the agriculture and the various soils is not so definite as it is in many other parts of North Carolina. This may be due largely to the fact that the agriculture has been and is of a subsistence type, and the same crops are grown on a variety of soils. The relief, or lay of the land, is the main controlling factor in the agricultural use of the soils. The county includes large areas of inherently good soils, as regards texture, structure, and drainage conditions; in other words, their internal characteristics; but their steepness of relief and, in some places, their stoniness preclude their use for general farming. Therefore, practically all of the farm crops are produced on soils of the first bottoms, second bottoms, and the gently sloping to rolling intermountain areas.

The soils of this county differ considerably in color, texture, structure, consistence, fertility, relief, and conditions of stoniness and erosion, all of which bear close relationship to the productivity and use that can be made of the land. Most of the soils are loams, silt loams, and fine sandy loams, which are mellow and friable, easy to till, and warm early in the spring. The brown loams predominate throughout the mountainous parts of the county, whereas the redder surface soils and subsoils are developed in the intermountain areas and terraces. Raising cattle never has been an enterprise in this county, although moderately steep areas of Porters soils will produce good pasture grasses.

The soils are classed in five main groups: First-class soils, Second-class soils, Third-class soils, Fourth-class soils, and Fifth-class soils.

In this grouping of the soils the principal land uses or crop adaptations, as revealed by both the internal and external characteristics of the soils and their productive capacity, have been given due consideration.

In the following pages the soils are described in detail, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 3.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Clay County, N. C.*

Soil type	Acres	Per cent	Soil type	Acres	Per cent
Hayesville loam.....	1,024	0.7	Hiwassee silt loam, slope phase.....	384	0.3
Hiwassee silt loam.....	1,280	1.0	Fannin clay loam, eroded hill phase.....	2,496	1.8
Congaree silt loam.....	3,968	2.8	Fannin loam, hill phase.....	4,096	2.9
Tusquitee loam.....	1,216	.9	Hiwassee fine sandy loam, eroded		
Fannin loam, colluvial phase.....	256	.2	gravelly phase.....	448	.3
Hayesville clay loam.....	2,688	1.9	Fletcher silt loam.....	512	.4
Worsham fine sandy loam.....	256	.2	Hayesville loam, steep phase.....	1,600	1.1
Worsham fine sandy loam, gravelly			Porters loam.....	17,536	12.4
phase.....	576	.4	Porters stony loam.....	64,448	45.8
Congaree fine sandy loam.....	896	.6	Rabun stony clay loam.....	384	.3
Fannin loam.....	1,408	1.0	Burton stony loam.....	512	.4
Porters loam, hill phase.....	6,464	4.6	Ranger slaty silt loam.....	896	.6
Hiwassee fine sandy loam.....	1,280	1.0	Talladega silt loam.....	1,600	1.1
Toxaway silt loam.....	2,432	1.7	Stony colluvium (Porters soil mate-		
Warne loam.....	128	.1	rial).....	1,920	1.3
Congaree-Toxaway silt loams.....	1,024	.7	Rough stony land (Porters soil		
Porters stony loam, hill phase.....	2,368	1.7	material).....	4,288	3.0
Hayesville loam, hill phase.....	6,528	4.6	Rock outcrop.....	128	.1
Hayesville clay loam, eroded hill			Total.....	140,800	-----
phase.....	5,760	4.1			

FIRST-CLASS SOILS

First-class soils include Hayesville loam, Hiwassee silt loam, Congaree silt loam, Tusquitee loam, and Fannin loam, colluvial phase. These soils cover only a little more than one-fifth of the Hiwassee River Valley, which includes the rolling and intermountain areas. They represent about 5.6 percent of the total area of the county. They occupy level or nearly level first bottoms, almost level to undulating second bottoms, and sloping, undulating, or gently rolling uplands, which range in slope from 3 to 8 percent, with small areas of slightly greater slope. All these soils are naturally well drained. They occur for the most part in the central and southwestern parts of the county. Very little sheet erosion or gullyng has taken place on these soils, and they lie favorably for the use of all kinds of farm machinery. They have mellow friable surface soils and are easily tilled.

Considering the inherent character of these soils, and the slope, or lay of the land, they are the best in the county, and they dominate the agriculture, producing the greater part of the wheat, corn, and hay crops. Practically all of these soils is farmed. They are easily accessible, as they are conveniently located as to roads.

Hayesville loam, Fannin loam, colluvial phase, and Tusquitee loam are the most level upland soils. Hiwassee silt loam is developed on terraces or high second bottoms and everywhere is well drained. It is one of the best agricultural soils in the county. Congaree silt loam occurs in comparatively narrow areas on first bottoms along the Hiwassee River and other large streams. This soil, according to the

North Carolina Agricultural Experiment Station, is recognized as one of the best soils in the State as regards inherent plant nutrients. It is especially well suited to the production of corn and hay crops.

Hayesville loam.—The 7- to 9-inch surface soil of Hayesville loam in cultivated fields is brown or grayish-brown loam grading into light-brown loam. In most places this is underlain by a 2- to 4-inch gradational layer of reddish-yellow or yellowish-brown moderately friable clay loam. The subsoil, beginning just below the gradational layer, is red or brownish-red moderately stiff but fairly crumbly and brittle clay that breaks into irregular-shaped lumps, which are easily crushed between the fingers into a friable mass. This layer reaches a depth of 28 to 32 inches, where it passes into reddish-brown rather friable light clay, streaked with light gray and white, containing some mica flakes. This material, in turn, passes into a more mottled light-red and yellow friable clay or clay loam. It becomes more friable with depth, and at a depth of about 60 inches grades into brownish-yellow, brown, and light-gray disintegrated gneiss or fine-grained granite. When crushed it is yellow and shows some black specks. Wooded areas have a shallow covering of partly decomposed leaves and twigs, and here the topmost 1 or 2 inches of the soil is dark-brown loam. As developed in this county, Hayesville loam is fairly uniform in depth. In places, angular quartz fragments are scattered over the surface. In some cleared areas the surface soil is shallow, owing to sheet erosion.

Hayesville loam occupies rather small bodies scattered throughout the intermountain section of Clay County. The largest areas are near Hayesville, Ledford Church, Shooting Creek Church, Downing Creek Church, Meyers Chapel, and Pinelog Church and east of Marshall Chapel. The total area mapped is not large. This soil occupies undulating to sloping land, with a slope of 3 to 7 percent. All kinds of farm machinery can be used on this soil.

Both surface and internal drainage are well established. When properly managed, this soil is not subject to serious erosion. Areas on the steeper slopes that have been in cultivation over a period of years are susceptible to sheet erosion unless protected by terracing or strip farming.

Probably 75 percent of this soil is cleared and under cultivation, and the rest is forested, mainly to white oak, post oak, red oak, black oak, a few pine trees, and some locust, sourwood, and dogwood. The principal crops grown are wheat, corn, oats, lespedeza, clover, soybeans, and rye. With an application of 200 pounds of superphosphate per acre, corn yields from 15 to 30 bushels; wheat, with 200 pounds of superphosphate per acre, yields from 10 to 18 bushels; rye yields from 10 to 20 bushels without commercial fertilizer; lespedeza from $\frac{3}{4}$ to 1 ton of hay; and clover, mostly red and alsike, from 1 to 2 tons. Probably 40 percent of this soil is planted to corn, 50 percent to wheat, and 10 percent to other crops.

As a rule small grain is sown after corn. It is the general practice of all the farmers throughout the county to cut the tops and pull fodder from the cornstalks.

In the more level areas Hayesville loam is one of the best upland soils in the county and should be used for general farming. With proper rotation of crops, including the turning under of leguminous crops,

satisfactory yields can be obtained and the soil built up to a fair or high state of productivity.

Hiwassee silt loam.—The 8- to 10-inch surface soil of Hiwassee silt loam is dark-brown or reddish-brown mellow friable silt loam. The subsoil is reddish-brown or dark brownish-red predominantly friable silty clay loam or silty clay, ranging from 4 to 10 feet in thickness. In most places the subsoil is underlain by rounded quartz gravel embedded in red silty clay loam. The particles of gravel or stones range in diameter from $\frac{1}{4}$ inch to 6 inches. In some places the subsoil rests directly on bedrock and the gravel layer does not occur. This soil is practically free of gravel on the surface, in the surface soil, and in the subsoil. In places the surface soil is grayish-brown fine sandy loam.

Hiwassee silt loam occupies old terraces or second bottoms lying from 50 to 150 feet above the stream bottoms. The largest areas are along the Hiwassee River north of Brasstown; in the vicinity, southeast, and north of Hayesville; and southwest of Ledford Church. Smaller areas are along Shooting Creek and its tributaries, especially near Elf School and the village of Shooting Creek. The total area is not large.

The surface of this soil ranges from nearly level to undulating and gently sloping. One narrow strip within the large area near Brasstown is sloping. The Hiwassee soils are developed from old alluvial materials and were deposited when the streams flowed at a higher level. These materials have undergone changes by soil-forming processes. Owing to the friability of the surface soil and subsoil, the presence of the underlying gravelly layer, and the relief, this soil everywhere is well drained.

Practically all of Hiwassee silt loam is cleared and in cultivation, and it is a desirable soil for all the crops commonly grown. The principal crops are corn, wheat, soybeans, and field peas. With light applications of commercial fertilizers wheat produces from 12 to 20 bushels per acre, and with an application of 200 to 300 pounds of superphosphate per acre corn produced from 30 to 50 bushels. Fertilizer is seldom used for soybeans and field peas. These crops are sometimes grown with the corn, being sown after the corn is laid by.

Very little fall plowing is done. Ordinarily the land is prepared in the spring and immediately planted to corn. Wheat generally is sown after the corn is harvested in the fall, but sometimes peas and soybeans are sown in early summer and plowed under in the fall, after which the wheat is sown. This practice increases the yield of wheat considerably.

Congaree silt loam.—The surface soil of Congaree silt loam is brown silt loam ranging from 10 to 15 inches in thickness. It is underlain by yellowish-brown silt loam or silty clay loam, which continues to a depth of 3 feet or more. In places this material grades into somewhat yellow or gray silt loam between 20 and 30 inches below the surface. Both surface soil and subsoil contain considerable quantities of finely divided mica flakes. This soil has long been recognized as containing a larger quantity of plant nutrients in its natural condition than any other soil in the State, but in this county it does not occur in large uniform bodies as it generally does elsewhere. Its best development is along the Hiwassee River. Very small strips of Congaree fine sandy loam, Congaree fine sand,

Congaree-Toxaway silt loams, and Toxaway silt loam, which could not feasibly be separated on the scale of mapping used, are included with this soil. Small strips of colluvial soil overlying the alluvial material on the outer borders of the bottoms near the slope also are mapped with Congaree silt loam. These areas of colluvial material are higher than the main part of the bottoms and are normally above overflow.

The largest areas of Congaree silt loam border the Hiwassee River and Shooting and Tusquitee Creeks. Narrow strips border a number of small streams in various parts of the county. This is the most extensive soil of the first group, although its total area is not large.

The surface is generally flat or almost level with a gradual slope toward the stream channel and in the direction of flow. Small depressions or swales occur in this soil. The soil owes its origin to material washed from the surrounding higher soils and redeposited by the streams. This is a young soil of comparatively recent deposition, and the material has not been in position a sufficient length of time for the development of a normal profile. Most of this soil has good surface and internal drainage, for a soil in the first bottoms, except in some of the flatter areas and in slight depressions.

Congaree silt loam is probably the most fertile soil in the county, and it is decidedly the best soil for corn. Practically all of it is devoted to this crop or is used for hay and pasture land. Minor crops are wheat, rye, oats, and soybeans. Corn yields from 30 to 60 bushels an acre, hay 1 to 2 tons, wheat 7 to 20 bushels, and rye 10 to 18 bushels. Soybeans and cowpeas do particularly well on this soil. Some lime and very little fertilizer is used. The fertility is kept renewed by material that is deposited by stream overflow and washed from the higher surrounding soils.

Congaree silt loam can be handled under a wide range of moisture conditions.

Tusquitee loam.—The surface soil of Tusquitee loam is grayish-brown friable mellow loam, ranging in thickness from 10 to 28 inches. The subsoil is yellowish-brown or brown friable loam or clay loam to a depth ranging from 3 to 10 feet or more. In many places the difference in structure, texture, and color throughout the surface soil and subsoil is slight, and it is difficult in some places to differentiate these two layers. The entire soil is very permeable, allowing ready absorption and free percolation of rain water. Locally a few angular rock fragments are scattered over the surface and mixed with the soil. Forested areas have a 2- to 4-inch covering of well-decomposed leafmold containing a large percentage of organic matter. In other places the surface soil is dark-brown mellow loose loam to a depth of 8 to 10 inches. The subsoil ranges in color from brown to brownish yellow and in texture from very friable loam to clay loam. A small area of Porters loam with the same slope is included with Tusquitee loam in mapping. The principal difference between these soils is in the depth of the surface soil.

Tusquitee loam occurs for the most part at the bases of the mountain slopes, near the heads of streams, and in coves, and it extends a short distance along some of the smaller streams. Areas are most numerous along Tusquitee Creek and its tributaries and along the tributaries of the Hiwassee River below the mouth of the Tusquitee River. One

of the largest bodies lies along Buck Creek in the northeastern part of the county. The total area, however, is not large.

This soil occupies slopes or undulating to gently rolling areas. Although the surface is smooth enough for the use of heavy farm machinery, the small size of the soil bodies precludes the practical use of modern farm machinery. This soil is formed from material washed or sloughed from the higher surrounding Porters soils and accumulated at the bases of the slopes. Some of it extends up the slopes, and the soil gradually thins out over the residual soils. Drainage is well established in this open and porous soil.

Probably 90 percent of the land is cleared and under cultivation. The principal crops are corn, potatoes, cabbage, sorgo, garden vegetables, and apples, and some tobacco is grown for home use. Very little fertilizer, if any, is used. The forest growth on the uncleared areas consists mainly of chestnut, chestnut oak, and locust, and there are a few black walnut trees.

Corn is the most important crop grown on this soil, and it yields from 30 to 40 bushels an acre without fertilizer. Potatoes yield from 75 to 200 bushels with an application of 400 to 600 pounds of 5-7-5.⁹ Vegetables do well, and good quality cabbage can be grown. Sorgo is an important crop.

Owing to the open porous character and permeability of both the surface soil and the subsoil, this soil is not subject to erosion. It constitutes practically all of the land suitable for agricultural purposes in some of the rougher mountainous parts of the county.

Fannin loam, colluvial phase.—The surface soil of Fannin loam, colluvial phase, consists of deep-brown loam or silt loam to a depth ranging from 15 to 25 inches. The subsoil is brownish-yellow micaceous silty clay loam continuing to a depth of 40 inches or more, where it grades into mica or talc schist. The surface soil is darker and the subsoil is lighter in color than the corresponding layers of typical Fannin loam. The main differences between this soil and the typical soil are in the depth of the surface soil and in the lower content of mica flakes. This colluvial soil has been formed from materials washed or sloughed from adjacent areas of the Fannin soil, where the uplands have been cleared for some time.

Fannin loam, colluvial phase, occurs in very small bodies at the bases of slopes, in depressions at the heads of drainageways, and in narrow bands along streams in association with Fannin loam, Fannin clay loam, eroded hill phase, and Congaree silt loam. The principal bodies are east of Brasstown, southeast of Bethel Church, southwest of Hayesville, northeast of Downing Creek Church, and south of Mount Pleasant Church. A total area of only 256 acres is mapped.

This soil has gently sloping relief and is smooth enough for the use of all kinds of heavy farm machinery where the fields are large enough to justify it. Measures of erosion control are needed on this soil. Both surface and internal drainage are good.

Approximately 90 percent of the land is cleared and under cultivation. The principal crops are corn, wheat, oats, sorgo, vegetables, clovers, lespedeza, and rye. Corn yields from 20 to 40 bushels an acre, wheat 15 to 20 bushels, and clover 1 to 2 tons. Sorgo and vegetables yield abundantly. This is a desirable soil for farming.

⁹ Percentages, respectively, of nitrogen, phosphoric acid, and potash.

SECOND-CLASS SOILS

Second-class soils comprise Hayesville clay loam; Worsham fine sandy loam; Worsham fine sandy loam, gravelly phase; Congaree fine sandy loam; Fannin loam; Porters loam, hill phase; Hiwassee fine sandy loam; Toxaway silt loam; Warne loam; Congaree-Toxaway silt loams; and Porters stony loam, hill phase. The Congaree and Toxaway soils occur in the first bottoms, which are almost level to gently undulating. Porters loam, hill phase, and Porters stony loam, hill phase, are developed on the lower and gentler slopes of the mountains, which range from 15 to 40 percent, whereas Hayesville clay loam, Worsham fine sandy loam, Worsham fine sandy loam, gravelly phase, Hiwassee fine sandy loam, and Warne loam have sloping to rolling topography. The Worsham soils were included in this group because of their favorable relief.

The soils in this group differ considerably not only in relief, or lay of the land, but in color, texture, susceptibility to erosion, drainage conditions, and agricultural value. Considered as a whole, the soils of this group are not such good soils as those of the first group. Hayesville clay loam and Fannin loam have become impaired by sheet erosion on those areas that have been cultivated for several years.

With the exception of Porters loam, hill phase, and Porters stony loam, hill phase, from 70 to 80 percent of the remaining soils in this group is under cultivation. The main use of these soils is for the production of wheat, corn, clover, lespedeza, rye, field peas, sorgo, sweetpotatoes, and watermelons. Porters loam, hill phase, and Porters stony loam, hill phase, are best suited for pasture grasses and apples; whereas Hayesville clay loam and Fannin loam are better adapted to growing wheat and clover than to growing any other crops. Hiwassee fine sandy loam and Worsham fine sandy loam are best suited to growing early vegetables, because of the light-textured surface soil and the fact that they warm early in the spring. Congaree fine sandy loam also is well suited for growing vegetables and watermelons, as well as general farm crops, whereas Toxaway silt loam is best suited to the production of corn and hay crops.

Hayesville clay loam.—The 4- to 7-inch surface soil of Hayesville clay loam is reddish-brown clay loam. It is underlain by a red stiff but brittle clay subsoil, which in most places continues to a depth ranging from 30 to 50 inches, where it grades into soft rotten gneiss or schist. This soil differs from Hayesville loam mainly in color and texture of the surface soil. In places this soil probably represents a former Hayesville loam from which part of the surface soil has been removed by sheet erosion and in which some of the material in the upper subsoil layer has been mixed with the surface soil through cultivation, thus producing a clay loam. In other places, however, the texture of this soil is probably due to the inherent qualities of the parent material rather than to sheet erosion. Wooded areas have a thin covering of leafmold, consisting of partly decomposed leaves, roots, and twigs on the surface. The surface soil varies in thickness from place to place, probably as a result of sheet erosion. In some places considerable angular quartz rocks are scattered over the surface, and in a few places veins of angular quartz rock are in the subsoil.

Small areas of Rabun clay loam, owing to their small extent, are combined with Hayesville clay loam in mapping. The surface soil of Rabun clay loam is dark brownish-red clay loam, 6 or 8 inches thick, and is underlain by a maroon-red stiff brittle clay subsoil.

Hayesville clay loam is widely scattered throughout the county. The largest and, agriculturally, the most important areas are near Mount Pleasant Church, southeast of Hayesville, near Tusquitee Church, and west of Ledford Chapel. Other small areas occur elsewhere throughout the central part of the county. Inclusions of Rabun clay loam are one-half mile west of Elf School and in the vicinity of and one-half mile south of Ledford Chapel.

This soil occupies slopes or rolling areas having a gradient ranging from 3 to 15 percent. Owing to the comparatively smooth surface, all kinds of modern farm machinery may be used on this soil. Surface drainage is fairly well established, but the heavy texture of the subsoil retards internal drainage to some extent. On some of the more rolling areas or steeper slopes, run-off is excessive, and sheet erosion is pronounced on areas under clean cultivation.

Approximately 80 percent of Hayesville clay loam is cleared and under cultivation. The forest growth on the rest consists of chestnut oak, chestnut, southern red oak, post oak, white oak, black oak, dogwood, sourwood, and a few scattered pine trees. The crops grown on this soil are clover, wheat, corn, and rye. Clover yields from 2 to 2½ tons of hay per acre, corn from 15 to 25 bushels, and rye from 8 to 12 bushels. Light applications of superphosphate usually are applied to wheat and rye.

This heavy-textured soil cannot be plowed under so wide a range of moisture conditions as the loam member of the series. If plowed when too wet it will clod and yields of crops will be reduced considerably. This is a good soil for the production of clover and wheat, and, with proper management and rotation of crops, good yields can be obtained.

Worsham fine sandy loam.—Worsham fine sandy loam, as mapped in Clay County, is variable in color and texture of both surface soil and subsoil and in drainage conditions. In places it is partly colluvial; that is, material from the higher lying areas has rolled or sloughed down the slopes and accumulated at their bases. The typical areas of Worsham fine sandy loam have a gray surface layer, 6 to 8 inches thick, underlain by a light-gray fine sandy loam subsurface layer, from 3 to 6 inches thick. The subsoil is brownish-yellow or yellow, mottled with gray and brown, heavy fine sandy clay or clay. In some places it contains sufficient small mica scales to give it a slight greasy feel. Locally, a layer, or an abundance, of white angular quartz fragments is in the subsoil. In such places it is probable that the quartz fragments were on the surface of the original soil and the present layer of soil over these fragments is colluvial material. Most of this soil is underlain by granite, although some quartzite is present in places.

Much of the soil mapped as Worsham fine sandy loam in Clay County has a surface layer of light-gray fine sandy loam to a depth of 8 to 10 inches, and this material passes into light-gray or grayish-yellow fine sandy loam that extends to a depth of 10 to 14 inches. The subsoil is yellow fairly heavy but friable fine sandy clay to a

depth ranging from 30 to 40 inches. These areas closely resemble Edneyville fine sandy loam, which occurs in Henderson County, N. C.

Worsham fine sandy loam occurs in a very few small areas, such as the ones along Pinelog Creek, along streams southwest of Hayesville, one-half mile west of Downing Creek Church, near Curtis School, and near Ledford Chapel.

This soil occupies benchlike positions near the bases of the slopes contiguous to the heads of streams and occurs in saddlelike positions between the low hills. The land is sloping to moderately rolling. Drainage conditions are extremely variable, ranging from poor to good. Most of the land lies favorably for the use of modern farm machinery and is under cultivation or in pasture. Corn, wheat, soybeans, clover, and lespedeza are the principal crops. With light applications of commercial fertilizer, corn yields from 15 to 25 bushels an acre, wheat 10 to 12 bushels, and clover 1 to 2 tons. Some lespedeza hay is produced, and soybeans, field peas, and sweetpotatoes give fair yields.

Worsham fine sandy loam, gravelly phase.—The gravelly phase of Worsham fine sandy loam differs essentially from typical Worsham fine sandy loam in that it contains a considerable quantity of angular quartz fragments, ranging from 1 to 5 inches in diameter, and a few larger quartz rocks scattered over the surface and mixed with the soil. A layer of this quartz gravel is present here and there in the subsoil.

This soil occurs on slopes ranging from 15 to 30 percent. Most of it is on the lower slopes in the intermountain areas. Drainage on the steeper areas is good, but, at the base of the slopes and contiguous to the heads of streams, both surface and internal drainage are poor.

Only a small acreage of Worsham fine sandy loam, gravelly phase, is mapped in this county. The larger areas are near and northeast of Shady Grove Church, near Ledford Chapel, south and southeast of Shooting Creek Church, and near Mount Pleasant Church.

Granite, and in some places quartz, underlie the subsoil. Some feldspar has been mined in several places in this soil.

The same crops are grown as on typical Worsham fine sandy loam, but the yields are not so high. Care must be exercised in the cultivation of this soil on the steep slopes. Most of the areas should be in grasses in order to prevent sheet erosion. Fair pasture can be obtained if this soil is seeded to lespedeza and clover and if liberal applications of lime and superphosphate are used.

Congaree fine sandy loam.—Congaree fine sandy loam is light-brown or brown fine sandy loam, from 10 to 18 inches thick, underlain by yellowish-brown or brown fine sandy loam, silt loam, or silty clay loam mottled with brown and gray in the lower part of the layer. Scattered throughout this soil are small areas and narrow bands of loamy fine sand and brown gravelly sand or sandy loam. Spots of dark-brown loam or silt loam occur in a few places where the finer sediment has accumulated. Such areas, which generally occur nearer the upland, have a larger content of organic matter. Both surface soil and subsoil contain considerable finely divided mica.

Congaree fine sandy loam occurs only in the first bottoms of streams, mainly along the Hiwassee River and the other larger streams of the county. This soil generally occupies narrow strips nearest to the

stream channel. The largest bodies are along Brasstown Creek in the vicinity of Brasstown, along the Hiwassee River, especially in the vicinity of Shallow Ford Bridge, and along Crawford Creek near Warne. A few smaller areas border Shooting and Tusquitee Creeks and minor streams. Congaree fine sandy loam is an inextensive soil.

The surface is nearly level or gently undulating. The soil has been formed from alluvial material washed from the uplands and deposited by the streams. Both surface and internal drainage are good, although the soil is subject to occasional overflow.

Practically all of this soil is under cultivation and is given the same treatment as Congaree silt loam, but the yields are somewhat lower. Corn yields from 20 to 30 bushels an acre and hay $\frac{1}{2}$ ton to $1\frac{1}{2}$ tons. Sorgo and vegetables do well. Congaree fine sandy loam is an easily managed soil; that is, it can be cultivated and worked under a wide range of moisture conditions. Owing to its sandy texture, it warms early in the spring and is, therefore, a good soil for early truck crops. It is a fair to good agricultural soil.

Fannin loam.—The 5- to 8-inch surface soil of Fannin loam in cultivated fields consists of mellow loam or silt loam. Under ordinary moisture conditions the material is grayish brown or brownish yellow, but when dry it is grayish yellow or light brownish yellow. In wooded areas it is grayish-brown loam containing some organic matter. The subsoil is yellowish-red or light-red moderately stiff but brittle clay or silty clay, from 10 to 30 inches thick. It grades into soft friable micaceous schist. The moderately thin subsoil and variations in color of the underlying soft rock material, which ranges from pink to red, yellow, or white, are very noticeable characteristics of this soil. Both surface soil and subsoil contain sufficient finely divided mica flakes to give the material a greasy feel when rubbed between the fingers.

Fannin loam occurs principally in the central and western parts of the county. The largest bodies are between Hayesville and Warne, near Ledford Chapel, in the vicinity of Union Chapel, and near Tusquitee. The total area is small.

This soil occupies gently sloping to rolling land where the slope ranges from 3 to 15 percent. Owing to the favorable surface and to the friability of the material in the lower part of the subsoil and the parent material, drainage is well established. Some of the cleared areas are subject to sheet erosion and gulying.

Probably 60 percent of this soil is cleared and under cultivation or in pasture. On the wooded areas the tree growth consists of white oak, post oak, hickory, dogwood, scrub pine, and poplar. The principal crops grown are wheat, corn, rye, sweetpotatoes, potatoes, clover, soybeans, and field peas. With an application of 200 to 300 pounds of 3-8-3 fertilizer, wheat yields from 8 to 15 bushels an acre, and corn 15 to 30 bushels. Both potatoes and sweetpotatoes produce fair yields if properly fertilized. Peas and clover yield moderately well.

The slope of this land allows the use of all kinds of modern machinery, and with careful handling the soil is not subject to serious erosion.

Porters loam, hill phase.—Porters loam, hill phase, occupies slopes ranging from 15 to 40 percent. The surface soil is brown or grayish-brown mellow loam, from 6 to 12 inches thick. The subsoil is yellowish-brown or reddish-brown friable clay loam, which, at a depth

ranging from 30 to 40 inches, generally grades into soft disintegrated or broken gneiss. In some places the subsoil is only a thin layer and rests directly on the soft or broken rock and soil material. Both surface soil and subsoil generally are very porous and friable, allowing free percolation of rain water. Here and there a few broken gneiss and granitic fragments are on the surface and mixed with the surface soil and subsoil. In forested areas the soil has a thin covering of leaf-mold on the surface, and the topmost 2 or 3 inches of the surface soil is rich in organic material. The color of this layer is dark gray or almost black. At the head of coves the surface soil is nearly black to a depth ranging from 6 to 10 inches and the subsoil is yellowish-brown friable clay loam. In places on the tops of mountains the surface soil is gray or grayish brown and the subsoil is brownish yellow, resembling that of the Ashe soils; whereas in other places, near the lower slopes, the surface soil is reddish brown and the subsoil resembles that of the Hayesville soils. Porters loam, hill phase, as mapped, includes small bodies of typical Porters loam, Burton stony loam, Porters stony loam, and Ashe stony loam.

Porters loam, hill phase, is developed along the lower slopes, in gaps, and on the tops of low mountains, and in a few places on the tops of the higher mountains. This is one of the most extensive cultivable soils. The largest areas are 1 mile northwest of Copperhill Church, 1 mile south and one-fourth mile north of Andrews Dam, just north of Shallow Ford Bridge, east and north of Fires Creek Church, north and northeast of Hayesville, east of Downing Creek Church, on either side of Shooting Creek between Shooting Creek Church and the village of Shooting Creek, and along Tusquitee Creek between Tusquitee and Tidwell School.

Most of this soil is on the moderately steep mountain slopes. Owing to the sloping topography and porous and permeable character of the surface soil and subsoil, allowing free percolation of rain water, both surface and internal drainage are excellent.

Probably not more than 10 percent of the soil has been cleared, although it is an important mountain soil. The forest growth on the uncleared areas consists of chestnut, chestnut oak, white oak, post oak, mountain red oak (black oak), dogwood, sourwood, poplar, and locust. The undergrowth consists of mountain-laurel, rhododendron, and galax. Practically all of this soil, the first year after being cleared, is planted to corn and potatoes. At present approximately 75 percent of the cleared areas is devoted to pasture and the rest is cultivated to corn, potatoes, and minor crops. This soil has a wider range of slope—from 15 to 40 percent—than any other agricultural soil mapped in the county, owing to the fact that the use value of the land throughout its range of slope is practically the same.

The small cleared areas of this soil generally are used for pasture, and cattle raising is the main source of income. The principal crops are corn and potatoes, and the minor crops are cabbage and string beans. Some apples are grown. On newly cleared land corn yields from 20 to 40 bushels an acre, potatoes 50 to 150 bushels, and vegetables produce well. Fertilizers are seldom used on cornland, but the land for potatoes and cabbage is fertilized.

As the steep slopes preclude the use of large machinery, only small plows and farming implements can be used on this soil. Shallow

breaking of the land is the general practice; the mellow soil does not require deep breaking. Erosion is not so serious on this open porous soil as it is on many of the soils with heavier subsoils on smoother land. Fertilizer is used only for the vegetable crops and some of the apple trees.

Porters loam, hill phase, is naturally a good soil, and more of it could be farmed. A large acreage could be seeded to grass and thus provide good pasture for cattle.

Hiwassee fine sandy loam.—The 6- to 8-inch surface soil of Hiwassee fine sandy loam is light-brown or grayish-brown fine sandy loam. The subsoil, which continues to a depth of about 40 or more inches, is red or reddish-brown fine sandy clay or fine sandy clay loam. It is rather stiff but brittle, so that it readily crumbles under pressure between the fingers to a friable mass. The subsoil contains some finely divided mica. In places, a 1- or 2-inch subsurface layer, consisting of brownish-yellow or reddish-yellow fine sandy loam, lies between the surface soil and the subsoil; and in other places a few rounded quartz gravelstones are scattered over the surface. The texture of the surface soil in some small areas is very fine sandy loam or silt loam. Where this soil joins the soils of the uplands it is shallow.

Most of Hiwassee fine sandy loam occurs as areas of old high alluvium along the principal streams. The largest bodies lie along the Hiwassee River near the Georgia State line and east of Herbert Bridge, along Shooting Creek between Mount Pleasant Church and the village of Shooting Creek, along Tusquitee Creek near its mouth, and near the village of Tusquitee. The total area mapped, however, is not large.

Hiwassee fine sandy loam has undulating to gently sloping relief. All the land is naturally well drained, and very little sheet erosion has taken place.

The underlying parent material consists of rounded particles of gravel and subangular quartz pebbles, ranging from $\frac{1}{8}$ inch to 6 inches in diameter, which are mixed with red fine sandy clay material. This soil consists of old alluvial deposits laid down at a time when the streams flowed at higher levels than they do today.

Most of the land is cleared and cultivated or is used for pasture. The tree growth on the uncleared areas includes mainly oaks, together with a few scattered pine, dogwood, sourwood, and chestnut trees. Corn, wheat, rye, sweetpotatoes, lespedeza, truck crops, field peas, and soybeans are the chief crops. Corn produces from 20 to 30 bushels an acre, wheat 8 to 12 bushels, rye 10 to 15 bushels, sweetpotatoes 75 to 100 bushels, and lespedeza 1 to $1\frac{1}{2}$ tons. From 200 to 400 pounds per acre of a 3-8-3 fertilizer or 200 pounds of superphosphate are used for wheat.

This soil is easy to cultivate, and all types of improved farm machinery can be used. It is a very desirable soil for wheat, rye, sweetpotatoes, truck crops, and corn. Its deficiency in organic matter should be supplied by growing and turning under legumes and by adding barnyard manure. This soil is used advantageously for general farm crops.

Toxaway silt loam.—The 8- to 15-inch surface soil of Toxaway silt loam consists of black, dark-brown, or dark-gray silt loam. The typical soil contains a large quantity of organic matter. Numerous spots

of dark-gray or brown silt loam or very fine sandy loam are too small to show separately on the soil map. The subsoil is steel-gray or brown silt loam or loam. In many places the loam grades into yellowish-gray or nearly white heavy silty clay at a depth of 20 to 24 inches, and this material is locally called pipe clay. Areas underlain by this material are said to be less productive and more difficult to drain than areas of the typical soil. In a few places at a depth of 30 inches a highly micaceous fine sandy loam or fine sand is reached. Where this material underlies the subsoil the land is better drained.

This soil occurs along practically all of the streams in this county. The largest areas border Tusquitee Creek, Brasstown Creek, the Hiwassee River, and some other streams. Large bodies are southwest and southeast of Tusquitee, in the vicinity of Tusquitee Church, near Hayesville, near Warne, and along Clear Creek in the northeastern part of the county. Smaller areas are near the headwaters of other streams.

This soil occupies first-bottom positions along streams, and the land ranges from level to very gently sloping. It is subject to overflow during periods of high water.

Toxaway silt loam is an alluvial soil, being formed from sediments deposited by streams at times of comparatively slow-moving water. This material consists chiefly of silt, very fine sand, and clay washed from areas of Porters loam and associated soils. Formerly this soil was in a semiswampy condition and supported a thick growth of trees and a dense undergrowth of water-loving plants and grasses. The leaves, plants, and grasses, on decaying, became intermixed with the mineral particles and produced a black mellow soil.

Possibility of damage by overflow renders this soil unsuitable for some crops. The natural surface drainage of the flatter areas is poor, and open ditches are necessary and are in use throughout the areas of this soil. The areas having the pipe-clay subsoil are even less well drained than the areas of typical soil. Tiling of some of the higher areas would prove beneficial.

Practically all of this soil is cleared and used for general farming or for pasture. It is especially adapted to corn, grass, rye, soybeans, and some late truck crops. Cucumbers and pumpkins would produce well. Corn yields from 20 to 40 bushels an acre, hay 1 to 2 tons, and rye 10 to 18 bushels. Toxaway silt loam in Clay County is less productive than Congaree silt loam, but in Buncombe and Transylvania Counties, N. C., it has the same productivity as Congaree silt loam.

Cultural methods practiced on this soil are the same as those on Congaree silt loam and are the best in the county. Modern machinery is extensively used. At present corn and hay are grown universally. Liming this soil is absolutely necessary for best results. Very little commercial fertilizer is used, but the response in increased yields warrants its use.

Warne loam.—The 6- to 8-inch surface soil of Warne loam is gray or grayish-brown mellow and friable loam or silt loam. The subsoil, which continues to a depth of 24 to 30 inches, is yellow, stiff but brittle clay that crumbles easily, although in places it is compact and tight. This layer is underlain by steel-gray heavy tough silty clay, mottled with yellow and rust brown. In places this is a real claypan and is impervious to air and water. A few rock outcrops occur in places.

Only a few small areas of this soil are mapped. They are east of Moss Church, north of Brasstown, and in the vicinity of Warne. They cover a total area of only 128 acres.

The soil occupies comparatively smooth land that ranges from 2 to 7 percent in slope.

The material forming this soil was deposited partly by streams when they were flowing at higher levels and partly from colluvial wash from the uplands. In places the soil is underlain by a layer of subangular and rounded quartz gravel. It has good surface drainage but imperfect internal drainage.

Practically all of this soil is cleared and under cultivation. The principal crops are corn, wheat, field peas, soybeans, rye, vegetables, sweetpotatoes, clover, and lespedeza. Given a light application of 3-8-3 fertilizer, corn yields from 18 to 30 bushels an acre and wheat 10 to 15 bushels. Vegetables, potatoes, and hay yield well. The management of this soil is similar to that of surrounding soils.

Congaree-Toxaway silt loams.—This soil complex includes areas of poorly developed Congaree and Toxaway soils. In places the surface soil is variable in color, although in general it is brown or grayish brown, like the fully developed Congaree soils. In places the subsoil is dark-gray or black silt loam. This soil complex represents more recently deposited material over the original dark-colored soil. In many places that part nearest the slope has a reddish-brown surface layer of recent colluvial wash from the red soils of the uplands. Narrow strips of colluvial Hayesville soils are included within the complex. Congaree-Toxaway silt loams vary greatly throughout the county in color and in depth of the surface soil and subsoil. The material underlying the subsoil in most places is the same as that underlying the Toxaway soils.

This complex of soils occupies first bottoms along many of the streams throughout the county, and the strips range in width from a few feet to a quarter of a mile. The largest areas border Tusquitee Creek east of Tidwell School and near the mouth of the creek, Giesky Creek near Bethara Church, Hyatt Mill Creek north of Meyers Chapel, and Brasstown Creek and its tributaries near Warne. The total area of Congaree-Toxaway silt loams is not large.

Areas of this soil complex are nearly level. Congaree-Toxaway silt loams are alluvial in origin, being formed from the sediment deposited by streams in comparatively slow moving water. This material consists mostly of silt, very fine sand, and clay washed from the areas of Porters, Hayesville, and Fannin soils. Here and there throughout the area of this soil are poorly drained spots, and artificial drainage is necessary to reclaim them for adequate crop use.

Practically all of this soil is cleared and under cultivation or is used for grazing. The principal crops are corn, hay, soybeans, and field peas. With the addition of light applications of commercial fertilizer and lime, fairly good yields can be obtained. Corn yields from 20 to 50 bushels an acre; hay, such as redtop and orchard grass, from 1 to 2 tons.

Porters stony loam, hill phase.—The surface soil of Porters stony loam, hill phase, consists of light-brown to dark-brown friable loam, ranging in depth from 6 to 14 inches, and it contains considerable well-

decomposed organic matter in the topmost 2 or 3 inches. The subsoil is yellowish-brown or reddish-brown friable loam or clay loam to a depth ranging from 24 to 40 inches. It is underlain by soft, partly decomposed Carolina gneiss and Roan gneiss. Both the surface soil and the subsoil contain from 30 to 60 percent of mica schist, Roan gneiss, and Carolina gneiss fragments, from a few inches to several feet in diameter. Porters stony loam, hill phase, as mapped, includes small areas of Porters loam, Burton stony loam, Ashe stony loam, and rough stony land. In a few places patches of a soil having a red or brownish-red subsoil also are included.

Porters stony loam, hill phase, is typically developed on mountain slopes, on tops of mountains, and in coves near the heads of small drainageways. It occurs principally along the headwaters of Tusquitee Creek; on Chairmaker Branch, Perry Creek, and Hurricane Creek; along the headwaters of Shooting Creek; on Giesky Creek; on the Right Fork of Eagle Creek; and on White Oak Stamp; along Buck Creek, east of Carundum; and along the Tallulah River.

Porters stony loam, hill phase, has a slope ranging from 15 to 40 percent. Owing to the permeability of both the surface soil and subsoil, external and internal drainage are good. For the same reason, run-off and erosion are not great.

Only a few small patches of this soil have been cleared and are being used for corn and pasture. This soil probably has been the best forested soil in the county, but practically all of the merchantable timber has been cut. The present growth consists of hemlock, poplar, chestnut, chestnut oak, white oak, post oak, northern red oak, and a few scattered white pine trees. The undergrowth is mountain-laurel, rhododendron, galax, and black birch.

If the stones were removed from the surface, this soil on the more gentle slopes would produce good yields of corn, wheat, cabbage, and potatoes. It would afford excellent pasture for cattle, as, even where stones are present, much of it could be used advantageously for pasture. The stonier and steeper areas should remain in forest.

THIRD-CLASS SOILS

Hayesville loam, hill phase; Hayesville clay loam, eroded hill phase; Hiwassee silt loam, slope phase; Fannin clay loam, eroded hill phase; Fannin loam, hill phase; Hiwassee fine sandy loam, eroded gravelly phase; and Fletcher silt loam make up the group of Third-class soils. All these soils are developed on rolling to hilly land having a slope range from about 15 to 30 percent and are naturally well drained. Sheet erosion and gulying have been active on areas that have been in clean cultivation over a period of years, particularly on Hayesville loam, hill phase; Hayesville clay loam, eroded hill phase; and Fannin clay loam, eroded hill phase. Hiwassee fine sandy loam, eroded gravelly phase, and Hiwassee silt loam, slope phase, occupy rolling to hilly areas; and some of Hiwassee silt loam, slope phase, occupies escarpments. Fletcher silt loam has a hilly relief and is considered a soil of comparatively low value.

At present only a small proportion of the soils in this group is used for cultivated crops. Some of these soils were the first in the county to be cleared and cultivated, and they once returned fair yields of corn, wheat, and grasses, and some of them were used for growing

apples. It was the practice of some of the early farmers to clear an area, cultivate it as long as it gave fair yields, or until it became seriously eroded, and then abandon it and clear new land. Conservation practices, such as terracing and strip farming to prevent soil washing, were neglected by many of the farmers. Some of these eroded areas can be reclaimed by terracing, strip farming, and the growing of grasses, but a few of them are so badly gullied that it would not be feasible or economical to reclaim them for agricultural use.

Hayesville loam, hill phase.—Hayesville loam, hill phase, differs from typical Hayesville loam in the degree of slope or relief. Sheet erosion has thinned the surface soil in most places, especially in areas that have been farmed. In wooded areas this layer consists of an inch or two of dark-brown or brown leafmold underlain by light-brown mellow loam to a depth of 5 or 6 inches. Fine plant roots fill this layer. The subsurface soil, or gradational layer, between the surface soil and the subsoil, consists of yellowish-brown moderately friable clay loam, 2 or 3 inches thick. The subsoil, beginning at a depth ranging from about 8 to 14 inches, is brownish-red, red, or light-red moderately stiff but fairly crumbly brittle clay. It breaks down rather easily when crushed. This, in turn, is underlain, at a depth of about 30 inches, by reddish-brown light clay streaked with light-gray or nearly white rather friable clayey material. This material contains mica flakes and reaches a depth ranging from 40 to 60 inches. Below a depth of 60 inches is disintegrated gneiss rock, mottled brownish yellow, brown, and white. When crushed between the fingers this material is yellow and shows some black specks. In places the surface soil is shallow, and in other places quartz fragments are scattered over the surface. In a few isolated spots the texture of the surface soil is fine sandy loam.

Numerous bodies of this soil occur throughout the central and western parts of the county. The largest areas are in the vicinity of Pinelog Church, northeast of Hayesville, and west of the Hiwassee River from the Georgia State line north to Herbert Bridge.

Hayesville loam, hill phase, with a slope ranging from 15 to 30 percent, is too hilly and steep for the convenient use of heavy farm machinery. Both surface and internal drainage of this soil are good, and in cleared areas the run-off is excessive, causing sheet erosion.

Approximately 10 percent of this soil is cleared and used for cultivated crops and pasture, and the rest is forested to post oak, white oak, southern red oak, chestnut, chestnut oak, dogwood, sourwood, and a few scattered pine trees. The principal crops on this soil are rye, wheat, clover, field peas, soybeans, and a little corn. Very little fertilizer is used.

Hayesville loam, hill phase, is a difficult soil to cultivate in clean crops without serious erosion unless proper methods of control are used. Sheet erosion begins on this soil as soon as it is cleared. If terracing, strip cropping, and proper rotations are practiced, this soil can be used for cultivated crops and fair yields may be obtained. If the land is seeded to grass as soon as it is cleared, much of it will afford valuable pasture. A small quantity of nitrogen, a liberal quantity of phosphate, and some lime would be very beneficial.

Hayesville clay loam, eroded hill phase.—The surface soil of Hayesville clay loam, eroded hill phase, is red or brownish-red clay loam from 3 to 6 inches thick. The subsoil of red stiff brittle clay continues downward to a depth of 30 inches or more, where it grades into soft disintegrated gneiss, hornblende gneiss, or granite. This soil differs from typical Hayesville clay loam in that it occupies hilly areas. Erosion has been active; in many places it has removed the entire surface soil and exposed the heavy red-clay subsoil. The depth of the surface soil ranges from 1 to 6 inches. Associated with this soil are small areas with a dark-red surface soil, 5 to 7 inches thick, and a maroon-colored heavy but brittle clay subsoil reaching to a depth of 3 feet or more. This included soil is underlain by dark-colored basic rock. These small areas would have been mapped as Rabun clay loam had they been large enough to separate on a map of the scale used.

Hayesville clay loam, eroded hill phase, occurs mainly in the south-central part of the county on either side of the Hiwassee River and Shooting Creek. Other areas lie between New Hope Church and Hayesville, north of Warne, and near Pinelog Church.

As this soil occupies hillsides and steep slopes ranging from 15 to 30 percent, it is too steep and too hilly for the practical use of modern heavy farm machinery.

Owing to hilly and moderately steep relief, this soil is excessively drained. It was one of the first in the county to be cleared, but sheet erosion and gullying, encouraged by careless farming methods, have removed the surface soil and exposed the subsoil, which is not desirable for cultivated crops. This does not mean, however, that this soil could not be reclaimed for farm use.

Practically all of this hilly soil is, or was at one time, cleared, but many areas have been allowed to become reforested with small pines and oak brush. The greater part of the land is used for pasture. Small areas are cultivated to corn, rye, some wheat, and peas. Corn produces from 5 to 12 bushels an acre and wheat from 5 to 8 bushels; rye gives low yields. A light acre application of superphosphate is usually the only fertilizer used.

A system of soil reclamation should be practiced on this soil, such as proper terracing, filling of gullies, growing clover and lespedeza on the better areas, and reforesting the gullied and badly eroded areas with pines. In its present condition the soil not only produces low yields but is unprofitable to farm because it is difficult to cultivate without danger of serious erosion.

Hiwassee silt loam, slope phase.—This soil represents a hilly or slope phase of Hiwassee silt loam and occupies a position on the escarpments or breaks between the nearly level or undulating Hiwassee silt loam and the first-bottom soils. The 4- to 8-inch surface soil is reddish-brown friable mellow silt loam. The subsoil is reddish-brown or maroon-red friable silty clay loam to a depth of about 20 inches, where, in most places, it is underlain by rounded gravel and cobbles ranging from 1 to 6 inches in diameter. In some places the subsoil rests directly on solid bedrock and the gravel layer is absent; in places the surface soil is completely gone and the red clay loam subsoil is exposed; and in still other places both surface soil and subsoil are eroded away and the gravel layer is exposed. This soil differs from

typical Hiwassee silt loam in slope, in the character of the surface soil and subsoil, and in the presence of the gravel layers. In many places rounded gravel is scattered over the surface.

The principal areas are along the Hiwassee River in the western part of the county, and other areas are near Ogden School. Only a very small total area is mapped.

This soil occupies the steep slopes or breaks and occurs in long winding narrow belts and in small areas. Heavy modern farm machinery cannot be used on the land. The structure of this soil, together with its hilly or rather steep relief, allows excessive drainage, and, in places, the land is badly eroded.

Practically all of this soil is cleared, but, because of its occurrence in very narrow breaks and strips, little of it is used for farming. The same crops are grown as on typical Hiwassee silt loam, but yields are lower. The land is being allowed to grow up in small bushes, honeysuckle, briars, and underbrush of various kinds. Such a growth prevents the soil from eroding back into the smoother areas of Hiwassee silt loam. In fact, this soil should be kept in some kind of permanent growth, such as honeysuckle, clover, lespedeza, bushes, briars, and grasses, in order to prevent serious sheet erosion.

Fannin clay loam, eroded hill phase.—Fannin clay loam, eroded hill phase, represents areas of Fannin loam where the surface soil has been largely removed by sheet erosion and gullyng. The surface soil is yellowish-red or reddish-purple micaceous clay loam from 4 to 6 inches thick. The subsoil is yellow, light-red, or pink silty clay, ranging in thickness from 6 to 30 inches. It grades into soft friable mica schist. The thin surface layer and shallow subsoil are noticeable characteristics of this soil. Both surface soil and subsoil contain a considerable quantity of mica flakes, that is, enough to give the soil a greasy feel when rubbed between the fingers. In places the underlying parent material is pink or purple well-decomposed rock, which has lost all its original structure and conformation. The depth of this soil varies throughout the county. In places the underlying mica schist is exposed at the surface.

Fannin clay loam, eroded hill phase, occurs in scattered bodies throughout the central and western parts of the county. The largest areas are northwest of Shooting Creek Church, north of Marshall Chapel, east and northwest of Ogden Church, one-fourth mile north of the Georgia State line between Winchester and Brasstown Creeks, along the highway from Warne to Hayesville, and north of Downing Creek.

This soil occurs on moderate to steep slopes and hillsides, where the slope ranges from 7 to 30 percent. Heavy farm machinery can be used on the smoother slopes, but the greater part of the land is too steep for the use of such implements. Both surface and internal drainage of this soil are excessive, and sheet erosion and gullyng have been active.

Practically all of the areas of this soil have been cleared and cultivated, but at present very little of the land is suited for cultivation, owing to the serious erosion. Some of it is used for pasture, but the greater part is now idle and supports a brush growth, and nothing is being done to reclaim it. Rye in small patches, a little wheat, soybeans, and field peas are the only crops grown. Yields are very

low and, for the most part, unprofitable. Much of the land supports a growth of small pines and other bushes.

Fannin clay loam, eroded hill phase, is similar in color, slope, and erosiveness to Hayesville clay loam, eroded hill phase, except that it erodes more easily than the Hayesville soil on the same degree of slope and under the same cultural treatment, and it is less productive. The principal difference between these two soils is in the underlying parent rock. In its present condition, Fannin clay loam, eroded hill phase, should not be used for cultivated crops. A system should be worked out by which this soil, together with Hayesville clay loam, eroded hill phase, can be reclaimed and brought back to normal productivity.

Fannin loam, hill phase.—Fannin loam, hill phase, differs from typical Fannin loam mainly in surface topography. The 4- to 6-inch surface soil in cultivated fields is light-brown mellow loam under ordinary moisture conditions and brownish yellow when dry. The subsoil, to a depth ranging from 10 to 25 inches, is yellowish-red or light-red moderately stiff but brittle smooth silty clay. This grades into yellowish-red micaceous loam, which gradually passes into the soft distintegrated mica schist. Wooded areas have a 2- or 3-inch surface covering of brown loam that is high in organic matter. Included with this soil in mapping are small areas of Talladega silt loam, and in such areas the subsoil is very thin over the soft schist rock.

The greater part of this soil occurs in the central, southern, and southwestern parts of the county. The largest areas are north of Warne and between Shady Grove Church and Hayesville. Many small areas are along Shooting Creek and its tributaries between Mount Pleasant Church and the village of Shooting Creek. Other areas are near Brasstown.

The slopes occupied by this soil range from 15 to 30 percent, and drainage is good to excessive. Heavy farm machinery cannot be used advantageously on this hilly land. Without very careful management, serious sheet erosion and gullying would soon reduce this soil to Fannin clay loam, eroded hill phase. Therefore, only small areas are cleared and cultivated.

Probably 90 percent of the land supports a forest growth consisting chiefly of white oak, post oak, southern red oak, chestnut oak, chestnut, poplar, locust, dogwood, and sourwood. The undergrowth consists mainly of mountain-laurel and small shrubs. The crops grown are corn, wheat, oats, rye, and field peas. Small quantities of fertilizers are used on corn and wheat—from 200 to 400 pounds of 3-8-3 mixed fertilizer or 200 to 300 pounds of superphosphate. Corn yields from 12 to 25 bushels an acre, wheat from 7 to 12 bushels, and rye from 5 to 10 bushels.

The management of this soil is practically identical with that practiced on the other soils of the uplands. Careful cultural methods or a grass cover have to be employed in order to prevent erosion, as the cleared areas are very susceptible to sheet erosion. Areas in cultivation should be terraced and strip farmed or seeded to lespedeza or some suitable grass mixture. Unless proper methods of management are exercised, it will be more profitable to leave this soil in forest.

Hiwassee fine sandy loam, eroded gravelly phase.—The eroded gravelly phase of Hiwassee fine sandy loam occurs in hilly or strongly

sloping and generally gravelly areas. It occupies the slope that grades from the areas of smoother old high alluvium, where Hiwassee fine sandy loam is developed, to stream bottoms of recent alluvium. The gravelly areas are not scattered uniformly on these slopes. This gravelly soil represents a soil condition rather than a soil type and is largely the result of erosion. Erosion has cut through the gravelly layer of Hiwassee fine sandy loam and mixed the gravel with the surface soil and subsoil on the slopes; hence neither the surface soil nor the subsoil have uniform color or depth. In places the surface soil has been entirely removed and the red or reddish-brown gravelly loam is exposed. In other places on these slopes the surface soil is shallow, and near the lower part of the slope it is much deeper as a result of the accumulation of material through colluvial action.

Narrow strips of this soil lie along the Hiwassee River and to less extent along Tusquitee and Shooting Creeks. The total area is small.

This land has too steep a slope—from 15 to 30 percent—for the use of heavy farm machinery. Surface drainage is good to excessive. In spots sheet erosion has been active, and shallow gullies have formed. Hiwassee fine sandy loam, eroded gravelly phase, is old alluvial material, which was brought down by the streams and deposited when they flowed at much higher levels than they do now.

Approximately 75 percent of this soil has been cleared, and the greater parts of the cleared areas are used for pasture. The same crops are grown as on typical Hiwassee fine sandy loam, which occupies smoother land. Yields are slightly less on this soil than on the typical soil under the same cultural practices and fertilizer treatments.

Owing to its hilly relief, the management of this soil necessarily is different from that practiced on the smooth areas. The soil on the slopes erodes very badly when devoted to clean-cultivated crops, such as corn and potatoes. The general practice of the best farmers, therefore, is to seed these hilly areas to wheat, rye, field peas, soybeans, and lespedeza.

Fletcher silt loam.—The 6- to 9-inch surface soil of Fletcher silt loam is grayish-brown or brown mellow silt loam. The subsoil is yellowish-brown or reddish-brown friable silty clay, which continues to a depth ranging from 24 to 40 inches. The typical surface soil and subsoil, as mapped in Transylvania County, are derived from Brevard schist, and the subsoil grades into soft rock. As mapped in Clay County, this soil is derived from Brasstown schist and slate. Noticeable quantities of platy schist fragments are scattered over the surface and mixed throughout the subsoil. In places the surface soil ranges from bluish gray to brown, and it is shallow, especially on the steeper slopes. In a few small areas on the steeper slopes the surface soil has been eroded away, and these areas would be mapped as Fletcher silty clay loam if they were large enough to show on the soil map. Where this soil joins Ranger slaty silt loam, the surface soil is bluish gray or slate-colored, and the subsoil is bluish gray mixed with yellow and brown.

Fletcher silt loam occupies only a very small total acreage in this county, principally near Brasstown, north of Sweetwater Church, and south of Fires Creek Church.

The land is hilly to steeply sloping, the slope ranging from 15 to 30 percent. Surface drainage is good to excessive, and sheet erosion and gullying are apparent on cultivated areas.

Approximately 50 percent of this soil has been cleared, and the greater part of it is used for grazing. The rest is forested to old-field pine, persimmon, chestnut, chestnut oak, post oak, white oak, poplar, dogwood, and sourwood. Corn, wheat, and tobacco are the principal crops grown, but the yields are small, except of tobacco, which, when properly fertilized, produces from 600 to 900 pounds an acre.

Shallow breaking and the use of light farm machinery are general practices. No definite system of crop rotation is practiced, and very few leguminous crops are grown for soil improvement. This soil is subject to sheet erosion in places where it is not covered by forest or other vegetation.

FOURTH-CLASS SOILS

The Fourth-class soils include Hayesville loam, steep phase, Porters loam, Porters stony loam, Rabun stony clay loam, Burton stony loam, Ranger slaty silt loam, and Talladega silt loam. All these soils are developed on steep to very steep slopes that range from 30 to 90 percent, and many of them occupy the mountain peaks and knolls. The steepness of slope and, in some places, the presence of stones preclude their use for general farming purposes, and they are therefore considered Fourth-class soils suited to forestry. This does not mean that trees do better on these soils than on the better agricultural soils of the county, but forestry is about their only profitable use under present conditions. Some areas on the more gentle slopes, if cleared and seeded immediately, would produce good pasture grasses, and in some places apple orchards could be maintained, though with considerable difficulty. Here and there small areas have been cleared and used for the production of corn, cabbage, potatoes, garden vegetables, and other crops. Some of the smoother areas that could be farmed are so isolated or inaccessible that it would not be economical to farm them. A considerable area of these soils is included in the Nantahala National Forest. Porters stony loam, Burton stony loam, and Hayesville loam, steep phase, are inherently good soils, are mellow and friable throughout, absorb a large part of the rain water, and would be productive and easy to till if they occurred in areas of favorable relief and were stone free.

Hayesville loam, steep phase.—In wooded areas, the surface soil of Hayesville loam, steep phase, consists of an inch or two of dark-brown loam surface material composed of well-decomposed leaves, roots, and twigs high in organic matter, underlain by brown or yellowish-brown mellow friable loam ranging from 5 to 8 inches in thickness. The subsoil, which extends to a depth ranging from 30 to 40 inches, is red or yellowish-red stiff but brittle clay, which becomes friable in the lower part. This is underlain by soft disintegrated gneiss, hornblende gneiss, or fine-grained granite. In places a gradational layer of reddish-yellow clay loam is between the surface soil and the subsoil. Both the surface soil and the subsoil of this steep phase of Hayesville loam are more porous and permeable than the corresponding layers of the more level areas of Hayesville loam.

Hayesville loam, steep phase, occupies the steepest slopes of the intermountain area. The largest bodies are west, northwest, and south

of Hayesville; along the Hiwassee River at the mouth of Goose Creek; south of Ogden Church; and north of Philadelphia Church. Smaller areas are near Downing Creek Church and along Shooting Creek. The total area is not large.

This soil occupies slopes that range from 30 to 60 percent and are too steep for the use of ordinary farm machinery. Surface drainage is excessive. If cleared and cultivated the soil would erode very badly, owing to its steep relief.

Practically all of this land is in native forest growth consisting chiefly of chestnut, chestnut oak, white oak, post oak, black oak, red oak, southern red oak, scattered pines, poplar, dogwood, and sourwood, and in addition a few hickory trees. This soil is too steep for cultivated crops, although a few cleared areas are used for grazing. It is possible, if a good stand of grass becomes set before erosion starts, to use this soil profitably for pasture. Orchards could also be established on this soil if the trees were planted on the contour and the land kept in grass.

Porters loam.—The 1- to 3-inch surface layer of Porters loam on the steeply sloping areas consists of dark-brown loam containing a considerable quantity of organic matter, consisting of leaves, roots, and twigs. The underlying material, to a depth of about 8 inches, is yellowish-brown, reddish-brown, or dark-brown mellow friable loam, which, also, contains a fairly high percentage of well-decomposed vegetable matter. The subsoil, to a depth of 24 to 30 inches, is reddish-brown, light-brown, or yellowish-brown friable clay loam. This passes into yellowish-brown permeable heavy loam, which continues downward to a depth of about 45 inches, where it grades into the soft disintegrated or broken gneiss or fine-grained granite. The surface soil and the subsoil in some places grade into each other without any perceptible line of demarcation. Where this soil is associated with Porters stony loam, fragments of gneiss and schist rock are on the surface and mixed with the subsoil. In a few spots they are numerous and very noticeable and probably would hinder cultivation if the land were cleared for farm use. In other places the subsoil is very thin or is absent, and the surface soil rests on the soft disintegrated gneiss or broken rock material.

Porters loam is an extensive mountain soil. It occupies steep slopes on the low mountains throughout the central part of the county and the steep lower slopes of the high mountain ranges in the eastern, northern, western, and southern parts. Some of the largest areas are on or partly surround Double Knobs; Chasteen, Cherry, Carrell, Fleaback, Vineyard, and Little Mountains; and Kimsey Ridge 2 miles southwest of Hayesville.

Probably 5 percent of this soil has been cleared and is being used for crops or pasture. The principal crops are corn, cabbage, and potatoes. Fertilizer is applied for cabbage and potatoes but rarely for corn. The forest growth on the rest consists of chestnut, chestnut oak, mountain red oak, black oak, white oak, post oak, sourwood, dogwood, yellow buckeye, and some sugar maple and cucumbertree, together with an undergrowth of rhododendron, mountain-laurel, and galax.

This soil occurs on steep slopes where the gradient exceeds 40 percent; in places it ranges from 60 to 90 percent. Only the lightest and smallest farm implements can be used on these steep slopes.

Natural surface and internal drainage of all areas of this soil are excellent. The mellowness and permeability of both surface soil and subsoil allow free percolation of the greater part of the rainfall, leaving the soil well drained soon after rains. On some cleared areas the soil is eroded.

Porters loam is inherently a strong soil, easy to till, and adapted to the production of corn, potatoes, cabbage, apples, and many other crops, but the steepness of slope precludes its use for general farming. Fair to good pastures can be maintained for grazing cattle, and more of the land could be cleared and seeded for pasture if economic conditions warranted an increase in cattle raising.

Porters stony loam.—The surface soil of Porters stony loam is brown or dark-brown very mellow and friable loam ranging from 6 to 10 inches in thickness. The subsoil is yellowish-brown friable clay loam to a depth of 15 to 48 inches. The material in this layer grades into soft disintegrated gneiss or fine-grained granite. Large quantities of stones, ranging from a few inches to several feet in diameter, are scattered over the surface and mixed throughout the soil mass. In many places bedrock is near the surface, and large outcrops occur here and there. In places the line of demarcation between the surface soil and the subsoil is not sharp, and the brown loam or heavy loam continues down to bedrock with little change except for a yellowish-brown hue in the lower part. Both surface soil and subsoil are very friable and porous, thereby allowing easy absorption and free percolation of rain water. The surface soil on the northern slopes of the mountains is darker and has a thicker organic layer overlying it than does the surface soil on the southern slopes. Small spots having a brown or red surface soil and a red subsoil are included with this soil in mapping. In some places the soil is stony fine sandy loam, and in other places small bodies of Ashe stony fine sandy loam, which has a gray surface soil and a grayish-yellow subsoil, are included with Porters loam, as they were too small to map separately. Still other inclusions are made of small areas of Burton stony loam, rough stony land (Porters soil material), and Ashe stony loam.

Porters stony loam is by far the most extensive soil mapped in Clay County; its total area exceeds 100 square miles. Typically, it occupies mountain slopes and in most places extends to the tops of the mountains. The largest areas are on the Tusquitee Mountains and the mountains in the eastern and southeastern parts of the county. Medium-sized areas are on the tops and steep slopes of Chasteen Mountain, on Beach Top, between Davy and Shewbird Mountains; on Double Knobs; northeast of Copperhill Church; and elsewhere in the southwestern part of the county.

This soil occurs on steep to very steep slopes, ranging from 30 to more than 90 percent, and also on knobs and narrow ridges. Natural surface drainage and internal drainage of all areas are excellent.

Most of this soil is and should remain in forest. The principal trees are chestnut, chestnut oak, mountain red oak, black oak, white oak, post oak, sourwood, dogwood, yellow buckeye, some sugar maple, cucumbertree, hemlock, and yellow birch, and the undergrowth is rhododendron, mountain-laurel, and galax.

Very little of the land is cleared and used for farming purposes. A few small areas are devoted to the production of corn and potatoes,

and some are used for grazing and range for hogs. This soil, where not too stony or too steep, will produce good pasture grass if cleared. In the eastern part of the county, especially where the stock law is not in effect, considerable livestock is turned loose in the mountains without being fenced in.

Rabun stony clay loam.—The 4- to 6-inch surface soil of Rabun stony clay loam consists of dark-red clay loam. It is underlain by deep-red or maroon-red heavy but brittle clay, which continues to a depth ranging from 15 to 36 inches. Large quantities of dark-colored basic rocks, mainly hornblende schist, ranging from a few inches to several feet in diameter, are scattered over the surface and through the soil mass. These rocks underlie the subsoil and in places outcrop. They are high in manganese. Both the surface soil and the subsoil effervesce with a weak solution of hydrogen peroxide. Small very stony areas are mapped with rough stony land (Porters soil material). This soil is not so permeable and friable as are the Porters soils.

Rabun stony clay loam occurs principally as a narrow strip on the west side of Chunky Gal Mountain, around the headwaters of Cold Spring Branch. A small body is 1 mile southwest of the village of Shooting Creek. Only a small total area is mapped.

This soil occupies steep to very steep slopes with a range of 30 to 70 percent, and it is too steep and mountainous for farming. Surface drainage is good to excessive. When cleared and farmed, the land is subject to serious erosion, owing to the heaviness of the soil and steepness of slope.

Only a few acres have been cleared and are used for cultivated crops, mainly corn, potatoes, cabbage, and garden vegetables. The cabbage and potatoes are of excellent quality. With the use of small quantities of fertilizer, corn and potatoes yield well on this soil. The forest cover consists chiefly of chestnut, chestnut oak, mountain red oak, post oak, white oak, sourwood, dogwood, yellow buckeye, cucumbertree, hemlock, locust, and yellow birch, and there are a few southern red oak trees. The undergrowth includes principally mountain-laurel, rhododendron, and galax. This is a good forest soil, and, because of steepness of slope and stoniness, it should remain in forest, or, if cleared, be used for pasture.

Burton stony loam.—The surface soil of Burton stony loam, to a depth ranging from 8 to 30 inches, is very dark gray or black mellow friable loam with a high content of well-decomposed organic matter. The subsoil is brownish-yellow or yellowish-brown friable loam or clay loam, which continues to a depth ranging from 12 to 40 inches. No subsurface layer is between the surface soil and the subsoil. The thickness of the surface layer varies considerably, as it is very shallow in some places and in other places it is 3 feet or more in thickness. Numerous fragments of gneiss rock, ranging from a few inches to several feet in diameter, are scattered over the surface and mixed with the soil mass. The percentage of rock on and in this soil varies from place to place. In places areas of Burton loam, too small to map separately, are practically free of stones.

Burton stony loam occurs principally in the high mountain sections. The largest areas are in the east-central part of the county at the headwaters of Glade and Mill Branches, and on Marbleyard Ridge between Black and Park Gaps. Smaller areas are at Black

Gap, on the north slope of Little Nigger Head Mountain, and on Big Stamp Knob. The total area is small.

The greater part of this soil occupies high steep mountainous areas on slopes ranging from 15 to 60 percent. Practically all of it is too mountainous and steep for agricultural use. With the exception of a few small spots at the heads of drainageways, on the tops of mountains, and in low gaps, where the slopes are not so steep as in other places, surface drainage is well established. This mellow soil is capable of absorbing a large quantity of rain water.

Owing to the small size of the areas and their isolation, none of the land has been cleared for agricultural use. Some areas, if they were cleared and the stones removed from the surface, would produce excellent bluegrass for grazing. Organic matter is abundant. If the elevation were not so high, the soil would produce good yields of corn and potatoes, but the elevations nearly everywhere exceed 4,000 feet. This is an excellent soil for forestry. The tree growth consists chiefly of chestnut, chestnut oak, buckeye, hemlock, a few white pines, white oak, and post oak. Where the tree growth is not so thick, in covers or gaps in the mountains, this soil produces unusually large trees. The high elevation and the remote location limit the use of this soil to forestry.

Ranger slaty silt loam.—The 8- to 10-inch surface soil of Ranger slaty silt loam is bluish-gray, gray, or brownish-gray silt loam. Broken schist or slate fragments are scattered over the surface and form from 20 to 40 percent of the soil mass. The subsoil is yellow, light-brown, or slate-colored friable silty clay to a depth of 20 or more inches. In many places bedrock, consisting of slate or schist, lies only a few inches below the surface or outcrops. As mapped in this county, Ranger slaty silt loam includes many spots of Fletcher silt loam. In such areas the surface soil is brown silt loam and the subsoil is yellow or reddish-yellow silty clay. In other places the soil is dark gray or bluish gray to a depth of 2 to 3 feet and contains small slate fragments mixed throughout the soil mass.

Ranger slaty silt loam occurs only in the western part of the county. The largest area is on Wells Mountain along the Cherokee County line; small areas are southwest of Fairview Church, east of Sweetwater Church; and west of Fires Creek Church. This is an inextensive soil.

The relief is prevailingly steep, with more nearly level areas on the narrow crests of knobs. In general, the slope ranges from 30 to 50 percent over the greater part of this soil, although there are places where the slope ranges from 60 to 90 percent. Surface drainage is good to excessive, and in cleared areas under cultivation sheet erosion is pronounced. This soil is too steep for the use of heavy farm implements, and only the lightest tools are used where the land is cultivated.

Only a few small areas of this soil have been cleared, and they are used principally for the production of corn, garden vegetables, and orchard fruits for home use. Yields of corn are very low. The greater part of this land is in forest. The tree growth consists mainly of hickory, chestnut, chestnut oak, dogwood, sourwood, and a few poplars. Some of the cleared areas supply scant pasture. Owing to its unfavorable relief, high content of slate fragments on the surface and throughout the soil mass, and susceptibility to serious erosion, this soil is best used for forestry.

Talladega silt loam.—The surface soil of Talladega silt loam is light-brown, reddish-brown, or light-red silt loam, from 4 to 6 inches thick. The subsoil is red or salmon-red silty clay loam, which in most places continues to a depth ranging from 10 to 30 inches. The surface soil, and particularly the subsoil, have a decidedly greasy feel, owing to the presence of a large quantity of finely divided mica scales. The underlying soft mica schist rock generally is reached at a depth ranging from 10 to 24 inches. The color of the lower part of the subsoil may be yellow, brown, white, or purple over the schist. Platy fragments of mica schist and fragments of quartz are scattered over the surface in many places. Locally the mica or talc schist is near the surface, and outcrops are numerous.

Small areas of Talladega slate loam and a few very small areas of Chandler silt loam are included with this soil as mapped. The surface soil of Chandler silt loam is light-brown or grayish-brown silt loam to a depth of 6 to 9 inches. The subsoil is brownish-yellow silty clay loam passing downward within a depth of a few inches into well-disintegrated mica schist. Both surface soil and subsoil have a decidedly greasy feel, owing to the large amount of mica present.

Talladega silt loam occupies steep low mountainous areas. It occurs principally in the central, southwestern, and western parts of the county. The largest areas are in the western part between Will Mason and Paynes Branches of Brasstown Creek, in the vicinities of Ogden and Shady Grove Churches, southeast of Martin Hill Church, at the headwaters of Tusquitee Creek, west of Marshall Chapel, southwest of Mount Pleasant Church, and southeast of Mount Pleasant Church along Shooting Creek. The total area is not large.

This soil occupies steep to very steep slopes that range from 30 to 60 percent or more. Surface drainage is good to excessive. Cleared and cultivated areas are subject to serious erosion.

The greater part of this soil represents cut-over land. The remaining forest consists mainly of white oak, post oak, hickory, a few chestnut trees, dogwood, scrub oak, some sourwood, and a few scattered pine trees. Some of this soil has been cleared and is used for pasture. Only a few local areas are used for cultivated crops. The principal crops are corn, potatoes, peas, and rye. All crops give low yields on this soil. Corn produces from 8 to 20 bushels an acre, rye 5 to 8 bushels, and potatoes and peas both give low yields.

Nitrogen and phosphoric acid are inherently deficient. Owing to its steep mountainous topography and susceptibility to serious erosion when devoted to clean-cultivated crops, this land should remain in forest.

FIFTH-CLASS SOILS

Fifth-class soils include stony colluvium (Porters soil material), rough stony land (Porters soil material), and rock outcrop. In general, this land is nonagricultural except for the possible growing of trees. Small spots of stony colluvium (Porters soil material), however, are cultivated. Rock outcrop has no agricultural value, whereas stony colluvium (Porters soil material) and rough stony land (Porters soil material) can be used for forestry.

Stony colluvium (Porters soil material).—This classification represents a condition rather than a definite soil type. The soil has no uniform development of a profile and is variable in color. The sur-

face soil and much of the subsoil are dominantly brown and loamy. A characteristic feature of this material is the presence of a large quantity of rounded and smooth angular rock fragments that range from a few inches to several feet in diameter. They occur not only on the surface but throughout the soil to a depth of several feet. The material, therefore, consists of a mixture of silt, clay, and sand, which has rolled or washed down the steep mountainsides from areas dominantly of Porters loam, together with some material from Rabun, Burton, and Talladega soils.

This mapping unit includes a few areas of riverwash that consist of small rock fragments and gravel, together with some sand, deposited along the streams. A few areas in first-bottom positions could have been classed as Congaree soils except for the fact that they are extremely gravelly and stony. Such areas are at the intersection of Muskrat and Cold Spring Branches of Shooting Creek and at the intersection and along the Right and Left Forks of Eagle Creek.

Most of the stony colluvium (Porters soil material) occurs at the bases of the mountain slopes and at the headwaters of the streams. These materials have been brought down through both colluvial and alluvial action from the surrounding high mountains, during times of heavy freezes or rains, and deposited near the heads of the streams or at the foot of the mountains. The chief areas border Buck Creek in the extreme eastern part of the county; tributaries of Tusquitee Creek—Chairmaker and Bluff Branches and Perry, Matlock, Compass, and Johnson Mill Creeks; along Fires Creek in the northwestern part of the county; and along the tributaries of Shooting Creek—Pounding and Vineyard Creeks and Cold Spring and Muskrat Branches; and Right and Left Forks of Eagle Creek. This land type is not extensive.

The relief ranges from almost level or very gently sloping to sloping and rolling. All the land is naturally well drained, except here and there where a few very small wet areas occupy depressions.

Probably 60 percent of this land type has been cleared, but only a small acreage is under cultivation. Some is in pasture. Some of it supports a native forest growth consisting of sycamore, birch, walnut, and alder. On those areas that are free of stones, small patches of corn, sorgo, potatoes, and garden vegetables are grown, also a few apple trees. The soil in such areas is naturally productive and requires little or no fertilization in order to produce fair crops. In some areas, where the loose stones were not too large, they have been removed and piled in heaps or fence rows. Because of the abundance of stones on the surface and throughout the soil, by far the greater part of the land should be used for pasture and the more stony areas for forest.

Rough stony land (Porters soil material).—This designation comprises rough mountainous land characterized by steep relief and numerous large boulders and rock outcrops. In many places the land is too stony and steep to support a merchantable timber growth. In most places the brown soil material between the rocks is thin. The greater part of the soil material belongs to the Porters series of soils, and small areas of Ashe, Ranger, Rabun, and Burton soils are included.

Rough stony land (Porters soil material) occurs chiefly in the higher mountain sections. The largest areas in the northwestern part of the county occupy the mountain slopes surrounding Fires Creek, extend along Tar Kiln and Wolf Ridges, and border the Clay-Cherokee County line from Big Peachtree Bald to Weatherman Bald. In the southeastern part an area forms the southern slope of Boteler Peak and extends southward between Arch Ridge and Vineyard Creek until a gentler slope along Shooting Creek is reached; an area occupies the southeastern slope of Round Top Mountain; another occupies part of the western slopes of Chunky Gal Mountain and Riley Knob, extending southwest to form a ridge between Cold Spring and Muskrat Branches; and still another occupies the southern slopes of Vineyard Mountain.

The relief of this land type is steep to very steep, as the slopes range from 40 to 90 percent or more. Natural drainage is excessive. Many mountain streams and springs have their source in this rough mountainous land.

Most of the rough stony land (Porters soil material) is forested, and the timber constitutes its only value. Chestnut, chestnut oak, post oak, white oak, black oak, red oak, and hemlock are the principal trees. In a few places the land provides scant grazing. This land should be left in forest, although the production of merchantable timber is slow, and trees are difficult to log from the stony steep mountainsides.

Rock outcrop.—Rock outcrop represents exposures of bare rock large enough to be shown separately on the soil map. The principal areas are at Tusquitee Gap, on the southwestern slope of Vineyard Mountain, and 1 mile northeast of Fires Creek School.

The area mapped aggregates only 128 acres. Rock outcrop has no agricultural value. The rocks are steep to almost perpendicular.

LAND USES AND AGRICULTURAL METHODS

The capabilities and conservation of many of the soils in Clay County have never been fully realized or appreciated by some of the landowners. The inherent quality of many of the soils renders them susceptible to a rather high state of improvement, and their productivity can be easily maintained through proper treatment, including a leguminous crop in the rotation. Some soils in the intermountain valley area, on slopes ranging from 10 to 20 percent, were cleared, cultivated, allowed to erode to such an extent as to impair their agricultural value, then were abandoned, and in some places have been reforested. Part of this land can be reclaimed for pasture by sowing grasses, lespedeza, and clover, which will improve the soil and prevent sheet erosion in a large measure. The more eroded and gullied areas should remain in forest. Some of these soils should never have been cleared of their native tree growth, or, if cleared, should have been seeded immediately to grass in order to maintain the soil.

In any well-planned farm program a proper use of the soil is of fundamental importance. The use of the land inevitably changes with changes in social and economic conditions. The agriculture in Clay County has always been of a subsistence type. Some of the farmers are making excellent use of the soil as regards crop adaptation and the market demand for the crops. Today they are practicing slightly

more diversification than they have in the past; they are being more careful to plow and cultivate the land along the contour, to seed the land to grasses, and to rotate crops. Both soil and climatic conditions favor the growth of a wide variety of crops.

Approximately 85 percent of all land in this county is in forest. Most of this land is included in the mountainous section, which is really too steep for general farming. Large areas of these forested soils, particularly the more gentle slopes of the Porters, are suitable for growing pasture grasses if and when the demand and price for beef cattle or dairy products warrant expansion of these enterprises. Timothy, redtop, lespedeza, and alsike clover make a good pasture-grass mixture.

Most of the soils on the intermountain uplands and some of the soils on the terraces and in the first bottoms have undergone much leaching of organic matter and mineral plant nutrients. Moreover, none of these soils, except Toxaway silt loam and to less extent Congaree silt loam, contained much organic matter prior to their cultivation. On some of the intermountain areas that have been under clean cultivation for several years, surface erosion and gullying are serious problems.

The best method of rebuilding these soils is by strip farming and the growing of legumes. Professor C. B. Williams, head of the Agronomy Department, North Carolina State College, Raleigh, N. C., says: "The methods of maintaining and building up the producing power of the soils of the State need not necessarily be elaborate. As a matter of fact, the methods will have to be fairly simple to be generally practicable, such as the growing of leguminous crops, as soybeans, cowpeas, lespedeza, and clover." These, in rotation with the cash crop or subsistence crops, should play a vital part in the farming operations on all the soils of Clay County.

Nitrogen is one of the limiting factors in crop production on many of the soils. Many are low in organic matter, and it must be supplied to the soils either by plowing under legumes or by adding it in other ways if optimum yields are to be obtained. Soils cannot be built up by removing plants grown from the soil, and this seems to have been the practice in this county for many years. Therefore, in order to improve such soils as those of the upland rolling intermountain areas, considerable quantities of crop residues must be plowed into the soils.

There probably never was a time in Clay County when the need for the use of sound economical methods in managing the soils and in growing crops was greater than at present. Every farmer should adopt a rotation, in which suitable legumes, such as cowpeas, soybeans, clover, and lespedeza, are grown at frequent intervals, and should turn back into the soil as much as possible of the plant growth, thereby replenishing the organic matter and nitrogen.

All the soils except Rabun stony clay loam are acid to strongly acid in reaction and are therefore badly in need of lime. Those most in need of it are the Toxaway, Congaree, Hayesville, and Fannin soils. Rabun stony clay loam is only slightly acid. Lime and superphosphate are essential to the production of good pasture grasses.

Table 4 gives the results of pH determinations on several soils from Clay County.

TABLE 4.—pH determinations of several soils in Clay County, N. C.¹

Soil type and sample No.	Depth	pH	Soil type and sample No.	Depth	pH
Burton stony loam:	<i>Inches</i>		Hayesville loam—Continued.	<i>Inches</i>	
239501.....	0-24	4.9	239515.....	10-30	5.1
239502.....	24-40	5.6	239516.....	30-42	5.1
Toxaway silt loam:			239517.....	60+	5.1
239503.....	0-14	4.5	Fannin loam:		
239504.....	14-28	4.4	239518.....	0-6	4.8
239505.....	28-40+	4.5	239519.....	6-24	5.0
Congaree silt loam:			239520.....	24-36	5.2
239506.....	0-14	5.6	Hiwassee silt loam:		
239507.....	14-40	5.5	239526.....	0-9	5.5
Porters loam:			239527.....	9-15	5.3
239508.....	0-2	4.6	239528.....	15-45	5.3
239509.....	2-8	4.8	239529.....	45+	6.8
239510.....	8-24	5.0	Ranger silty silt loam:		
239511.....	24-40+	5.0	239530.....	0-12	5.3
Hayesville loam:			239531.....	12-40	5.2
239512.....	0-1	4.5	Rabun stony clay loam:		
239513.....	1-6	4.7	239543.....	0-4	5.9
239514.....	6-10	4.8	239544.....	4-60+	6.2

¹ By E. H. Bailey, Bureau of Plant Industry, using the hydrogen-electrode method.

The North Carolina Agricultural Experiment Station has conducted experiments on soils similar to those in Clay County and has recommended the following treatment for corn and wheat on Hayesville loam, Hayesville clay loam, and Fannin loam: From 200 to 400 pounds of a 4-10-4 fertilizer per acre with a side dressing of 100 pounds of nitrate of soda or sulfate of ammonia during the growing season. Grass should receive from 200 to 300 pounds of the same fertilizer; potatoes, 800 to 1,000 pounds of a 3-8-6; legumes, 200 to 300 pounds of a 2-10-4; burley tobacco, 800 to 1,000 pounds of 3-10-6 (State formula); vegetables, 500 pounds of 5-8-6. These fertilizers are adaptable to soils of the uplands of Clay County. Hiwassee fine sandy loam, Hiwassee silt loam, and Worsham fine sandy loam respond to the same fertilizer treatment. The Porters soils probably give better yields of crops, especially of corn and grasses than the other soils of the uplands with equal or less fertilizing. The soils of the first bottoms are the better balanced for crops without the use of fertilizer. The treatment for corn, small grains, and grasses on well-drained Congaree silt loam, Congaree fine sandy loam, and Toxaway silt loam is from 200 to 400 pounds of a 3-10-4 fertilizer; legumes, 200 to 300 pounds of 0-10-6; potatoes, 400 pounds of 3-8-8; vegetables, 600 to 800 pounds of 3-8-6; melons, 400 to 600 pounds of 4-10-6.

The better farmers recognize that Congaree silt loam, Hiwassee silt loam, Tusquitee loam, and Fannin loam, colluvial phase, are best suited for the production of corn, soybeans, hay, and grass, and that Hayesville loam, Hayesville clay loam, Hiwassee silt loam, and Fannin loam are best suited for wheat. The eroded phases of the Hayesville, Fannin, and Fletcher soils are not suited for the production of cultivated crops. Very little is being done to prevent soil erosion, although some areas of these eroded soils are being pastured.

On rolling lands, the following 4-year rotation is recommended for the soils in Clay County in North Carolina Agricultural College Extension Circular 208:⁷ First year—corn (for grain or silage) with

⁷ NORTH CAROLINA AGRICULTURAL EXTENSION SERVICE. AGRICULTURAL PROGRAM FOR NORTH CAROLINA. N. C. State Col. Agr. and Engr. Ext. Cir. 208. 70 pp., illus. 1936.

soybeans (for seed and turning under) or soybeans (for hay) and wheat or other small grain in fall; second year—wheat or other small grain (for grain), clover and grass mixture drilled on grain-field in April; third year—clover and grass mixture (for hay); and fourth year—clover and grass mixture (for grazing and turning under). If enough land is available, the clover and grass might be left on the land for 1 to 3 years longer before turning under, depending on the stand and vigor.

On bottom lands the following 4-year rotation is recommended: First year—corn (for grain or silage) and crimson clover in fall (for turning under); second year—corn (for grain or silage) and clover and grass mixture in fall; third year—clover and grass mixture (for hay or grazing); and fourth year—clover and grass mixture (for grazing and turning under).

The varieties of crops recommended in this circular are: Corn (for grain)—Holcombe Prolific, Southern Beauty, Biggs Two-Ear, Jarvis Golden Prolific, Highland King, and Golden Queen; cowpeas—Groit, Whippoorwill, and Black; crimson clover—Southern and Hungarian; lespedeza—Korean, Kobe, and Common; oats—(for spring seeding) Fulghum; soybeans (for soil improvement)—Herman and Mammoth Yellow; soybeans (hay)—Laredo and Virginia; soybeans (pasture and seed)—Herman and Mammoth Yellow; sweetpotatoes (late)—Porto Rico and Nancy Hall; tobacco (burley)—Kelley Root-rot Resistant and Judy Pride; watermelons—Stone Mountain, Kleckley Sweet, and Tom Watson; and wheat—Fulcaster and Leap Prolific.

For permanent pastures on fertile well-drained soils throughout the area, Kentucky bluegrass, redtop, orchard grass, tall oatgrass, timothy, white clover, alsike clover, and lespedeza are recommended.

For further information on agricultural land use and management the North Carolina Station suggests the following circulars and bulletins:

North Carolina State College of Agriculture and Engineering Extension Circulars 24, How to Use Lime on the Farm; 178, Winter Legumes for Soil Improvement; 187, Winter Hay Crops; and 202, Pastures in North Carolina.

North Carolina Agricultural Experiment Station Agronomy Information Circulars (mimeographed) 49, Factors in Soybean Production—Variety Recommendations and Characteristics; 68, The Part Legumes Play in Maintaining the Productiveness of North Carolina Soils; 69, Soil Fertility—A Most Important Factor in Making Richer Farm Homes and Community Life; 88, Fertilizer Analyses for Different North Carolina Crops Including the Best Percentages of Water-Insoluble Nitrogen of Totals in Fertilizer Mixtures Recommended; 89, Suitable Fertilizer Mixtures for Different Crops Including the Functions of Chief Plant Nutrients; 91, Corn Varieties for North Carolina 1925-34; and 93, Some Facts About Legumes as Soil Improvers.

North Carolina Agricultural Experiment Station Bulletins 256, Influence of Crop Rotation and Soil Treatments upon the Yield of Crops on Cecil Clay Loam Soil; 285, The Value of Lime on Toxaway Loam and Porters Loam Soils; 293, Agricultural Classification and Evaluation of North Carolina Soils; and 300, Approved Practices for Alfalfa Growers.

PRODUCTIVITY RATINGS AND LAND CLASSIFICATION

Table 5 lists the soils of Clay County in the approximate order of their general productivity for the common crops under the better soil-management practices. The most productive soils are at the head of the table and the least productive at the foot. The order is modified to some extent to show the comparative desirability of the soils as influenced by their workability and erodibility.

TABLE 5.—Productivity ratings of the soils of Clay County, N. C.

Soil (soil types, phases, complexes, and land types) ¹	Crop productivity index ² for—													General productivity grade ⁴		Remarks concerning fertility, workability and erodibility	Soil groups or land classification ⁵
	Corn		Wheat		Rye		Clover hay		Lespedeza ³	Soy-beans ³	Pota-toes ³	Vegeta-bles ³	Pasture ³	A	B		
	A	B	A	B	A	B	A	B	B	B	B			A	B		
Hiwassee silt loam.....	70	100	50	90	60	90	50	100	130	100	80	Good..	Good.....	4	2	Rather low in fertility but responsive to management; easily worked; only slightly erodible. Fertile; very easily worked; subject to overflow; little or no erosion. Rather low in fertility but responsive to management; easily worked except areas are small; slightly erodible. Rather low in fertility but responsive to management; easily worked; moderately erodible. Fertile; easily worked; subject to overflow; little or no erosion. Rather low in fertility but responsive to management; easily worked; moderately erodible. Moderately fertile; slope makes it difficult to work; moderately erodible (not so erodible as slope suggests). Rather low in fertility but responsive to management; easily worked; very little erosion. Rather low in fertility but responsive to management; fairly easy to work; little erosion. Rather low in fertility but responsive to management; moderately hard to work; moderately to highly erodible. Rather low in fertility but responsive to management, fairly easily worked; moderately erodible. Rather low in fertility; drainage variable; fairly easy to work; moderately erodible.	First-class soils (good cropland, also capable of supporting good pasture).
Congaree silt loam.....	70	95	40	70	40	70	70	100	90	85	80	...do...	Very good..	4	2		
Tusquitee loam.....	50	70	50	70	50	70	45	80	80	80	90	...do...	Good.....	5	3		
Fannin loam, colluvial phase.	45	65	50	70	50	75	55	70	70	70	80	...do...	...do.....	5	3		
Hayesville loam.....	40	70	50	80	50	80	55	80	105	85	60	...do...	...do.....	5	3		
Congaree-Toxaway silt loams.	40	80	30	70	30	70	50	90	90	110	80	Fair...	...do.....	6	4		
Congaree fine sandy loam.	50	80	40	60	50	70	40	90	90	85	80	Good..	Fair.....	6	4		
Toxaway silt loam.....	30	80	30	70	30	70	40	80	90	125	80	Fair...	Good.....	7	4		
Porters loam, hill phase ⁶	40	70	30	60	30	60	50	80	80	100	90	Good..	...do.....	7	4		
Hiwassee fine sandy loam..	35	90	30	70	40	70	30	90	120	90	80	...do...	Fair.....	7	5		
Warne loam.....	30	60	30	70	30	70	20	50	105	100		Fair...	...do.....	8	5		
Hayesville clay loam.....	30	70	30	70	30	70	40	80	105	85		...do...	Good.....	7	5		
Fannin loam.....	30	50	30	50	30	50	30	50	75	60	50	...do...	Fair.....	7	5		
Worsham fine sandy loam ⁷	30	50	25	45	25	45	40	60	75	70		...do...	...do.....	7	6		

Footnotes at end of table.

The rating compares the productivity of each soil for each crop to a standard—100. This standard index represents the approximate average acre yield obtained without the use of amendments on the more extensive and better soil types of the region in which the crop is most commonly grown. An index of 50 indicates that the soil is about half as productive for the specified crop as are those with the standard index. Soils given amendments, such as lime and commercial fertilizers, and unusually productive soils of small extent may have productivity indexes of more than 100 for some crops.

The following tabulation sets forth some of the acre yields that have been set up as standards of 100. They represent long-time average yields of crops of satisfactory quality on the better soils of the United States without the use of amendments:

Crop:		
Corn	-----bushels--	50
Wheat	-----do-----	25
Rye	-----do-----	25
Potatoes	-----do-----	200
Clover hay	-----tons--	2
Lespedeza hay	-----do-----	1.5
Soybean hay	-----do-----	2.5

The rating in the column headed "A" under each crop indicates yields obtained under the less careful and intensive soil-management practices, which, on most of the soils, include the use of small quantities of commercial fertilizers. On more fertile soils, such as Congaree silt loam, Congaree fine sandy loam, and Toxaway silt loam, little or no fertilizer is used. In the column headed "B" yields under more careful and intensive recommended practices are given. These practices consist of regular crop rotation, including the growing of legumes, the use of barnyard and green manure, application of liberal quantities of complete commercial fertilizers, the use of improved varieties and high-quality seed, and, in some areas, the use of mechanical measures, such as contour tillage, strip cropping, and terracing, for the control of erosion.

The principal factors affecting the productivity of land are climate, soil (this includes the many physical, chemical, and biological characteristics), slope, drainage, and management, including the use of amendments. No one of these factors operates separately from the others, although some one may dominate. Crop yields over a long period of years furnish the best available summation of the associated factors and therefore are used where available. In Clay County many of the indexes are based on estimated yields rather than on reported yields, as definite information is scarce. Interviews with farmers, combined with the observation of members of the soil-survey party, were depended on for information on which to base yield estimates.

Because of limited information no indexes are given for vegetables or pasture. Only general statements are used to indicate the productivity of the soils for these crops, also for lespedeza, soybeans, and potatoes on some of the poorer soils.

The soils are listed in the order of their general productivity under the more careful practices, and productivity grade numbers are assigned in the column headed "General productivity grade." The general productivity grade is based on a weighted average of the indexes

for the various crops, the weighting depending on their relative acreage and value. If the weighted average is between 90 and 100, the soil type is given a grade of 1; if it is between 80 and 90, a grade of 2 is given, and so on. Since it is difficult to measure or express mathematically either the exact significance of a crop in local agriculture or the importance of suitability of given soils for particular crops, the weightings are used only as guides.

Under the column headed "Remarks concerning fertility, workability, and erodibility" are listed many of the factors that determine the suitability of the soil for growing crops, grasses, or trees. These include lay of the land, depth of soil, fertility, responsiveness to fertilization, drainage, susceptibility to overflow, and erodibility.

In the column headed "Soil groups or land classification" the soils are grouped according to their comparative desirability or physical suitability for crop growing, grazing, or forestry.

The best soils of the area, grouped as First-class soils, are considered to be good cropland; that is, they are, in general, capable of producing moderate to rather high yields of the commonly grown crops under good soil-management practices; they are rather easily worked, and it is not difficult to maintain productivity. In short, it is possible to farm these soils rather intensively and at the same time to conserve them without great difficulty. The land is so desirable for crops that comparatively little of it is devoted to pasture or wood lots, in spite of the fact that it will support a good growth of pasture grasses or trees. Some small areas of soils that are inferior, principally because of steep slope and erosion, are included in the soil types grouped in this class.

Second-class soils are considered somewhat less desirable than First-class soils and are designated as fair cropland. They are generally somewhat less productive and somewhat harder to till, or harder to conserve if tilled, than the First-class soils. They are capable of supporting fair to good pasture, and some areas are in timber.

Third-class soils are considered poor cropland or fair to good pasture land. They are of medium to low productivity and are generally rather hard to till or to protect from erosion.

Fourth-class soils are almost entirely unsuited for crop growing. They are considered fair to good pasture land. In Clay County they are largely under a forest cover. Stones or rough, steep lay of the land make tillage almost impossible.

Fifth-class soils include stony colluvium (Porters soil material), rough stony land (Porters soil material), and rock outcrop. The land is not well suited to any purpose but forestry.

The productivity rating and land classification do not present the relative roles that soil types, because of their extent and the pattern of their distribution, play in the agriculture of the county. They give a characterization to the productivity and use capabilities of the individual soil types, but they do not picture the total production of crops by soil types, as this depends also on the acreage of each type devoted to each crop.

Economic considerations play no part in determining the crop indexes and little part in determining the land classification; therefore, neither indexes nor soil classes can be interpreted into land values except in a very general way. Distance to market, relative prices of farm products, and other factors influence the value of land. The asso-

ciation or the pattern of distribution of soil types in any particular locality or farm may have a very important influence on the use and value of the land. Such conditions are not adequately covered in this classification.

MORPHOLOGY AND GENESIS OF SOILS

Clay County lies in the Gray-Brown Podzolic soils region. Approximately three-fourths of the county comprises mountain ranges and knobs with steep and, in many places, precipitous slopes. The elevation ranges from about 2,000 to 5,600 feet above sea level. The remaining one-fourth of the county comprises upland valleys and river flood plains where the elevation ranges from about 1,600 to 2,300 feet above sea level. The soils of the mountains and upland valleys have good to excessive drainage.

All the soils of the county originally supported a heavy growth of hardwoods, such as mountain red oak, white oak, post oak, southern red oak (Spanish oak), chestnut, chestnut oak, hickory, maple, poplar, hemlock, yellow birch, buckeye, and a few old-field pines on the soils of the upland valleys. The soils have developed under forest cover and are prevailingly light in color, ranging from light brown through brown to brownish red in the surface layers. In most forested areas a thin layer of partly decomposed leaves, twigs, and roots covers the surface, and the topmost 2 or 3 inches of soil generally contain a noticeable amount of organic matter. Soon after the land has been cleared and cultivated, most of the organic matter disappears. In a few places on some of the highest mountains and in some of the shady coves, especially on the north side of mountains, are small areas having a black surface soil. This dark-colored soil is caused by the accumulation of organic matter through the growth and decay of vegetation.

The soils of the upland valleys, or intermountain areas, lie between the mountain ranges or adjacent to the flood plains of the Hiwassee River and Shooting, Tusquitee, and Brasstown Creeks. Climatic conditions of these upland valley sections differ somewhat from those of the higher mountainous sections, and the differences in the organic-matter content of the surface soils in these localities is probably due to these conditions. In the mountainous parts of the county the temperature is colder, the cold season lasts longer, the rainfall is greater, the vegetation grows faster, and the leaching of organic matter is less than in the lower lying uplands of the Hiwassee River Valley.

The soils of the mountainous sections are less subject to accelerated erosion and gullying than the soils of the upland valleys, because their forest cover and greater porosity and permeability prevent rapid run-off of rain water. The structure and consistence of the B horizons of these soils is such that they absorb a large quantity of rain water. Some translocation of material, however, takes place from high areas or steep slopes to the bases of the slopes.

The soils have been formed through the soil-forming processes from the weathered materials of the underlying rock in a region having a cool climate and heavy rainfall. The greater part of the county is underlain by Carolina gneiss and Roan gneiss, which is cut in places by granite and dikes of dark-colored basic rock and mica

schist. In the northwestern part mica schist and blue slates of sedimentary formation are found. The underlying rocks in the western half consist mostly of mica schist and talc schist, also slates, although the mica schist rock also occurs in places in the eastern half.

Table 6 gives the parent materials, soils series names, and brief descriptions of the soils occurring in Clay County.

TABLE 6.—Parent materials, soil series, and description of soils derived from various kinds of parent materials in Clay County, N. C.

Parent material	Soil series	Description
Carolina gneiss and Roan gneiss.	Porters.....	Brown loam A horizon; reddish-brown friable clay loam B horizon. Solum from 24 to 50 inches thick.
	Burton.....	Black loam with high organic-matter content in A horizon; yellowish-brown friable clay loam B horizon.
	Hayesville....	Light-brown or brown mellow loam A horizon; yellowish-brown or yellowish-red friable gradational layer; brownish-red moderately stiff but brittle clay B horizon.
Mica schist and talc schist.	Fannin.....	Light-brown mellow loam A horizon; yellowish-brown moderately stiff silty clay loam B horizon, to a depth of about 24 inches; yellowish-red friable micaceous silty clay loam lower B horizon.
	Talladega.....	Mainly an A-C soil; brown silt loam A horizon; micaceous B horizon.
Slate rock.....	Ranger.....	Gray or bluish-gray silt loam, with slaty fragments, A horizon; bluish-gray or gray silty clay loam B horizon.
Brasstown schist.....	Fletcher.....	Light-brown or grayish-yellow silt loam A horizon; yellowish-red or yellowish-brown silty clay loam B horizon.
Basic rocks and hornblende schist.	Rabun.....	Dark-brown or red clay loam A horizon; dark-red clay B horizon.
Old alluvium.....	Hiwassee.....	Brown or red silt loam A horizon; red silty clay loam B horizon.
	Warne.....	Gray or grayish-brown silt loam A horizon; yellow stiff but brittle clay B ₁ horizon; steel-gray, mottled with yellow and brown, compact clay B ₂ horizon.
Recent alluvium.....	Congaree.....	Light-brown or brown silt loam or fine sandy loam A horizon; brown silt loam or heavy fine sandy loam B horizon, with small mica flakes.
	Toxaway.....	Dark-gray or black silt loam A horizon; dark-gray silty clay loam B horizon.

Tusquitee loam; Worsham fine sandy loam; Worsham fine sandy loam, gravelly phase; stony colluvium (Porters soil material); rough stony land (Porters soil material); and rock outcrop are not shown in the table, as no definite soil profile has developed in these soils and land types. Warne loam, because of the presence of a claypan or hardpan in the B₂ horizon, is a true Planosol.

In most places a direct relationship exists between the underlying rock and the soils, and the influence of the parent material is evident throughout the soil profile. This is especially noticeable in road cuts and on mountainsides where the soil covering is shallow. The thickness of the solum over the parent rock varies greatly. It is rather slight in the soils of the mountains. Here, the effect of the parent material on the soil profile is more noticeable than on the soils of the upland valleys, where the rocks are weathered to a much greater depth and where, through the soil-forming processes, the solum is thicker and a more nearly normal soil profile has developed.

Only a few small areas are level enough to have developed a normal soil profile. The characteristics of these normally developed soils are (1) a comparatively light textured A horizon, (2) a heavy uniformly colored B horizon, and (3) a lighter textured varicolored C horizon. Most of the soils in Clay County, however, have young immature profiles. The soils of the mountains show no sharp line of demarcation between the different layers in the solum. The soil-

forming processes in the mountain sections have been so slow or geologic erosion has kept such close pace with rock disintegration that no normal profile has been developed.

Three main groups of soils occur in this county: the light-brown or brown soils of the mountains, the red soils of the upland valleys, and the brown soils of the flood plains along the streams.

The red soils of the upland valleys throughout the central part of the county include the Hayesville and Fannin soils on the uplands and the Hiwassee soils on the high terraces. They have dark-red heavy but crumbly B horizons, the red color indicating a rather complete oxidation and uniform distribution of the iron salts. These soils represent the advanced stage of the soil-forming processes. They occupy gently rolling or hilly areas ranging in elevation from 1,700 to 2,300 feet above sea level.

The soils of the mountains, ranging in elevation from 2,500 to 5,600 feet, have developed under a different climate from that of the brown and red soils of the upland valleys. The red soils of the valleys or intermountain areas really belong in the Red Podzolic soils group. The wide difference between the soils of the mountains and those of the so-called valleys undoubtedly is due to the climatic influence. In the mountainous section the rainfall is heavier, the temperature is lower, and the snowfall is heavier and lies on the ground longer than at lower elevations where the red soils occur. The principal differences in the soils of these two groups are their color, content of organic matter, and structure. The soils of the mountains contain more organic matter, are lighter in texture, and are dominantly brown. Both the A and B horizons are more permeable and friable than the corresponding horizons in the red soils of the valleys.

The soils of the mountains include members of the Porters, Burton, Talladega, Ranger, and Rabun series. The Porters and Burton soils are closely associated and are underlain by similar parent materials. They are distinguished mainly by the color of the A horizon and quantity of organic matter in the A horizon. The A horizon of the virgin Burton soil is much thicker and darker than that of the Porters soils. As the Burton soils lie at somewhat higher altitudes than the Porters soils, they have accumulated more organic matter. Probably a colder climatic condition is the cause of the difference in color of the soils of these two series. The Rabun soils are characterized by their dark-brown surface horizons and the maroon-red heavy B horizon. The B horizon is much thinner and heavier than that of the Porters soils. In most places the Rabun soils show no normal profile development. The Talladega soils are light-brown shallow highly micaceous soils underlain by disintegrated mica schist or similar rock materials. The Ranger soils are gray or brownish-gray shallow soils. Fragments of the parent rock are abundant on the surface and throughout the soil mass. The underlying rock is dark-colored slate or schist.

Brown soils of the flood plains, which make up the third group, occur in narrow strips on recent flood plains or first-bottom land along practically all of the streams. The soil materials have been washed from the surrounding soils of the uplands and deposited by the streams at times of overflow. These soils are classed as young soils as they have not lain in position for a sufficient length of time to develop a

normal profile. In many places fresh material is deposited at each overflow, and in places some of the soil material is removed by freshets. The Congaree and Toxaway soils are mapped on these first bottoms.

Hayesville loam, in the valley, or intermountain area, has a normally developed profile. Following is a description of the profile of this soil, as observed in a fresh cut on the State highway, one-half mile north of the Georgia State line:

- A₁. 0 to 1 inch, dark-brown loam containing some organic matter, leaves, twigs, and fine roots.
- A₂. 1 to 6 inches, light-brown mellow loam full of fine roots.
- B₁. 6 to 10 inches, yellowish-brown clay loam that is moderately friable and crumbles readily when crushed between the fingers. This is a gradational layer between the A₂ and the B₂ horizons.
- B₂. 10 to 30 inches, brownish-red moderately stiff but fairly crumbly and brittle clay. This material breaks into irregular-shaped lumps that are easily crushed.
- C. 30 to 42 inches, reddish-brown light-textured rather friable clay or clay loam streaked with gray and white. Some mica flakes are present.
- C₂. 60 inches +, disintegrated and partly decomposed gneiss rock streaked with yellow, white, and black.

The entire soil contains quartz sand grains. The B horizon of this soil is more friable and crumbly and not so stiff as the B horizon of the Cecil soils of the Piedmont Plateau, and, as a rule, is lighter red in color.

Table 7 gives the results of mechanical analyses of samples of the surface soil, subsurface soil, and subsoil of Hayesville loam.

TABLE 7.—*Mechanical analyses of Hayesville loam*

Sample No.	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		<i>Percent</i>						
239512.....	Surface soil, 0 to 1 inch.....	2.2	11.4	13.1	27.5	7.3	27.1	11.4
239513.....	Subsurface soil, 1 to 6 inches.....	2.2	8.7	11.0	22.9	9.9	30.1	15.2
239514.....	Subsoil, 6 to 10 inches.....	2.8	8.2	8.9	18.3	9.5	29.9	22.4
239515.....	Subsoil, 10 to 30 inches.....	2.8	9.6	6.6	10.7	5.2	22.2	42.9
239516.....	Subsoil, 30 to 42 inches.....	4.4	11.5	7.8	12.2	6.7	24.9	32.5
239517.....	Subsoil, 60 inches +.....	8.0	18.0	9.2	13.4	7.8	21.9	21.7

Following is a description of a profile of Fannin loam, as observed in a forested area along United States Highway No. 64, 1½ miles southwest of Hayesville:

- A. 0 to 6 inches, mellow friable loam that is light-brown under ordinary moisture conditions and light brownish yellow when dry. The material contains a noticeable quantity of mica flakes. The surface has a very thin covering of leafmold.
- B. 6 to 24 inches, yellowish-brown moderately stiff but friable silty clay loam containing a high percentage of finely divided mica flakes.
- C. 24 to 36 inches, heavy friable silt loam that is variously colored, but predominantly yellowish red. This material is very micaceous and contains broken fragments of mica schist rock.
- C₂. 36 inches +, brown, yellow, purple, and silver-colored partly disintegrated mica schist.

This soil is characterized by a thin B horizon and a high percentage of mica flakes in both the A and B horizons.

Following is a description of the profile of Porters loam, as observed on the west side of Yellow Mountain, south of United States

Highway No. 64, along the camp road of the Civilian Conservation Corps leading to Standing Indian, $1\frac{1}{4}$ miles south of Black Gap:

- A. 0 to 2 inches, dark-brown loam with a rather large content of organic matter consisting mostly of decomposed leafmold and fine roots.
- A₂. 2 to 8 inches, brown mellow friable permeable loam.
- B. 8 to 24 inches, reddish-brown friable clay loam that crumbles and breaks readily into a mealy mass having no definite structure.
- B₂. 24 to 40 inches, yellowish-brown friable porous clay loam.
- C. 40 inches+, mixed light-gray, white, and yellow, streaked with black, partly decomposed gneiss rock.

The depth to the underlying parent material varies greatly, and in places the B horizon rests on solid rock.

Table 8 gives the results of chemical analyses of samples of Porters loam, collected near Chimney Rock, Rutherford County, N. C., which is similar to this soil as mapped in Clay County.

TABLE 8.—*Chemical analyses of samples of Porters loam from Rutherford County, N. C.*¹

Sample No.	Depth	SiO ₂	TiO ₂	Fe ₂ O ₃	Al ₂ O ₃	MnO	CaO	MgO	K ₂ O	Na ₂ O	P ₂ O ₅	SO ₃	Ignition loss	N
	<i>Inches</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>	<i>Per-cent</i>
236524...	0-2	71.59	0.39	1.79	11.57	0.021	0.20	0.09	3.82	0.84	0.04	0.06	9.20	0.179
236525...	2-10	72.17	.45	2.61	14.65	.023	.16	.13	3.94	.74	.03	.04	4.81	.040
236526...	10-36	60.83	.56	4.48	22.25	.051	(²)	.78	2.54	.35	.06	.03	7.69	.014
236527...	36-54	65.46	.52	3.97	19.37	.058	(²)	.53	4.26	.44	.01	.05	5.42	.005
236528...	54+	69.57	.46	3.21	17.35	.086	.09	.59	4.93	.62	(²)	.01	3.92	.000

¹ Analyzed by G. Edgington, Division of Soil Chemistry and Physics, Bureau of Plant Industry.

² Trace.

The foregoing profile descriptions include all the soils of this county that have a more nearly normal profile development. In addition, the soil profile is fairly well developed in some old high alluvial areas.

Following is a description of the profile of Hiwassee silt loam, as observed one-fourth mile east of United States Highway No. 64 and one-fourth mile north of the village of Brasstown:

- A. 0 to 9 inches, brown mellow silt loam.
- B. 9 to 15 inches, brownish-red heavy but brittle crumbly silty clay loam.
- B₂. 15 to 45 inches, dark-red friable silty clay.
- C. 45 inches+, rounded quartz gravel, ranging from 1 inch to 5 inches in diameter, intermixed with red and yellow clay.

In this county the percentage of slope and degree of erosion are mapped. The intermountain soils are similar in many respects to those of the Piedmont Plateau, or rather of the foothills, except that the B horizon is more friable and crumbly than the similar horizon of the soils of the Piedmont Plateau.

Extensive areas of Porters stony loam and rough stony land (Porters soil material) with steep to very steep relief have many boulders on the surface and through the soil mass. Over the greater part of this section the solum is shallow and bedrock lies near the surface and outcrops in places. The main soil-forming rock is Carolina gneiss; the gneiss belts, however, are cut by dikes of dark-colored shiny hornblende schist and by belts of mica schist. A slate belt is in the northwestern section of the county. This rock gives

rise to soils of the Ranger and Fletcher series. In the intermountain areas the Brasstown schist rock formation gives rise to soils of the Fannin series, and in the mountainous areas it gives rise to soils of the Talladega series.

SUMMARY

Clay County is in the southwestern part of North Carolina; its southern boundary coincides with the Georgia State line, and only one county separates it from the Tennessee State line on the west. It has an area of 220 square miles, or 140,800 acres. Hayesville, the county seat, is about 80 miles by air line southwest of Asheville, N. C., and 140 miles north of Atlanta, Ga.

The county lies entirely within the Appalachian Mountains, with three-fourths of the entire area having rough mountainous relief; the other one-fourth is included in what is known as the Hiwassee River Valley. The northern and eastern parts are included in the Nantahala National Forest.

The elevation above sea level ranges from 1,600 feet to about 5,600 feet. Drainage ranges from good to excessive. Most of the streams are swift-flowing, and an abundance of water and water power are available.

Only one main paved highway passes through the county from east to west, and a hard-surfaced highway extends south from the main highway toward Atlanta, Ga.

The climate is healthful. Warm days and cool nights prevail throughout the summers. In the Hiwassee River Valley the winters are moderately open. Rainfall is plentiful and well distributed throughout the year.

Practically no important cash crop is grown. The agriculture is mainly of a subsistence type and consists of general farming. The principal crops are corn, wheat, rye, and hay. Corn occupies perhaps 60 percent of the crop acreage. The minor crops are oats, sweet-potatoes, potatoes, sorgo, soybeans, and vegetables for home consumption. A large part of the cash income is obtained from the sale of poultry and dairy products, cattle, and hogs, although considerable income is obtained from the sale of timber, acid wood, tanbark, cross ties, pulpwood, telephone poles, and fence posts.

The greater part of the important agricultural soils of Clay County occur in the Hiwassee River Valley. The productivity of these soils varies according to their physical and chemical characteristics, slope or relief, and degree of erosion. The soils are placed in five classes. The first three classes include agricultural soils of descending value for the production of crops. The Fourth-class soils are suitable only for forestry, and the Fifth-class soils are largely nonagricultural.

First-class soils comprise Hayesville loam, Hiwassee silt loam, Congaree silt loam, Tusquitee loam, and Fannin loam, colluvial phase. These soils occupy almost level or gently sloping areas and are naturally well drained. They dominate the agriculture and, together with the soils of the second group, produce practically all of the farm crops. They occupy only a small acreage but are considered the best soils in the county, and they are practically all farmed.

The Second-class soils are Hayesville clay loam; Worsham fine sandy loam; Worsham fine sandy loam, gravelly phase; Congaree fine

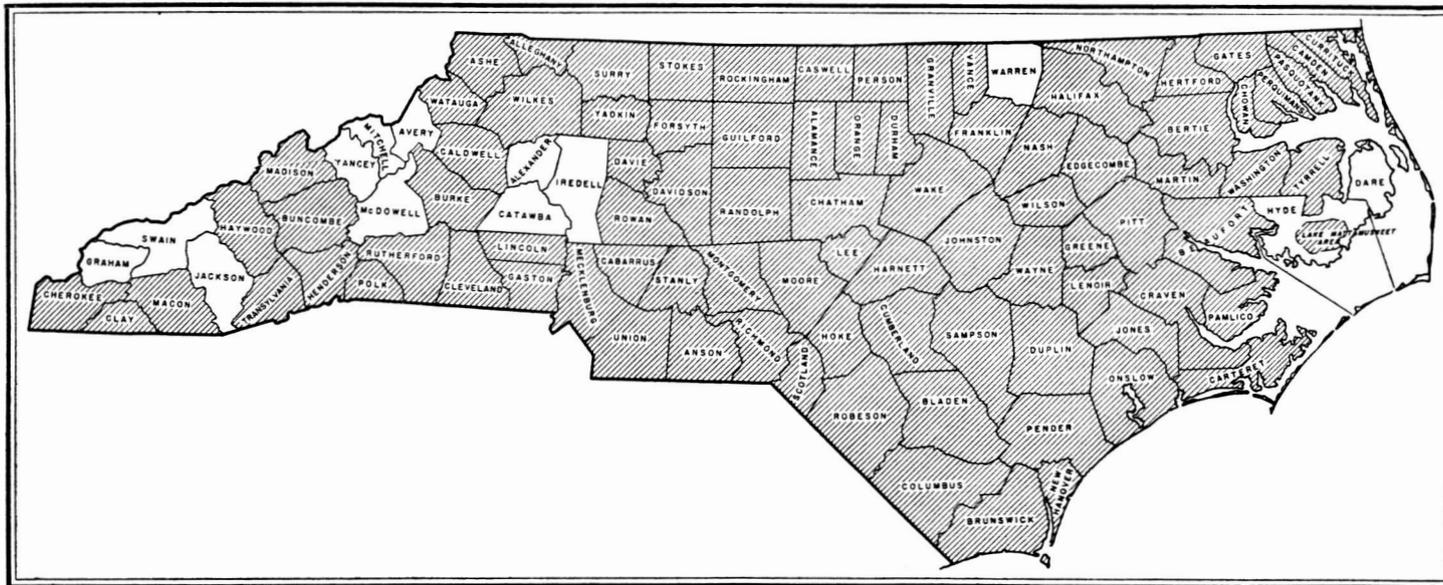
sandy loam; Fannin loam; Porters loam, hill phase; Hiwassee fine sandy loam; Toxaway silt loam; Warne loam; Congaree-Toxaway silt loams; and Porters stony loam, hill phase. The soils of this group, considering their inherent qualities, the lay of the land, and the effects of erosion, are not such good agricultural soils as those in the first group. In some respects the soils of the two groups show very little difference, but the soils of the uplands developed on steeper slopes and rolling relief present a more difficult problem of soil management.

The Third-class soils include Hayesville loam, hill phase; Hayesville clay loam, eroded hill phase; Hiwassee silt loam, slope phase; Fannin clay loam, eroded hill phase; Fannin loam, hill phase; Hiwassee fine sandy loam, eroded gravelly phase; and Fletcher silt loam. All these soils are developed on rolling to hilly relief and have slopes ranging from about 15 to 30 percent. Natural drainage is good, and sheet erosion and gullying have been active on those areas that have been in clean cultivation for some time. Only a small percentage of the soils of this group is under cultivation, although some of these soils were the first in the county to be cleared and cultivated, and they produced fair yields of corn, wheat, and grasses. Conservation practices, such as terracing, strip farming, and the seeding of the slopes to grasses, were neglected by many of the farmers, and, as a result, serious erosion took place and the fields were later abandoned. Some areas of these soils can be reclaimed by growing lespedeza and clover and thereby restored to productive pastures.

Fourth-class soils comprise Hayesville loam, steep phase; Porters loam; Porters stony loam; Rabun stony clay loam; Burton stony loam; Ranger slaty silt loam; and Talladega silt loam. All these soils are developed on steep or very steep relief, having a slope ranging from 30 to 90 percent. The steepness of slope and, in some places, the presence of stone, preclude their use for general farming, and they are therefore classed as forest soils. Some areas of these soils on the more gentle slopes, if cleared and immediately seeded, will produce good pasture grasses.

Stony colluvium (Porters soil material), rough stony land (Porters soil material), and rock outcrop represent the Fifth-class soils. Except for small spots of stony colluvium (Porters soil material), these land types are of no agricultural use other than for the possible growing of trees.

Practically all of the soils in Clay County are low in nitrogen, phosphorus, and lime, except Congaree silt loam, which is the best balanced soil in all the plant nutrients. Most of the soils contain a high percentage of potash, particularly in the subsoils and the disintegrated parent materials. Practically all of the soils are moderately to strongly acid, and in order to obtain best yields lime should be applied in liberal amounts. Excellent pasture grasses can be grown after the application of lime and superphosphate. Large areas of soil in the mountains, particularly the less steep areas of the Porters soils, are suitable for pasture grasses.



Areas surveyed in North Carolina shown by shading.

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