SOIL SURVEY

Buncombe County North Carolina

Series 1942, No. 6

Issued August 1954

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with the
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
and the
TENNESSEE VALLEY AUTHORITY

How to Use THE SOIL SURVEY REPORT

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

SOILS OF A PARTICULAR FARM

The soil map is in the jacket that contains this report. To find what soils are on any farm or other land, it is necessary first to locate this land on the map. This is easily done by finding the locality of the farm and by using landmarks such as roads, streams, mountains, villages, dwellings, and other features to locate the boundaries.

Each kind of soil mapped within the farm or tract is marked on the map with a symbol. For example, all the areas marked Bf are Buncombe loamy fine sand. The color in which the soil area is shown on the map will be the same as the color indicated in the legend for the particular type of soil. If you want information on the Buncombe soil, turn to the section in this publication on Soil Descriptions and find Buncombe loamy fine sand. Under this heading you will find a statement on the characteristics of this soil, what it is mainly used for, and some of the uses to which it is suited.

Suppose, for instance, you wish to know how productive Buncombe loamy fine sand is. You will find this soil listed in the left-hand column of table 11. Opposite the name you can read the yields for different crops grown on the soil. This table also gives estimated yields for all the other soils mapped in the county.

If, in addition, you wish to know what good use and management practices are recommended for Buncombe loamy fine sand, read what is said about this in the section on Soil Descriptions. Refer also to the section headed Soil Use, Management, and Productivity, where the soils suited to the same use and management practices are grouped together.

SOILS OF THE COUNTY AS A WHOLE

A general idea of the soils of the county is given in the section on Soil Series and Their Relations, which tells about the principal kinds of soils, where they are found, and how they are related to one another. After reading this section, study the soil map and notice how the different kinds of soils tend to be arranged in different parts of the county. These patterns are likely to be associated with well-recognized differences in types of farming, land use, and land-use problems.

A newcomer to the county, especially if he considers purchasing a farm, will want to know about the climate; the types and sizes of farms; the principal farm products and how they are marketed; the kinds of farm tenure; availability of roads, railroads, and electric services; water supplies; industries of the county; and cities, villages, and population characteristics. Information about all these will be found in the sections on General Nature of the Area and on The Agriculture of Buncombe County.

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

This publication on the soil survey of Buncombe County, N. C., is a cooperative contribution from the—

SOIL CONSERVATION SERVICE

the

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION

and the

TENNESSEE VALLEY AUTHORITY

Series 1942, No. 6 Issued August 1954

SOIL SURVEY OF BUNCOMBE COUNTY, NORTH CAROLINA

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United States Department of Agriculture in cooperation with the North Carolina Agricultural Experiment Station and the Tennessee Valley Authority

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[1] The Division of Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

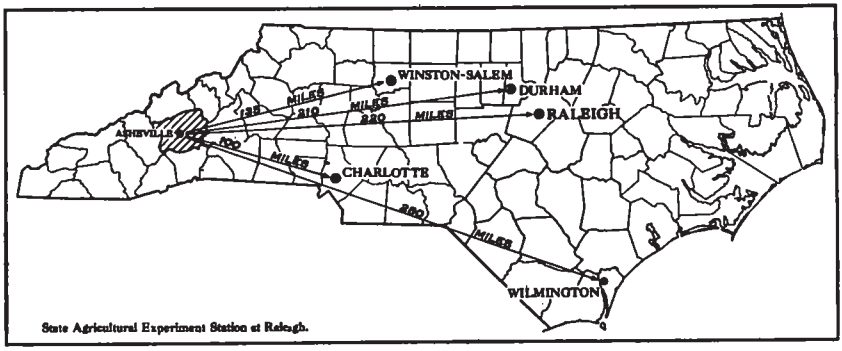


FIGURE 1.—Location of Buncombe County in North Carolina.

BUNCOMBE COUNTY, in the Blue Ridge province of the Appalachian Highlands, is divided into two sections—a mountain area and an intermountain plateau. Most cropland is in the intermountain part. Corn, wheat, rye, oats, hay, and forage are the principal subsistence crops; truck crops and tobacco, the chief cash crops. There are a few commercial apple orchards. Asheville, the county seat and largest city, and other towns furnish good markets for surplus produce. Beef and dairy cattle, hogs, and poultry are the most important livestock. Much of the county is still forested, especially in mountainous areas. Textile manufacturing is the chief industry, but woodworking factories, a tannery plant, and office and sales work give other nonagricultural employment. To provide a basis for the best use of the land, a cooperative soil survey was made by the United States Department of Agriculture, the North Carolina Agricultural Experiment Station, and the Tennessee Valley Authority. Field work was completed in 1942. Unless otherwise mentioned, all statements in this report refer to conditions in the county at that time.

GENERAL NATURE OF THE AREA

LOCATION AND EXTENT

Buncombe County, in the western part of North Carolina (fig. 1), is bounded on the north by Madison and Yancey Counties, on the east by McDowell, Rutherford, and Yancey Counties, on the south by Henderson County, and on the west by Haywood County. Asheville, the county seat, is 220 miles west of Raleigh, 135 miles southwest of Winston-Salem, and 100 miles northwest of Charlotte. The county is irregular in outline, the boundary following streams and the crests of winding mountain ridges in most places. The total area is approximately 642 square miles, or 410,880 acres.

PHYSIOGRAPHY, RELIEF, AND DRAINAGE

Buncombe County is in the Blue Ridge province of the Appalachian Highlands (*4*)[2] and can be separated into two physiographic subdivisions, the intermountain plateau and the mountain area (fig. 2)

[2] Italic numbers in parentheses refer to Literature Cited, p. 122.

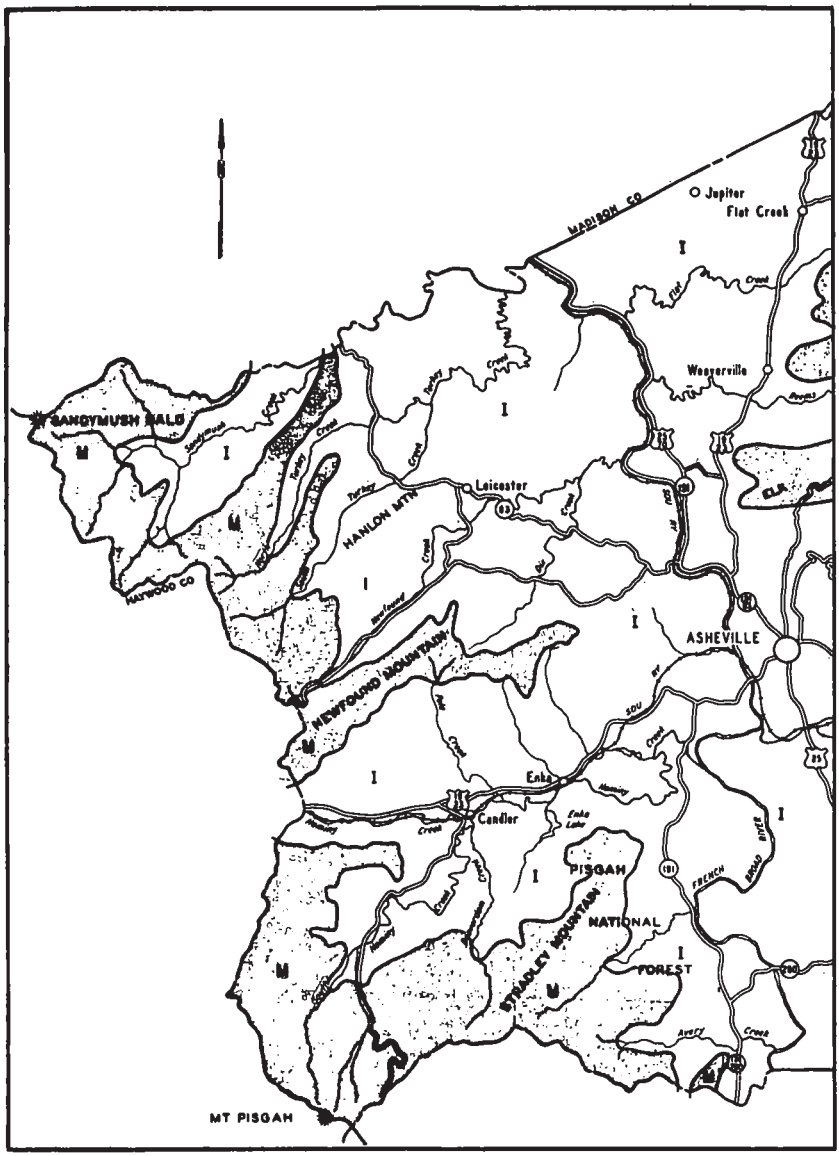
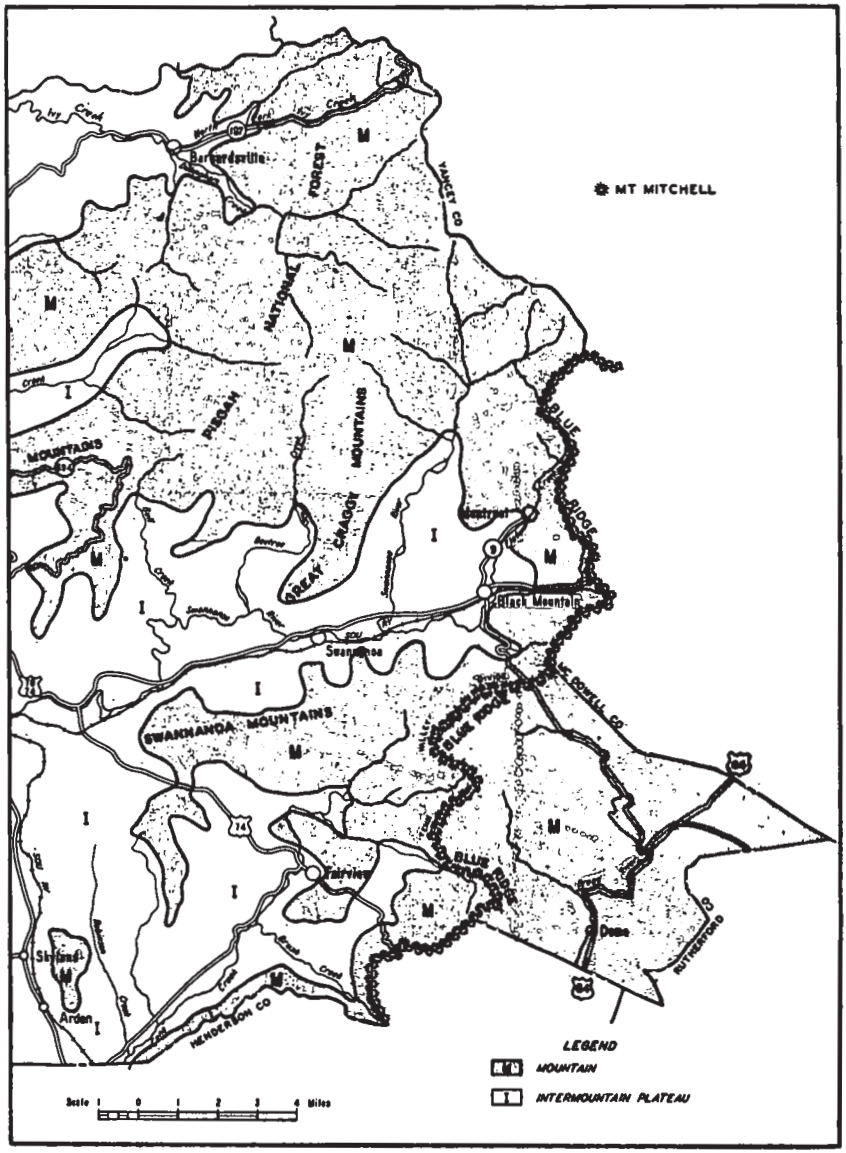


FIGURE 2.—Physiographic divisions

(pl. 1, *A*). The intermountain plateau, consisting of the broad valley on both sides of the French Broad River, is essentially a deeply cut but not very sharply dissected plain, somewhat more rugged than much of the Piedmont province. Almost all of the land on the intermountain plateau is rolling and hilly, the average elevation being 2,300 feet above sea level. In most places the mountain area forms an abrupt margin to the intermountain plateau, but there are outlying knobs and higher hills and ridges. Most of the mountain ranges are narrow-



of Buncombe County, N. C.

crested and steeply sloping. The more mountainous part is along the eastern boundary of the county; the most rugged areas are in the northeastern section and in the Mount Pisgah area.

The elevation ranges from about 1,740 feet where the French Broad River leaves the county to 6,419 feet on the summit of Potato Knob on the Buncombe-Yancey County line. Some of the highest elevations [3]

[3] Elevations from U. S. Geological Survey topographic maps.

in the area are Blackstock Knob, 6,386 feet; Craggy Dome, 6,105; Big Butt, 6,001; Mount Pisgah, 5,749; and Sandymush Bald, 5,168 feet. The elevation at Black Mountain is 2,367 feet; at Swannanoa, 2,222; at Asheville, 2,192; and at Alexander, 1,795 feet.

The well-established natural drainage system is largely within the drainage basin of the French Broad River. Practically all the streams are swift flowing. The French Broad River has a fall of about 375 feet in its course across the county. The chief tributaries are the Swannanoa River and Ivy, Cane, Hominy, Newfound, Turkey, Sandymush, Reems, and Beetree Creeks. A small part of the county in the southeast extremity is in the Broad River drainage basin. Except for some first-bottom lands, no areas in the county have poor surface runoff. Runoff is excessive on most of the upland, and drainage outlets reach every farm.

GEOLOGY

There are eight geologic formations, or groups of rocks, in Buncombe County (*10*, *11*): (1) Carolina gneiss, (2) Roan gneiss, (3) a group consisting of conglomerate and graywacke, (4) Brevard schist, (5) Henderson granite, (6) Cranberry granite, (7) a group of formations consisting of metagabbro, and (8) a group consisting of soapstone, dunite, and serpentine.

The Carolina and Roan gneiss formations underlie a major part of the area. The Carolina gneiss consists of interbedded mica schist, garnet schist, mica gneiss, garnet gneiss, and fine-grained granitoid layers. Most of these materials are light or dark gray and weather to dull gray and greenish gray. A few thin layers in the mica schist are bluish gray or black.

The feldspar in the Carolina gneiss decomposed to form a clay filled with bits and layers of schist, quartz, mica, and granite. The clay cover on the decayed rocks is thin, and the soil is light because it contains so much quartz and mica. Accordingly, natural growth on soil developed on this formation is poor, even in gently sloping areas where the formation has been well decomposed; however, such soil can be greatly improved by careful tillage.

Roan gneiss consists of a great series of beds of hornblende gneiss, hornblende schist, and diorite, with some interbedded mica schist and mica gneiss. The hornblende beds are dark green or black; the micaceous beds are dark gray. The mica schist and mica gneiss beds range from a few inches to 70 or 80 feet thick and occur most frequently near Carolina gneiss. In fact the micaceous beds form a transition from the Roan to the Carolina formation.

The clays accumulating on the Roan formation are always deep and a strong dark red. The soils that formed are rich and fertile and well repay clearing costs. They are widely cultivated in places remote from principal settlements. Because of the hilly relief, they are well drained, but because of their clayey nature, they are subject to serious erosion.

The conglomerate and graywacke, in the Swannanoa Mountains, extend across the Swannanoa River at Black Mountain, northeast to Montreat, and thence almost to the county line. This group, or formation, contains a considerable variety of rocks, including conglomerate,

graywacke, and mica schist. The layers of conglomerate range from 1 to 2 feet thick and exhibit the original character of the rock most plainly. The conglomerate forms layers in the graywacke that in some places are sharply separated but in others grade into the graywacke. The conglomerate pebbles, seldom more than half an inch long, are composed mainly of quartz with some feldspar. On the south side of the Swannanoa Mountains, however, the pebbles are an inch long and grade into both coarse and fine graywackes. The matrix of the conglomerates, the same material as that of the graywacke, consists of gray fine-grained quartz, feldspar, muscovite, and a little biotite, which become whitish as the feldspar weathers. Interbedded with the coarser rocks are many seams and beds of gray and bluish-gray mica schist. These fine-grained schist seams, composed chiefly of quartz and muscovite, are a few inches to a foot thick. The graywackes and schists of this conglomerate group can scarcely be distinguished from similar rocks in the Carolina gneiss.

The rocks of this group, or formation, are resistant to erosion. Rock decay works in along the plane of schistosity, and the rock breaks into slabs and small fragments, which are left in the thin sandy micaceous soil that forms.

Brevard schist, occurring as northeast-southwest stringers, is east, southeast, and south of Black Mountain. This formation is sedimentary in origin and is placed in the Cambrian age. It consists of dark bluish-black or black schist and slate interbedded with sandy layers and lentils of blue limestone. The rocks are composed mainly of very fine quartz and muscovite, through which are scattered minute grains of iron oxides that produce the dark color. Another constituent commonly found is graphite, which is disseminated in minute grains through large masses of the rock and only here and there concentrated into layers. The principal variation in the appearance of the formation is caused by the presence or absence of garnets. Garnets are common near Fairview.

The rocks of the Brevard schist formation disintegrate more readily than those of most other formations in the region. Red and brown clay soils, which are shallow and contain many flakes of the black schist, are left when the rocks are completely disintegrated. The soils are light and fairly productive on the lowlands, but on the slopes and summits of the mountains they support only a scant forest growth.

Henderson granite occurs along the county line east of Fairview. This granite is intrusive into all other Archean rocks with which it comes into contact. The granite is composed mainly of orthoclase and plagioclase feldspar, quartz, muscovite, and biotite, enumerated in order of their importance. These materials are in granites of uniform grain, and the two kinds of feldspar may be present in a single ledge. Porphyritic crystals of orthoclase feldspar are a prominent characteristic of the granite. The rock has a general gneissoid aspect, and many phenocrysts are drawn out into lenses.

Upon complete decay Henderson granite produces a yellowish or reddish clay that is frequently leached nearly white. This clay is mixed with sand and fragments of rock on the mountainsides and is not deep. In the valleys the rock in many places is decomposed and soft to a depth as great as 30 feet, and the overlying clay is

6 to 8 feet thick. Except in coves and hollows the soil is infertile and is subject to drought.

The Cranberry granite formation lies as stringers southwest of Jupiter. It consists of granite of varying texture and color and of schist and granitoid gneisses derived from granite. The granite is an igneous rock composed chiefly of quartz and orthoclase and plagioclase feldspar. Biotite and muscovite mica and, in places, hornblende also occur, as do minor magnetite, pyrite, ilmenite, garnet, and epidote minerals.

The most notable variation in the Cranberry granite is in the size of the feldspar crystals. As the feldspar crystals change, the granite changes from a rock of fine even grain to one of porphyritic appearance. The porphyritic variety is more common in the smaller areas of the formation. In the coarse granite the feldspar is by far the most prominent mineral and is prevailingly light gray or white. In many places near areas of Max Patch granite, the feldspars are filled with iron oxide, which imparts a marked red color. This variety of granite is often characterized by epidote in small veins and segregated masses. The schistose parts of the formation break up most readily, as the planes of schistosity seem to afford ready passage for dissolving waters.

Land underlain by Cranberry granite usually has smooth and rounded relief and light loam soils of fair depth and productivity. Many areas are cultivated.

Two areas of metagabbro occur in the county, one east of the forks of Ivy Creek and the other surrounding the French Broad School. The metagabbro group, or formation, consists of basic rock that has essentially the same minerals as Roan gneiss—mainly plagioclase feldspar, dark-green or black hornblende, and a small quantity of quartz. The general appearance is also similar to the massive parts of the Roan formation, but there is much less schistose and gneissoid material. In places the rock is specked with garnet.

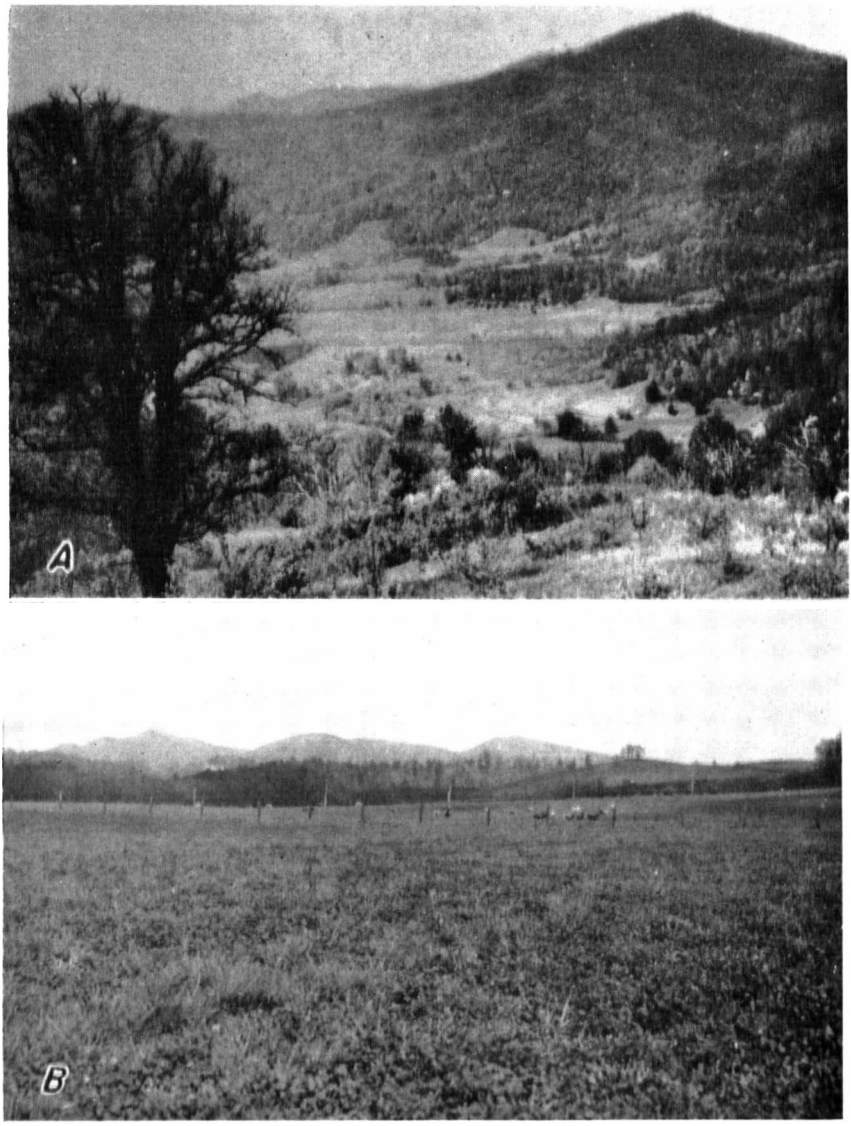
The metagabbro decomposes very slowly and leaves many rounded boulders on the surface. Final decay produces a dark-red clay of no great depth.

Several areas of the group consisting of soapstone, dunite, and serpentine are in the central and northern parts of the county; the largest is north of Democrat, and another is west of Swannanoa. This group, or formation, includes other combinations of minerals derived from original rocks through the process of metamorphism. The soapstone is white and light gray; the dunite, serpentine, and other included rocks are either bright or dull green.

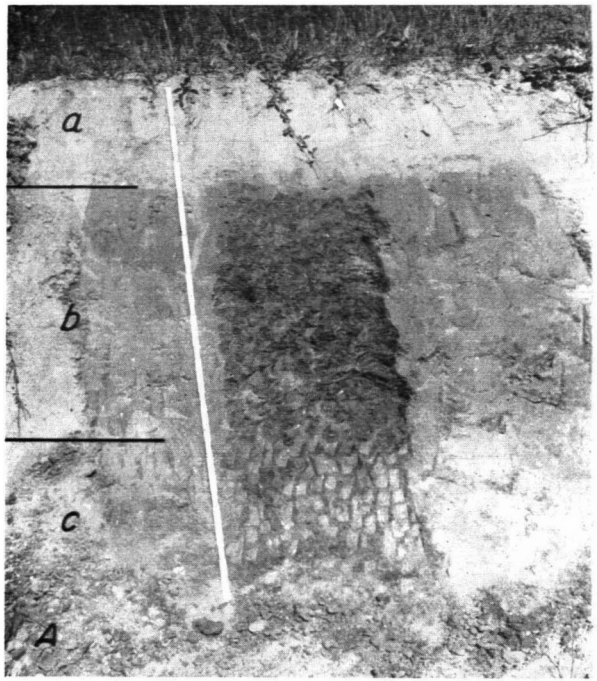
Few rocks disintegrate more slowly than those of the soapstone, dunite, and serpentine formation. Areas invariably show many ledges. The formation usually occupies low ground and is not much affected by solution, but it breaks down under the direct action of frost. Final decay leaves a thin cover of stiff yellow clay that is much interrupted by rock. Soils derived from this rock group are of almost no value.

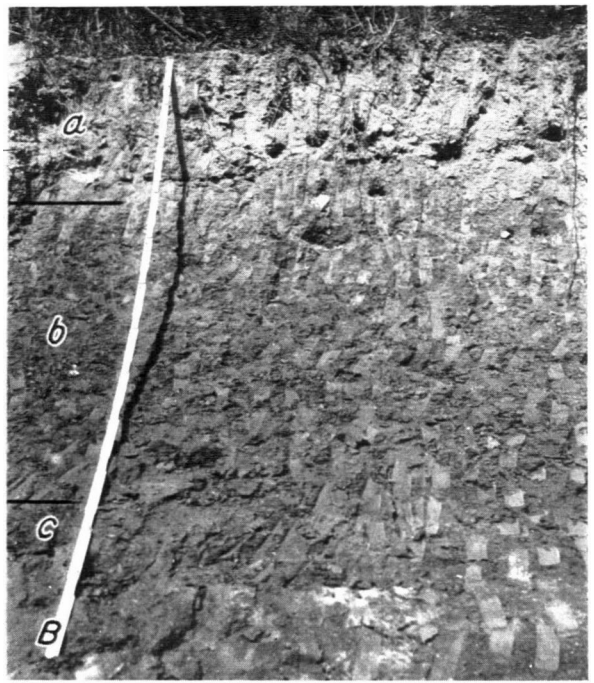
CLIMATE

Buncombe County has a humid temperate climate notably cooler than that of the lower parts of the State to the east. Summers are



A, Typical landscape of Buncombe County, showing Porters soils predominating on the mountains and Tusquitee soils on the valley floor.
B, Excellent stand of bluegrass and red clover on Chewacla silt loam.





A, Profile of Balfour fine sandy loam, rolling phase: *a*, Grayish-yellow fine sandy loam surface layer; *b*, light reddish-brown clay loam subsoil; and *c*, substratum that grades to partly disintegrated granite or gneiss.

B, Profile of Hayesville loam, hilly phase: *a*, Yellowish-brown loam surface layer; *b*, red clay subsoil; and *c*, substratum grading to partly distintegrated mica schist.

cool and moderately short; winters are generally fairly cold but not severe. Short erratic spells of cold weather occur in winter, but outdoor work can be done during most of the season. Cover crops of wheat, rye, and crimson clover and a few hardy vegetables can be grown in winter at elevations below 3,000 feet. Average annual temperature and precipitation vary widely from place to place because of great differences in elevation. On higher mountains precipitation is much heavier and temperature is considerably lower than in the valley areas. Snow remains on some of the higher northern slopes during much of midwinter.

Normal monthly, seasonal, and annual temperature and precipitation are given for two United States Weather Bureau stations, Asheville and Montreat, in table 1. The Asheville weather station is in the intermountain plateau part of the county; the Montreat station, in the mountainous part. Weather data for these stations are considered representative for the respective parts of the county they occupy.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Montreat and Asheville, Buncombe County, N. C.*

MONTREAT, ELEVATION, 2,600 FEET

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total for the driest year	Total for the wettest year	Average snowfall
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	39. 6	81	−14	4. 80	1. 37	2. 11	2. 5
January	38. 5	75	−7	3. 90	4. 05	3. 58	4. 5
February	40. 2	80	−4	4. 50	1. 98	6. 06	2. 3
Winter	39. 4	81	−14	13. 20	7. 40	11. 75	9. 3
March	45. 8	87	2	5. 20	2. 98	8. 24	2. 4
April	53. 6	90	12	4. 50	3. 64	3. 38	. 1
May	61. 0	95	28	5. 00	2. 71	5. 67	[1]
Spring	53. 5	95	2	14. 70	9. 33	17. 29	2. 5
June	68. 3	96	38	5. 40	1. 94	4. 51	0
July	70. 9	103	44	5. 70	4. 26	4. 33	0
August	69. 8	97	43	5. 10	1. 22	2. 65	0
Summer	69. 7	103	38	16. 20	7. 42	11. 49	0
September	65. 9	98	30	5. 20	3. 74	13. 68	0
October	56. 0	86	19	4. 20	3. 70	8. 93	[1]
November	46. 3	78	1	2. 60	3. 90	4. 63	. 1
Fall	56. 1	98	1	12. 00	11. 34	27. 24	. 1
Year	54. 7	103	−14	56. 10	[2] 35. 49	[3] 67. 77	11. 9

See footnotes at end of table.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Montreat and Asheville, Buncombe County, N. C.*—Continued

ASHEVILLE, ELEVATION, 2,203 FEET

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total for the driest year	Total for the wettest year	Average snowfall
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	37.8	78	−4	3.20	1.10	5.27	1.9
January	35.4	75	−5	3.10	2.74	6.25	3.4
February	38.5	78	−6	3.15	1.85	6.20	2.7
Winter	37.2	78	−6	9.45	5.69	17.72	8.0
March	44.9	87	8	3.97	2.45	9.40	1.9
April	53.9	89	20	3.02	2.45	4.30	.3
May	62.6	91	31	3.43	2.15	1.40	0
Spring	53.8	91	8	10.42	7.05	15.10	2.2
June	68.7	93	40	3.93	1.97	1.90	0
July	71.7	96	48	4.30	.77	5.10	0
August	70.5	96	47	4.16	.22	6.81	0
Summer	70.3	96	40	12.39	2.96	13.81	0
September	65.0	95	35	3.04	1.92	2.30	0
October	55.3	85	20	2.75	2.74	1.19	.2
November	45.1	76	4	2.23	2.43	2.74	.5
Fall	55.1	95	4	8.02	7.09	6.23	.7
Year	54.1	96	−6	40.28	[2] 22.79	[4] 52.86	10.9

[1] Trace.
[2] In 1925.
[3] In 1929.
[4] In 1875.

From table 1 it will be noted that the average annual precipitation is notably lower at Asheville than at Montreat but that the average annual temperature is about the same. The frost-free season at Asheville averages 191 days (from April 9 to October 17); that at Montreat, 176 days (from April 20 to October 13). Killing frost has occurred at Asheville as early as October 3 and as late as May 10, whereas at Montreat the extreme frost dates recorded are on September 22 and May 24.

The effects of altitude on climate are evident in comparing records from the stations in the county with those at Mount Mitchell (6,684 feet), 20 miles northeast of Asheville. At Mount Mitchell, the mean annual temperature is 42.8° F., the annual precipitation is 69.19 inches, and the average frost-free period is 127 days.

The average number of clear days in Buncombe County is 116; partly cloudy days, 129; and cloudy days, 120. Snow usually covers the ground about 30 days. There are about 50 days with heavy fog

and 50 days with thunderstorms. One or two local hailstorms occur yearly. Periods of drought sufficient to curtail crop growth rarely occur. Serious droughts occurred in 1925 and 1951.

WATER SUPPLY

The many streams furnish an abundant supply of water for livestock. Excellent spring water is available on most farms in the mountainous areas of the county, and well water is at 100 feet or less in the intermountain plateau. Beaver and Enka Lakes and Lake Louise are artificial lakes used for recreational purposes. Water for municipal districts is furnished by Beetree and Burnett Reservoirs. A few of the mountain streams afford good fishing, especially those that have been stocked or protected.

The Weaver hydroelectric plant and a steam plant on the French Broad River at Elk Mountain furnish light and power. Many gristmills are operated by water power. The Swannanoa and the French Broad Rivers and their tributaries offer possibilities for further development of hydroelectric power. According to estimates (*5*), 95,000 additional horsepower of electric current could be developed on the French Broad River.

VEGETATION

The county lies partly within three subdivisions (*6*) of the eastern forest region: (1) The birch-beech-maple-hemlock, (2) the chestnut-chestnut oak-yellow poplar, and (3) the spruce-fir. The birch-beech-maple-hemlock forest is on all the higher, more mountainous areas, except the two highest areas occupied by the spruce-fir forest. The chestnut-chestnut oak-yellow poplar forest occupies lower elevations on the intermountain plateau. The spruce-fir forest is confined to a small area in the southwestern part near Mount Pisgah and to another in the northeastern part near Mount Mitchell in Yancey County.

The dominant species in the original, or virgin, forest were chestnut, oaks, hemlock, balsam fir, birch, beech, yellow-poplar (tuliptree), hickory, walnut, wild cherry, buckeye, red spruce, and white pine. Of these, chestnut predominated. Rhododendron, laurel, sourwood, dogwood, huckleberry, gooseberry, and sassafras were intermixed with the original forest.

Much of the original forest has been cut for timber, and the growth now consists of oak, maple, yellow-poplar, locust, pine, balsam fir, hemlock, beech, birch, and hickory. Pines are more common in the present forest cover than in the original. Chestnut trees were killed by blight prior to 1930, but the dead trees are still being cut for acid or extract wood and pulpwood. In some areas white snakeroot, wild cherry, mountain-laurel, water hemlock, cocklebur, and other plants poisonous to cattle are common. In 1937, 1,100 seed-bearing plants, 143 species of trees, 800 fungi, and 300 mosses were reported as collected and identified in the mountain areas of the county.

Where seed trees, especially pine, are on the land, forest re-establishes itself readily on abandoned areas. Weeds, broomsedge, and briers are among the first plants to encroach on idle fields. White, shortleaf, and Virginia pines and black locust establish a good cover within a few years on the higher sites, and yellow-poplar develops a good stand on the lower sites where the soil is relatively fertile and

permeable and has favorable moisture relations. The pines, yellow-poplar, and locust grow rapidly except under the most unfavorable conditions.

ORGANIZATION AND POPULATION

Indians, particularly the Cherokees, hunted and camped in this county hundreds of years before the white man came, but they built no known villages within its present borders. De Soto, the Spanish explorer, was possibly the first white man to see the area. Some historians believe he came through Hickorynut Gap on his way west in 1540. Early adventurers in the area were Sam Lederer in 1640 (*1*) and James Needham and James Arthur in 1673 (*3*). Capt. William Moore obtained a grant in Hominy Valley after 1770. The next settlers, chiefly Englishmen from Virginia and North Carolina, did not arrive until after the Revolutionary War. They made their homes principally in the Swannanoa, Reems Creek, and Hominy areas and came to avoid slaveholding, to obtain land, or to trade with the Indians (*2*).

On January 14, 1792, the State Legislature formed Buncombe County from parts of Burke and Rutherford Counties. It was named in honor of Col. Edward Buncombe, a Revolutionary War hero from eastern North Carolina. The first courthouse was a log building erected at what is now Asheville. In 1795, the county seat, first called Morristown, was renamed Asheville in honor of Gov. Samuel Ashe.

The boundary lines of the county have changed many times. As the county was first organized, its western boundary was the State line. In 1808 Haywood County was formed from Buncombe County; in 1833 Yancey County was formed from it and Burke County. Henderson County was formed from Buncombe County in 1838. Madison County was formed from Buncombe and Yancey Counties in 1851.

The first road, the Buncombe Turnpike, was opened in 1824. The Asheville and Greenville Plank Road, built in 1851, brought many people to the county. In 1880 the first county railway, the Western North Carolina Railroad, connected Asheville and Salisbury and was later extended west to connect with a railroad in Tennessee. The railroad to Murphy was built in 1886.

The total county population was 124,403 in 1950. Many of the people live near Asheville and are mostly industrial workers. Few persons or families live in the mountainous parts, but the valleys are fairly thickly settled because they have most of the best and smoothest agricultural land.

Asheville, the county seat, had a population of 53,000 in 1950, and is a well-known summer resort. Other towns are Swannanoa (pop. 1,913); Black Mountain (pop. 1,174); Oteen; Weaverville; Enka; and Elk Mountain. Except for Elk Mountain, these towns are the principal local markets for the farm products of the county. Asheville has 10 tobacco warehouses and is the main cattle market.

INDUSTRIES

The major manufacturing plants are at Asheville, Enka, Swannanoa, and Black Mountain. Textile manufacturing leads in importance; rayon, nylon, blankets, and hosiery are produced. There are

small sawmills as well as larger and more complete woodworking plants. In 1942, one sawmill had a capacity of 20,000 board feet per 10-hour day; another, a capacity of 10,000 to 19,000 feet; and 42 others, a capacity of 1,000 to 9,000 board feet per day. In 1929, 10 sawmills in the county produced about 3 million board feet of lumber. One plant extracts from local wood a tanning material used in the leather industry.

Mineral production is small. One mine in the county is operating and producing small quantities of feldspar and mica. Among the mineral resources are corundum, limestone, kyanite, chromite, serpentine, garnet, granite, feldspar, and mica.

Manufacturing industries have pronouncedly affected the type of farming and the crops produced. Dairying and truck farming are important in manufacturing areas because the large number of employed persons provides a market. In addition, farming is a part-time occupation for some industrial employees.

TRANSPORTATION FACILITIES

Public roads and railroads furnish relatively good facilities for transporting products to and from farms. Only a few of the most remote communities lack adequate transportation. Long-distance and local motor-express and freight services are available to and from Asheville for all outside points. Paved United States and State highways connect Asheville with cities outside the county and with important communities in the county. Bus lines operate over many of the roads. Lines of the Southern Railway System connect Asheville with Knoxville, Tenn., to the west; Salisbury, N. C., to the east; and Spartanburg, S. C., to the southeast. A branch line extends southwest to Murphy in Cherokee County. East and west airline service from the local airport at Asheville is available, and private planes may be chartered.

COMMUNITY, HOME, AND FARM FACILITIES

Schools and churches are conveniently located throughout the county. All parts are served by busses that transport pupils to and from consolidated schools. There are three junior colleges and one standard college in the county, as well as several business and secretarial schools at Asheville.

Many of the farmhouses are substantial, and some have electricity, running water, and other modern conveniences. Telephone service and electricity are available in some parts of the county, especially those most densely populated. The 1950 census reported 558 farms having telephones and 3,544 farms with electricity. Most of the tenant houses and many houses in the remote mountain areas are small and in poor condition.

The barns on most farms are well constructed and large enough for storing crops, housing livestock, and curing the tobacco crop. Where winter feeding of cattle is practical, many of the better farms have exceptionally large barns for storing hay and forage. Outbuildings are usually available for storing machinery. According to the 1950 census, a total of 1,648 farms reported 1,957 automobiles, 974

TABLE 2.—*Soil series of Buncombe County, N. C., grouped according to topographic position, and the important characteristics of each*

Soil series	Relief	Drainage	Surface soil (A horizon) [1]	Subsoil (B horizon)	Source of parent material
MOUNTAIN UPLANDS					
Ashe	Rolling to steep	Somewhat excessive to excessive.	Yellowish gray, friable	Yellowish-brown or brownish-yellow friable loam or clay loam.	Granite, gneiss, and schist.
Burton	Hilly	Somewhat excessive	Very dark gray to almost black, friable.	Yellowish-brown friable clay loam	Do.
Porters	Hilly to very steep	Somewhat excessive to excessive.	Brown to dark brown, friable	Brown to yellowish-brown friable loam to clay loam.	Do.
Ramsey	Hilly to steep	do	Yellowish gray to dark yellowish brown, friable.	Brownish-yellow to brown friable shaly silt loam.	Shale, slate, sandstone, and quartzite.
Tate [2]	Undulating to rolling	Good	Gray to pale brown, friable	Brownish-yellow to yellowish-brown moderately friable silty clay loam.	Colluvium.
Tusquitee [2]	Undulating to hilly	Good to somewhat excessive.	Brown, friable	Yellowish-brown friable clay loam	Alluvium and colluvium.
INTERMOUNTAIN UPLANDS					
Balfour	Rolling	Good	Gray to grayish yellow, friable	Yellowish-brown to light reddish-brown friable clay loam.	Granite, gneiss, and schist.
Edneyville	do	do	Pale yellow, friable	Yellow friable fine sandy loam	Do.
Fletcher	Rolling to hilly	Good to somewhat excessive.	do	Yellowish-brown grading to reddish-yellow friable silty clay loam.	Schist.
Halewood	Hilly to steep	Good to excessive	Light brown to yellowish gray, friable.	Yellowish-brown or light reddish-brown brittle clay grading to splotched yellow and reddish brown.	Granite, gneiss, and schist.
Hayesville	Undulating to steep	do	Gray to yellowish brown, friable	Brownish-red to red moderately compact clay.	Do.
Iredell	Hilly	Somewhat excessive	Brownish gray, firm	Yellowish-brown grading to mottled olive, yellow, and gray plastic clay.	Dark basic igneous and metamorphic rocks.
Rabun	do	do	Reddish brown, moderately firm	Reddish-brown or red firm clay	Do.
Tate	Undulating to rolling	Good	Gray to pale brown, friable	Brownish-yellow to yellowish brown moderately friable silty clay loam.	Colluvium.
Tusquitee	Undulating to hilly	Good to somewhat excessive.	Brown, friable	Yellowish-brown friable clay loam	Alluvium and colluvium.
Wilkes	Steep	Excessive	Grayish brown to brownish gray, friable.	Yellowish-brown gravelly fine sandy loam or fine sandy clay.	Granite, gneiss, and schist.

HIGH STREAM TERRACES					
Hiwassee	Undulating to hilly	Good	Brown to slightly reddish brown, friable.	Brownish-red or dark-red firm brittle clay	Old alluvium.
Masada	do	Good to somewhat excessive.	Brownish gray to light brown, friable.	Yellowish-brown grading to light brownish-red heavy or firm clay.	Do.
LOW STREAM TERRACES					
Altavista	Undulating to rolling	Moderately good	Brownish gray, friable	Pale-yellow friable loam	Moderately young alluvium.
State	Nearly level to rolling	do	Light brown to brown, very friable.	Yellowish-brown friable clay loam	Do.
Warne	Nearly level to undulating.	Poor	Brownish gray or gray, friable	Yellowish-gray mottled with brown stiff plastic silty clay or clay.	Do.
FIRST BOTTOMS					
Buncombe	Nearly level	Excessive	Light brown, loose	Light-brown to brownish-yellow loose loamy fine sand or fine sand.	Young alluvium.
Chewacla	do	Imperfect	Brownish gray or light brown, friable.	Mottled gray and brown friable loam, fine sandy loam, or silt loam.	Do.
Congaree	Level or nearly level	Good	Grayish brown or brown, very friable.	Brown or yellowish-brown friable loam or fine sandy loam.	Do.
Toxaway	Nearly level	Poor	Very dark gray to almost black, friable.	Bluish-gray mottled with some yellow and brown friable silt loam.	Do.
Wehadkee	do	Poor to very poor	Dark gray to brownish black with some mottles, friable.	Gray mottled with rust-brown friable loam or silt loam.	Do.

[1] The description of the surface soil, or A horizon, applies to the virtually uneroded soil; with increased erosion the color and texture of the surface layer approach those of the subsoil.

[2] Also in intermountain uplands.

farms reported 1,088 motortrucks, and 354 farms reported 453 tractors. Most fences are of barbed wire, but on a few farms where hogs are kept fences are of woven wire. A few old-fashioned rail fences are still used.

THE SOILS OF BUNCOMBE COUNTY

SOIL SERIES AND THEIR RELATIONS

The soils of Buncombe County have been classified in 24 series, which can be placed in groups according to topographic position as follows: (1) Mountain uplands, (2) intermountain uplands, (3) high stream terraces, (4) low stream terraces, and (5) first bottoms. The soil series in each group and their characteristics are given in table 2.

MOUNTAIN UPLANDS

The Ashe, Porters, Ramsey, Burton, Tusquitee, and Tate soils are in mountain uplands on high steep and rough mountainous tracts in which there is little smooth upland or nearly level alluvial land. The average elevation of the mountain uplands is notably greater than that of the rest of the county, and accordingly the climate is cooler. In great part the soils are steep to very steep, relatively shallow to bedrock, and, in many places, stony. In general they have a gray to brown surface layer and a yellowish-brown or brownish-yellow friable subsoil.

The Ashe, Porters, and Ramsey are the chief soils of the mountain uplands. They are all shallow to bedrock, though the Ramsey soils are notably more shallow than the Ashe and Porters. The Ashe and the Porters soils developed over granite, gneiss, and schist; the Ramsey, over shale, slate, sandstone, and quartzite. The Ramsey and Ashe soils have yellowish subsoil. The Porters soils are predominantly brown throughout, and as they are more fertile than the others, probably a greater part of their acreage is cropped. Only a small part of the Ramsey soils is suitable for either crops or pasture.

The Burton soil is associated with Ashe and Porters soils and is distinguished from them by a nearly black surface layer very high in organic matter. Areas are chiefly in elevated coves and on steep north-facing slopes. Burton soil is not suited to crops, but many areas support a good grass cover when cleared.

The Tusquitee and Tate soils, occupying colluvial or local alluvial slopes, consist of material sloughed or washed from adjacent uplands. They occur in relatively small areas along drainageways throughout both the mountain and intermountain uplands. Soils of both series are relatively deep over bedrock and friable throughout the surface and subsoil layers. Much of the land occupied by these soils is valuable for agriculture, as it is easily worked and conserved and has moisture relations relatively favorable to crops and pasture. Parts, however, are stony. The Tusquitee soils are more fertile than the Tate, as is indicated by their brown surface layer and yellowish-brown clay subsoil. Tate soils have gray to pale-brown surface soil and brownish-yellow to yellowish-brown subsoil.

INTERMOUNTAIN UPLANDS

The soils of the intermountain uplands belong to the Hayesville, Halewood, Balfour, Edneyville, Rabun, Fletcher, Iredell, and Wilkes series. They are mostly rolling and hilly and in general have a lower elevation than soils of the mountain uplands, and the climate is notably warmer. The soils are redder, firmer in subsoil layers, and deeper to bedrock. Most of them have a gray to brownish-gray surface layer and a yellow, yellowish-brown, or red firm or moderately compact subsoil. Only a small acreage of soils in the intermountain uplands is suitable for forest only; a large acreage is suited to crops requiring tillage, and the rest is suitable for pasture. Much of the land cleared and cropped in this county is in the intermountain uplands.

The Hayesville, Halewood, Balfour, and Edneyville are the chief soils of the intermountain uplands. Hayesville soils have a gray to yellowish-brown surface layer and a reddish firm subsoil. They developed over granite, gneiss, and schist. The Halewood soils somewhat resemble the Hayesville, the essential difference being their less reddish, somewhat more friable subsoil. The Balfour soils have grayish surface soil and grayish-brown to light reddish-brown subsoil. They differ from Porters soils of the mountain uplands chiefly in having greater depth to bedrock and a firmer more nut-structured subsoil. The Edneyville soil resembles the Ashe soils of the mountain uplands, differing from them essentially in having somewhat greater depth to bedrock and a yellow firmer subsoil of more definite nut structure.

Less extensive soils of the intermountain uplands are the Rabun, Fletcher, Iredell, and Wilkes. The Rabun soil has a reddish-brown surface layer and a red firm clay subsoil developed over dark basic igneous and metamorphic rocks. The Rabun is the most fertile upland soil in the county. The Fletcher, Iredell, and Wilkes soils are all shallow to bedrock and generally less productive than the Rabun when used for agriculture. Fletcher soils have a yellowish-brown to reddish-yellow silty clay subsoil. They developed over schist, are high in content of slaty fragments, and over much of their acreage have a slaty silt loam texture. Although their fertility is not high, Fletcher soils respond well to proper management. The Wilkes soils are light colored throughout and very shallow to bedrock of granite, gneiss, schist, and dark basic rock. Surface and subsurface layers are grayish brown to brownish gray. All the Wilkes soils are steep, whereas many other soils of the intermountain uplands are undulating to rolling.

HIGH STREAM TERRACES

The high stream terraces are occupied by Hiwassee and Masada soils. The terraces are chiefly remnants of old alluvial plains, and they lie 50 to 100 feet above the present streams. The separate areas are relatively small and are associated with intermountain uplands on the one side and with low stream terraces and first bottoms on the other. These high stream terraces range from undulating to hilly and, on the whole, are somewhat smoother than intermountain upland areas.

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The Hiwassee and Masada soils have a firm reddish subsoil and are usually fairly deep to bedrock. Hiwassee soils have a browner surface layer and a redder subsoil than the Masada. Soils of both series have firm subsoil with a fairly well developed nut structure. In great part these soils are suited to crops requiring tillage.

LOW STREAM TERRACES

The soils of the low stream terraces are the Altavista, State, and Warne. These terraces are smooth alluvial benches only a few feet above the first bottoms. The separate areas are relatively small. The soils generally are permeable and fertile, and much of their acreage is used for tilled crops.

The Altavista soils, occupying the higher positions, have a surface layer lighter colored than that of the State soils, and their subsoil is more yellowish. State soils have a brown surface layer and a yellowish-brown friable clay loam subsoil; they are among the most fertile and best agricultural soils in the county. The Warne soil, closely associated with the Altavista soils, is generally in slight depressions or on very gentle slopes. Its gray surface layer is underlain by a mottled plastic silty clay or clay subsoil. This soil is limited in suitability for agriculture because of its compact subsoil, poor drainage, and low fertility.

FIRST BOTTOMS

The first bottoms are present alluvial flood plains along streams. They occur as irregular narrow strips, are nearly level, and are subject to overflow. The soils of the bottoms are the Congaree, Buncombe, Chewacla, Wehadkee, and Toxaway. They are mostly fertile and permeable, but the Buncombe soils are low in fertility. Much of the acreage is well drained and used for crops requiring tillage and for pasture. Only small areas are poorly drained. A small acreage is forested.

The Congaree and Buncombe soils are brownish, the well-drained Congaree consisting of fine sandy loam and loam material and the excessively drained Buncombe of loamy fine sand material. The imperfectly drained Chewacla soils are associated chiefly with the Congaree and Wehadkee. Chewacla soils occupy somewhat lower positions than the Congaree and are commonly mottled gray and brown to within 12 to 14 inches of the surface. The poorly drained Wehadkee soil, predominantly gray and mottled throughout, occupies the lowest parts of the bottoms and is most subject to overflow. Much of the time the water table is at or within a few inches of the soil surface. The Toxaway soil, distinguished by its almost black color and high content of organic matter to a depth of 6 to 26 inches, has a subsoil predominantly gray with some yellow and brown mottling. In its natural condition, Toxaway soil is poorly drained, but many areas have been artificially drained and are productive when properly managed.

SOIL DESCRIPTIONS

In the following pages the soils are described in detail and their agricultural relations are discussed. The soils are arranged alphabetically by series name. The dominant, or most important, phase of each

series is first described, and descriptions of other phases of the type[4] follow. The dominant phase of each soil type is described in detail, whereas the others are discussed more briefly and in relation to the dominant phase.

The approximate acreage and proportionate extent of the soils mapped in the county are given in table 3.

TABLE 3.—*Approximate acreage and proportionate extent of the soils mapped in Buncombe County, N. C.*

Soil	Acres	Percent
Altavista loam:		
Eroded rolling phase	149	(1)
Undulating phase	2,580	0.6
Ashe loam:		
Eroded hilly phase	120	(1)
Steep phase	429	.1
Ashe stony loam:		
Eroded hilly phase	721	.2
Eroded steep phase	1,731	.4
Rolling phase	96	(1)
Steep phase	1,469	.4
Balfour clay loam, severely eroded rolling phase	353	.1
Balfour fine sandy loam, rolling phase	222	.1
Balfour loam:		
Eroded rolling phase	6,845	1.7
Rolling phase	4,051	1.0
Buncombe gravelly loamy fine sand	745	.2
Buncombe loamy fine sand	3,298	.8
Burton stony loam	241	.1
Chewacla fine sandy loam	920	.2
Chewacla silt loam	1,099	.3
Congaree fine sandy loam	1,930	.5
Congaree silt loam	1,667	.4
Congaree-Tate loams	2,503	.6
Edneyville fine sandy loam	268	.1
Fletcher silt loam:		
Eroded hilly phase	743	.2
Eroded rolling phase	1,884	.5
Hilly phase	930	.2
Rolling phase	2,488	.6
Fletcher silty clay loam, severely eroded hilly phase	186	(1)
Fletcher slaty silt loam:		
Eroded hilly phase	920	.2
Eroded rolling phase	747	.2
Hilly phase	201	(1)
Severely eroded hilly phase	318	.1
Halewood clay loam:		
Severely eroded hilly phase	4,835	1.2
Severely eroded steep phase	3,977	1.0
Halewood loam:		
Eroded hilly phase	24,644	6.0
Eroded steep phase	16,471	4.0
Hilly phase	13,467	3.3
Steep phase	15,517	3.8

[1] Less than 0.1 percent.

[4] For a definition of soil types and phases see the section on Soil Survey Methods and Definitions.

TABLE 3.—*Approximate acreage and proportionate extent of the soils mapped in Buncombe County, N. C.*—Continued

Soil	Acres	Percent
Halewood stony loam:		
Eroded hilly phase	2,639	0.6
Eroded steep phase	4,857	1.2
Hilly phase	2,747	.7
Steep phase	21,668	5.3
Hayesville clay loam:		
Eroded hilly phase	16,117	3.9
Eroded rolling phase	6,939	1.7
Eroded steep phase	1,069	.3
Severely eroded hilly phase	9,924	2.4
Severely eroded rolling phase	465	.1
Severely eroded steep phase	2,263	.6
Hayesville loam:		
Hilly phase	4,982	1.2
Rolling phase	2,810	.7
Steep phase	746	.2
Undulating phase	289	.1
Hayesville stony clay loam:		
Eroded hilly phase	471	.1
Eroded rolling phase	860	.2
Hayesville stony loam:		
Hilly phase	343	.1
Rolling phase	525	.1
Hiwassee clay loam:		
Eroded hilly phase	92	(1)
Eroded rolling phase	269	.1
Eroded undulating phase	107	(1)
Iredell-Halewood stony loams, hilly phases	748	.2
Made land	551	.1
Masada gravelly loam:		
Eroded rolling phase	299	.1
Rolling phase	154	(1)
Masada loam:		
Eroded hilly phase	220	.1
Eroded rolling phase	844	.2
Rolling phase	317	.1
Undulating phase	207	.1
Porters loam:		
Eroded hilly phase	273	.1
Eroded steep phase	4,319	1.1
Steep phase	3,979	1.0
Porters stony loam:		
Eroded hilly phase	214	.1
Eroded steep phase	5,796	1.4
Steep phase	32,750	7.8
Very steep phase	2,865	.7
Rabun clay loam, eroded hilly phase	167	(1)
Ramsey shaly silt loam:		
Eroded hilly phase	870	.2
Eroded steep phase	1,793	.4
Hilly phase	1,258	.3
Steep phase	5,035	1.2
Rock outcrop	266	.1
Rough gullied land (Hayesville and Halewood soil materials)	6,311	1.5
State gravelly loam	891	.2
State loam	1,341	.3
Stony colluvium (Tusquitee soil material)	4,301	1.0
Stony rough land (Porters soil material)	99,540	24.1

[1] Less than 0.1 percent.

TABLE 3.—*Approximate acreage and proportionate extent of the soils mapped in Buncombe County, N. C.*—Continued

Soil	Acres	Percent
Tate silt loam:		
Rolling phase	1, 803	0. 4
Undulating phase	4, 746	1. 2
Toxaway silt loam	273	. 1
Tusquitee loam:		
Eroded rolling phase	210	. 1
Rolling phase	854	. 2
Undulating phase	897	. 2
Tusquitee stony loam:		
Eroded hilly phase	683	. 2
Eroded rolling phase	950	. 2
Hilly phase	2, 475	. 6
Rolling phase	4, 675	1. 1
Undulating phase	739	. 2
Warne silt loam	1, 287	. 3
Wehadkee silt loam	478	. 1
Wilkes gravelly loam:		
Eroded steep phase	6, 332	1. 5
Severely eroded steep phase	3, 297	. 8
Steep phase	6, 925	1. 7
Total	410, 880	100. 0

[1] Less than 0.1 percent.

Altavista loam, undulating phase (AB).—This soil occurs on the moderately low stream terraces. It is associated with State and Warne soils of the low stream terraces and with soils of the first bottoms, and it is commonly adjacent to more sloping soils of the uplands. It has smooth relief, the slopes ranging chiefly from 2 to 7 percent; small parts are nearly level. The parent material is alluvium washed from soils that originally developed from igneous and metamorphic rocks. Surface runoff is medium, and internal drainage is moderate to slow. In reaction the soil is medium acid, and in fertility it is generally moderately low. The native vegetation was hardwood forest, chiefly of oak, hickory, and yellow-poplar.

Profile description:

0 to 7 inches, brownish-gray mellow friable porous loam.
7 to 18 inches, pale-yellow mellow friable porous loam of granular structure; crumbles to fine friable mass.
18 to 34 inches, olive-yellow friable but slightly sticky clay or silty clay; breaks into angular-shaped lumps that crumble easily to a friable mass.
34 inches +, olive-yellow fine sandy clay mottled with strong brown and light yellowish brown; a few fine gravel and rounded stones; breaks into irregularly shaped lumps that crumble to a friable mass.

Some areas have a fine sandy loam surface soil and a more sandy subsoil; others contain a moderate quantity of gravel, which in places is sufficient to interfere with cultivation. Some areas are more strongly mottled below a depth of 30 inches.

Use and management.—Practically all of this phase is cleared and used for crops and pasture. Its smooth relief, generally good drainage, good moisture relations, and ability to respond to good manage-

ment make it well suited to such uses. The principal crops are corn, potatoes, and market vegetables. The soil is particularly valued as cropland because few soils of the county are so well suited to such use.

Altavista loam, eroded rolling phase (Aa).—Stronger slopes and an eroded condition distinguish this soil from the undulating phase. The predominant slope is from 7 to 15 percent. Because of the eroded condition of the soil, the subsoil material has been mixed with the original surface soil during tillage. Owing to this mixing, the plow layer is now yellower and more clayey. The content of organic matter is lower than in the undulating phase, but the quantity of phosphorus, potash, calcium, and magnesium does not differ materially.

This soil varies chiefly in thickness of the surface layer and subsoil and in the quantity of organic matter in the surface layer. A few areas contain stone or gravel in quantities sufficient to interfere somewhat with tillage. Nevertheless, all areas are tillable.

Use and management.—All of this soil is cleared and used for crops. It is desirable for general farming, although its rolling surface is less favorable than that of the undulating phase. Corn, hay, small grains, and many vegetable crops are well suited. Short suitable rotations may be followed, provided good management is used. Good management includes proper fertilization, liming, addition of organic matter, and adequate supplementary measures to control runoff.

Ashe loam, steep phase (Ad).—This soil is derived from light-colored granite, gneiss, and some schist. It occurs on high mountain areas with slopes of 30 to 60 percent and is associated with Porters soils and Stony rough land (Porters soil material). The soil is relatively shallow—generally less than 3 feet deep to bedrock. Surface runoff is very rapid, and internal drainage is rapid. The soil is medium to very strongly acid, low in calcium and magnesium, medium to low in phosphorus, and fairly high to low in potash. In virgin areas it is fairly high to moderately high in organic matter, but in cultivated areas the supply is low. The native forest cover was chiefly chestnut, white, post, and Spanish oaks, maple, locust, serviceberry, dogwood, sourwood, white pine, mountain-laurel, and rhododendron.

Profile description:

0 to 13 inches, yellowish-gray friable loam containing a few mica flakes; surface inch contains much organic matter.
13 to 34 inches, moderate yellowish-brown or brownish-yellow loam or clay loam; porous and easily crumbled to a friable mass.
34 inches +, moderate yellowish-brown rotten rock mottled with white and light olive gray; material shows constructional form of original rock; solid bedrock at 40 to 60 inches.

The depth to partly decomposed bedrock ranges from about 12 to 34 inches, and the subsoil is generally thinner where the rock is at a shallow depth. A few stones are on the surface and in the soil in places but not in sufficient quantity to interfere greatly with tillage. There are few bedrock outcrops.

Included with this soil because of small acreage and similarity of profile are about 160 acres that have been moderately eroded. The plow layer of this eroded variation consists of a mixture of the original surface soil and some subsoil, and therefore it is more yellowish and in places more clayey.

Use and management.—All but a small part of Ashe loam, steep phase, is forested. The soil is low in organic matter, is very permeable to roots and moisture, and would afford good grazing if properly managed. Chiefly because of its steep slope and susceptibility to erosion, it is not suited to crops requiring tillage.

Ashe loam, eroded hilly phase (Ac).—Hilly slopes of 15- to 30-percent gradient and an eroded condition differentiate this soil from the steep phase of Ashe loam. Erosion has removed 25 to 75 percent of the surface soil, and there are a few shallow gullies. Surface runoff is rapid and internal drainage is rapid. The content of calcium, magnesium, phosphorus, and potash is about the same as in the steep phase, and the entire profile is strongly acid. The supply of organic matter is low.

The plow layer consists of original surface soil mixed with subsoil materials and is more yellowish and heavier in consistence than it would be if uneroded. The subsoil is within plow depth over most of the acreage.

Included with this soil is a small acreage under native forest that is not eroded. Small patches that have lost most, or all, of the original surface soil are also included.

Use and management.—Most of this eroded hilly phase has been cleared. It is well suited to small grain, hay, and truck crops. The cabbage, snap beans, and potatoes grown are of exceptionally high quality. Chiefly because of the strong slope of the soil, however, row crops should not be grown frequently and tillage should be with the contour.

Ashe stony loam, steep phase (Ah).—This phase is in the more mountainous parts of the county and differs from Ashe loam, steep phase, chiefly in having enough stones to interfere materially with tillage. The stones range from gravel to boulder size, and there are a few rock outcrops. The depth to bedrock is generally less than for the steep phase of Ashe loam. Surface runoff is very rapid, and internal drainage is rapid. The soil is strongly acid, and the content of calcium, phosphorus, magnesium, potash, and organic matter is about the same as in Ashe loam, steep phase. A small acreage has very steep slopes.

Use and management.—Steep slope, stoniness, and low fertility limit the use of this soil to forest.

Ashe stony loam, eroded steep phase (Af).—A number of stones sufficient to interfere materially with tillage and a notable loss of soil material through erosion are the chief differences between this soil and Ashe loam, steep phase. The stones range in size from small gravel to large boulders, and there are small outcrops of bedrock. Some shallow gullies are in most fields. The soil is strongly acid, moderately low in content of plant nutrients, and low in content of organic matter. Surface runoff is very rapid and internal drainage is rapid.

Use and management.—This soil has been cleared of its forest cover and is used for crops or pasture. Owing to its eroded condition, steepness, and stoniness, it is not well suited to intertilled crops or pasture. With adequate management, however, the better parts will produce fair pasture. A good sod should be maintained at all times on grazed areas.

Ashe stony loam, eroded hilly phase (AE).—This soil differs from Ashe loam, steep phase, in having a milder slope, in containing stone in quantities sufficient to interfere materially with tillage, and in being eroded to such extent that subsoil material is mixed with the remaining part of the original surface soil during cultivation. The stones vary from gravel to large boulder size, and there are small bedrock outcrops in places. There are a few gullies, crossable by farm machinery but not commonly obliterated by tillage. Surface runoff is rapid, and internal drainage is moderate. A small included acreage is under native forest and is not eroded materially.

From 25 to 75 percent of the original surface soil has been removed by erosion. The present brownish-yellow surface soil is a mixture of the original surface layer and remnants of the subsoil material.

Use and management.—All but a small part of this soil has been cleared of its native forest cover and has been either cropped or pastured. Because of its eroded condition, hilly relief, and degree of stoniness, the soil is not well suited to intertilled crops. With proper management—including adequate liming and fertilization—it will produce good pasture. A good sod should be maintained.

Ashe stony loam, rolling phase (AG).—This soil occurs in the mountainous parts of the county, chiefly on ridge tops, and is associated with steeper Ashe soils. A smoother surface and stoniness distinguish it from Ashe loam, steep phase. The surface is rolling (7- to 15-percent slopes). Stones ranging from gravel to boulder size are sufficiently abundant to interfere materially with cultivation. A few areas are too stony to be tilled, and there are bedrock outcrops in places. Surface runoff is medium, and internal drainage is rapid. The content of plant nutrients is low, and the reaction is strongly acid.

Included with this phase because of limited extent is a small cleared acreage now used for crops or pasture. This inclusion has been eroded and has lost 25 to 75 percent of its original surface soil. The subsoil is now within plow depth in most places, and some of the subsoil is generally mixed with the surface soil.

Use and management.—Except for the small acreage of included soil, all of this phase is in forest. It could, however, be cleared and used for crops and pasture because it will produce truck crops of exceptionally good quality, especially cabbage, beans, and potatoes. Areas to be cropped could be improved by removing the loose stones. Care must be exercised to prevent erosion, and good management practices must be employed to maintain soil productivity.

Balfour loam, rolling phase (BD).—This soil of the valley or intermountain uplands and the low mountain areas is underlain by granite, gneiss, and schist. It has 7- to 15-percent slopes. Normally it is not so deep over bedrock as some soils in the intermountain uplands, averaging not more than 36 inches deep. Surface runoff is medium, and internal drainage is moderate. Reaction is medium to strongly acid. The soil is medium to low in calcium, low to very low in phosphorus, low to fairly high in potash, and medium in content of organic matter. The natural vegetation is a dense growth of hardwood trees—chiefly oak, yellow-poplar, hickory, sourwood, birch, locust, silverbell, serviceberry, and a few black walnut.

Profile description:

0 to 8 inches, friable porous grayish-yellow loam; some quartz gravel and many small roots.
8 to 13 inches, grayish-brown friable clay loam containing some quartz fragments; easily crushed to a friable mass.
13 to 22 inches, brown to light reddish-brown clay loam mottled with gray; irregularly shaped lumps of nutlike structure readily crushed to a friable mass; a few quartz fragments.
22 inches +, brown to reddish-brown rotten granitic rock specked with black and yellow.

Although this is one of the more uniform soils of the county, its depth to bedrock ranges from 25 to 45 inches. A small acreage has a smooth surface with slopes of less than 7 percent.

Use and management.—Although one of the most desirable soils of the county for crops and pasture, practically all of this phase is in native forest. It is productive, fairly easy to work and conserve when cleared, and well suited to crops requiring tillage. Corn, hay, and such vegetables as snap beans, sweet corn, and potatoes are especially well suited. Apples should be well adapted where air drainage is adequate. Proper fertilization and liming are required, and erosion is a hazard if care is not taken to control runoff.

Balfour loam, eroded rolling phase (Bc).—This moderately fertile soil is in the intermountain plateau part of the county. There are a few shallow gullies. The soil differs from Balfour loam, rolling phase, in having lost 25 to 75 percent of its original surface soil through erosion. Over much of the acreage its subsoil is within plow depth, and its plow layer therefore consists of a mixture of original surface soil and subsoil materials. Mixing of the surface soil and subsoil has given the plow layer a browner color, a more clayey texture, and a heavier consistence than normal. Surface runoff is medium, and internal drainage is moderate. The soil is permeable and retains moisture fairly well.

This is one of the more uniform soils in the county. Except for degree of erosion, variations are about the same as those of the rolling phase. About 54 acres are included that have slopes of 3 to 7 percent.

Use and management.—Practically all areas have been cleared of their forest cover and are used for tilled crops and pasture. Although this soil is moderately eroded, it is suited to many crops, especially small grains and sod-forming crops. When used for clean-tilled crops, it should be handled in a contour-strip rotation so that not over a third of the soil is plowed at any one time. Pasture is well suited where liming and proper fertilization have been practiced.

Balfour clay loam, severely eroded rolling phase (Ba).—This soil differs from Balfour loam, rolling phase, in that erosion has removed practically all of its original surface soil and, in places, part of its subsoil. The plow layer consists of yellowish-brown or light reddish-brown moderately friable clay loam. The depth to bedrock is about 26 inches. There are a few gullies, most of which are crossable by farm machinery but a few of which are not obliterated by tillage. Slopes range from 7 to 15 percent. Surface runoff is rapid; internal drainage is moderate.

Use and management.—The productivity of this soil is low, its tilth is unfavorable, and its ability to hold moisture available to plants is

notably less than for the less eroded Balfour soils. These conditions, together with sloping relief, make it fairly difficult to conserve the soil and to maintain a high level of productivity for crops. Proper fertilization, liming, and addition of organic matter in substantial quantities are needed. Where the soil is required for crops, long rotations consisting chiefly of fall-sown small grains and legume-and-grass hay should be used. Properly limed and fertilized, especially with phosphorus, this soil is capable of producing fairly good pasture.

Balfour fine sandy loam, rolling phase (Bb).—Most of this soil is in the intermountain plateau section. The relief is rolling, the slopes ranging from about 7 to 15 percent; about 60 acres are included that have a dominant slope of 2 to 7 percent. Surface runoff is medium, and internal drainage is moderate. Acidity is moderate to strong, and the content of plant nutrients is about medium. The natural vegetation is predominantly hardwood forest with a few pines intermixed.

A coarser textured surface layer distinguishes this phase from Balfour loam, rolling phase. This layer, about 8 inches thick, is gray to grayish-yellow fine sandy loam (pl. 2, *A*). The 15- to 24-inch subsoil is yellowish-brown to light reddish-brown friable clay loam or sandy clay loam. Bedrock of granite, gneiss, and schist is at a depth of about 36 inches.

Use and management.—Much of this soil is still under native forest. Because it is relatively productive and easily worked and conserved, it is well suited to crops requiring tillage and to pasture. Much of the acreage could well be cleared and used for crops. If this were done, more sloping soils now used for crops but less well suited to them could be used for pasture or forest. This soil has a fairly high water-holding capacity and responds well to good management. Where it is carefully managed, moderately short rotations can be used, but some care is required to control runoff where row crops are grown frequently. Practically all the crops commonly grown in the county are well suited, including corn, small grains, potatoes, onions, and beans.

Buncombe loamy fine sand (Br).—The alluvium of this very sandy first-bottom soil consists chiefly of material derived from granite, gneiss, and schist. All areas have nearly level or gently billowy relief and occur along the French Broad River and its larger tributaries in locations subject to overflow. Most areas are adjacent to stream channels and lie as gentle swells between the streams and lower lying soils of the first bottoms. Many areas are on the outer rim of the first bottoms that extend into stream meanders. The soil is strongly acid and very low in organic matter as well as plant nutrients. Surface runoff is slow, and internal drainage is rapid to very rapid. The water-holding capacity is low, but the water table is generally within reach of deep-rooted crops. Crops with shallower root systems, especially some of the grasses, are injured by lack of moisture during dry periods.

Profile description:

0 to 9 inches, light-brown very loose loamy fine sand, very low in organic matter.

9 to 30 inches +, light-brown to brownish-yellow loose loamy fine sand or fine sand underlain by alluvium of variable color and texture; much of the underlying material is mottled gray and brown and ranges in texture from sand to clay loam.

In some areas the texture of the surface 30 inches is coarser, ranging to loamy sand or sand. All of the material contains a notable quantity of fine mica flakes. Frequently beds of sand or gravel underlie this soil at depths of 40 inches or more.

Use and management.—Most of this soil has been cleared, and nearly half is used for crops. The rest is mainly in pasture, but a small part is idle. Corn, truck crops, and certain hay crops occupy most of the tilled acreage. Although its fertility and moisture-holding capacity are low, this soil is well suited to truck crops, corn, some hay, and winter grazing where it is adequately fertilized.

Cultivation is easy, and weeds are less difficult to control than on the finer textured soils of the bottoms. Runoff water is no hazard except during periods of flood. Plant nutrients, however, are difficult to conserve, as they leach rapidly from the soil. Because of leaching and low fertility, fertilizer ordinarily should be added in small but frequent applications. Early vegetables are particularly suited, for they develop more rapidly on the Buncombe than on finer textured soils.

Buncombe gravelly loamy fine sand (Be).—This soil differs from Buncombe loamy fine sand chiefly in having greater content of gravel and cobblestones. The stones occur in numbers sufficient to interfere with tillage and in places make tillage very difficult. Most stones are 6 inches or less in diameter. The soil is nearly level or slightly billowy. All of it is subject to overflow because it lies adjacent to the French Broad River and the larger swift-flowing streams of the county.

Use and management.—Much of this soil is cleared, and approximately a third is used for crops. Its fertility is low. The capacity for holding water available to plants is very low, but deep-rooted crops should be able to obtain moisture from the water table in many areas. The soil is considered suitable for truck crops, corn, hay, and winter grazing. Heavy fertilization and liming are required, but these materials should be applied frequently in small quantities. Permanent pasture is usually of poorer quality than on many of the finer textured soils, and grasses are frequently injured during droughts of even short duration.

Burton stony loam (Bg).—Areas of this rolling to hilly soil (slopes 7- to 30-percent) are associated with the Ashe and Porters soils. They occupy coves, north-facing slopes, bald patches on mountaintops, and crests of some of the higher ridges in the mountain area. The soil is underlain by granite, gneiss, and schist. Surface runoff is medium to rapid, and internal drainage is slow to moderate. The soil is strongly acid and high in organic matter, but apparently it is low in calcium, magnesium, phosphorus, and potash. Stones of gravel to large boulder size are abundant enough in places to interfere materially with cultivation. There are a few small outcrops of bedrock. The natural vegetation is generally a mixture of grass and shrubs.

Profile description:

0 to 12 inches, very dark-gray to almost black friable stony loam containing much organic matter, including an abundance of grass roots.
12 to 22 inches, yellowish-brown friable clay loam.
22 inches +, light yellowish-brown loam in which the laminations of the parent rock are evident.

Large rock fragments and a notable content of mica flakes are common throughout the soil mass. The dark surface layer ranges from 8 to 24 inches thick. In some places, as at the heads of drainageways, seepy conditions prevail, and the subsoil consequently is mottled yellow and gray and generally is wet much of the year.

Use and management.—A great part of this soil is under native vegetation. Practically none of it is tilled, but a small acreage is pastured. The chief limitations to its use are stoniness, relative inaccessibility, and to less extent the short growing season characteristic of the high elevation at which it occurs. The soil is well suited to pasture, however, and it is commonly referred to as natural grassland.

Chewacla silt loam (CB).—This nearly level soil of the first bottoms generally occupies slightly lower positions than the associated Congaree and Buncombe soils. Most areas lie as narrow strips on the bottom lands along major streams of the county and are subject to overflow. The parent material has been derived chiefly from granite, gneiss, and schist. The soil has slow to very slow surface runoff, slow internal dainage, moderately high organic-matter content, moderate fertility, and medium to strong acidity. The native vegetation was predominantly water-loving deciduous trees.

Profile description:

0 to 14 inches, light-brown friable silt loam that breaks to irregularly shaped lumps.

14 inches +, mottled gray and brown friable silt loam; dark mottling commonly increases with depth.

An abundance of mica occurs throughout the profile. The mottling is at varying depths.

Use and management.—Much of this soil has been cleared and is used for crops requiring tillage. Corn and hay predominate (pl. 1, *B*). Except for the fact that the soil remains wet for longer periods following flooding than do the Congaree and Buncombe soils, it is not difficult to work. A high state of fertility is easily maintained. Control of runoff is not a problem, but crops are at times damaged by floodwaters. Artificial drainage would increase productivity and make a greater acreage suitable for truck crops. This soil is well suited to short rotations and frequent row crops and is very productive where its fertility is maintained at a high level.

Chewacla fine sandy loam (CA).—As with Chewacla silt loam, the water table is at a relatively shallow depth and all areas are subject to flooding. Surface runoff is slow to very slow, and internal drainage is slow. The soil is strongly acid but has a fairly high content of organic matter in the surface layer and is moderately fertile. Areas are along the larger streams of the county.

This soil differs from Chewacla silt loam chiefly in being more sandy. The 12- to 15-inch surface layer is brownish-gray or light-brown fine sandy loam. The subsoil is mottled gray and brown friable loam or fine sandy loam.

Use and management.—Practically all of this productive soil has been cleared, and much of it is in crops, principally corn and hay. The soil is easily worked, except that it remains too wet for cultivation for longer periods than the associated Congaree and Buncombe soils. It

is easily conserved against losses of plant nutrients and soil material. At times, overflow water may damage or destroy crops.

Where feasible to establish, artificial drainage improves the usefulness and productivity of this soil. Many artificially drained areas are well suited to the intensive production of truck crops if adequate fertilization and liming are practiced. Permanent pasture is productive under natural drainage conditions, but lime and fertilizer should improve its quality and increase its carrying capacity.

Congaree fine sandy loam (Cc).—This level or nearly level soil of the first bottoms occurs along many streams in association with other Congaree soils and with Wehadkee, Chewacla, Altavista, and State soils. It is subject to overflow. Surface runoff is slow, and internal drainage is moderately rapid. The soil is strongly acid, low in calcium and magnesium, medium to low in potash, low to very low in phosphorus, and low to medium in organic matter. The original forest growth was water-loving hardwoods—willow, willow oak, perhaps a few other oaks, and beech, birch, and ash. In many places the soil had a thick growth of rhododendron and laurel.

Profile description:

0 to 10 inches, grayish-brown or brown very friable fine sandy loam of granular structure.

10 to 30 inches, brown or yellowish-brown loam or fine sandy loam of massive structure.

30 inches +, mottled gray, yellowish-brown, and brown material ranging in texture from fine sandy clay to loamy sand.

Mica flakes occur throughout the soil. The texture of the subsoil ranges from silt loam to loamy fine sand. The underlying material varies from beds of gravel to stone-free silty clay loam and usually shows indications of poor drainage.

Use and management.—Nearly all of this soil has been cleared and is used for crops, chiefly truck and other row crops and hay. Its good tilth, favorable moisture relations, smooth surface, and ability to respond to fertilization make it well suited to intensive use. It is one of the most desirable soils for crops requiring tillage and is especially well suited to snap beans, potatoes, sweet corn, and other row crops. Crops are subject to damage by overflow, however, and about one crop out of four is either seriously damaged or entirely lost. Areas severely damaged by overflow often remain idle the following year.

Congaree silt loam (Cd).—Areas of this soil occur along many of the larger streams of the county. Surface runoff is slow to very slow, and internal drainage is slow to moderate. The soil is medium acid, low in calcium and magnesium, very low in phosphorus, low to very low in potash, and high to medium in organic matter.

Its texture and a more nearly level surface differentiate this soil from the fine sandy loam. The surface layer is brown friable silt loam to silty clay loam; the underlying material, to 30 or 36 inches, is yellowish-brown silt loam or silty clay loam.

The most notable variations are in texture and consistence of the subsoil material and in the height above stream level. The texture of the surface soil is dominantly silt loam, but the subsoil may be silt loam, silty clay loam, or even fine sandy loam to loamy fine sand. The

consistence when moist ranges from sticky to slightly cohesive. Some areas lie nearer stream level than others and are subject to overflow more frequently.

Use and management.—Except for a few areas, the soil has been cleared and is used for crops or pasture. Corn is the most common crop, followed by truck and hay crops. Only a small acreage is in pasture or lying idle. This is one of the most desirable soils in the county for corn, truck crops, and hay because it is capable of producing high yields and is easy to work and conserve. It can be used intensively and in short rotations. Flooding is its most undesirable feature, and most farmers expect to have one crop in four or five seriously damaged or lost.

Congaree-Tate loams (Ce).—This complex is on first bottoms interassociated with soils on low stream terraces. It consists mainly of areas of Congaree silt loam over which 8 to 15 inches of Tate soil material has been deposited. It is acid like both the Congaree and Tate soils, but is permeable to roots, air, and water and in most places is capable of holding large quantities of water available to plants. Surface runoff is slow, and internal drainage is slow to moderate. The surface is nearly level, the slope being 0 to 2 percent. The supply of plant nutrients and organic matter in the surface soil is more nearly like that of the Tate soils than the Congaree.

Use and management.—Congaree-Tate loams have been cleared of forest and are used for crops, mostly corn, small grains, and hay. The complex is well suited to intensive use for row crops. Occasionally a crop may be lost or damaged from flooding. The flooding generally does not injure the soil, for the deposited material is often better balanced in plant nutrients than the original soil.

Edneyville fine sandy loam (Ea).—One of the smoother soils of the intermountain uplands, this soil has slopes of 7 to 15 percent. It is underlain by granite, gneiss, and schist. Associated with it are the Balfour and Hayesville soils. Surface runoff is medium, and internal drainage is moderate. The soil is medium acid, very low in calcium, magnesium, phosphorus, and potash, and low in nitrogen and organic matter. The natural vegetation consists mainly of white, post, red, and black oaks, dogwood, sourwood, maple, hickory, yellow-poplar, white and shortleaf pines, and some laurel and rhododendron.

Profile description:

0 to 13 inches, pale-yellow friable granular fine sandy loam.
13 to 23 inches, yellow friable fine sandy loam with a few gray mottlings but no mica flakes or quartz fragments.
23 to 37 inches, yellow friable fine sandy clay that crushes readily to a friable mass; very lightly sticky when moist; contains no rock fragments or mica flakes.
37 inches +, reddish-brown, yellow, and gray mottled friable rotten rock.

This is a relatively uniform soil, but there is some variation in the thickness of the surface soil and in the depth to bedrock. About 53 acres that are moderately eroded and have lost 25 to 75 percent of the original surface soil and about 76 acres that are smoother than average (slopes of 2 to 7 percent) are included.

Use and management.—Most of this soil has been cleared and is used for crops. Under proper management, moderately short rotations are feasible. The soil is especially well suited to snap beans, cab-

bage, potatoes, onions, and similar truck crops. It is also well suited to tobacco, corn, hay, and legume-and-grass permanent pasture. Liming and adequate fertilization are necessary for high yields and for establishing a good pasture stand.

Fletcher silt loam, rolling phase (FD).—Brevard schist is the material from which this soil of the intermountain areas is derived. The soil occupies slopes of 7 to 15 percent in association with Ramsey soil. It is strongly acid; very low in calcium, magnesium, and phosphorus; medium in nitrogen and potash; and in wooded areas moderate in content of organic matter. Surface runoff is medium, and internal drainage is moderate. The natural vegetation is mainly white, post, red, and black oaks, with some shortleaf and white pines intermixed. Undergrowth consists of dogwood, sourwood, laurel, and some rhododendron.

Profile description:

0 to 10 inches, pale-yellow friable silt loam containing many small schist particles but few mica flakes; a thin layer of organic matter on the surface in areas under native forest.

10 to 21 inches, yellowish-brown friable silty clay loam containing many black or dark-gray schist fragments and some very fine mica flakes; breaks into irregularly shaped lumps and crumbles easily to a friable mass.

21 to 37 inches, brown firm silty clay containing many small gray and black schist fragments and a few very fine mica flakes; heavy, stiff, brittle, and breaks to irregularly shaped lumps.

37 inches +, strong brown rotten rock (silt loam) mottled and speckled with gray, yellow, and black; contains an abundance of soft schist fragments and some very finely divided mica flakes; breaks to angular-shaped lumps of flaky appearance; has the constructional form of the original Brevard schist.

Use and management.—Although most of this soil is under native forest, it is well suited to many crops—especially corn, certain truck vegetables, hay, and pasture. As it is susceptible to erosion, it should be farmed in a moderately long rotation, and field operations should be on the contour. The schist fragments on the surface and in the soil will impede tillage in many places, but generally not seriously.

Fletcher silt loam, eroded rolling phase (FB).—On this soil there are a few small gullies, some of which are too deep to be obliterated by tillage. The soil is strongly acid, and, according to tests, very low in calcium, magnesium, and phosphorus and medium in nitrogen and potash. Surface runoff is medium, and internal drainage is moderate.

This soil differs from the rolling phase in having lost 25 to 75 percent of its original surface soil through erosion. The plow layer consists of original surface soil mixed with subsoil material and is yellowish-brown silt loam. In consistence it is somewhat firmer and in texture it is somewhat finer than the surface layer of the uneroded phase. The total thickness of the soil over bedrock schist ranges from 16 to 36 inches.

Use and management.—All of this soil has been cleared; about 30 percent is used for crops and 50 percent for pasture. The soil is moderately productive and not especially difficult to work and conserve. Moderately long rotations consisting mostly of fall-sown small grains and legume-and-grass hay should be used. Tillage should be on the contour. Small grains and sod-forming hay and

pasture crops are well suited. The schist fragments interfere somewhat with tillage, but over most of the acreage they are not a great obstruction. Where this soil is built to a high state of fertility and otherwise well managed, it is suited to limited use for truck crops, corn, and tobacco.

Fletcher silt loam, hilly phase (Fc).—A stronger slope of 15- to 30-percent gradient is the chief difference between this soil and the rolling phase. The surface soil and subsoil layers are more variable in thickness but generally thinner than in the rolling phase, and the total thickness over bedrock is less. Like the rolling phase, this soil is strongly acid and not high in content of plant nutrients. Surface runoff is rapid; internal drainage is moderate.

Use and management.—Practically all of this soil is under native vegetation, predominantly hardwood trees. Chiefly because of strong slope, moderately low fertility, and moderately shallow depth to bedrock, this soil is not well suited to tilled crops. It is well suited to permanent pasture, but liming and proper fertilization, especially with phosphorus, are necessary for a luxuriant forage growth. Areas that must be used for crops should be farmed in a long rotation consisting chiefly of fall-sown small grains, legume-and-grass hay, and pasture. Where the soil is tilled, contour tillage or like supplemental measures are needed to control runoff. Strip cropping may be feasible on some of the longer slopes.

Fletcher silt loam, eroded hilly phase (Fa).—The soil differs from Fletcher silt loam, rolling phase, chiefly in having stronger slopes and being materially eroded. The few gullies are mostly crossable with farm machinery. Surface runoff is rapid, and internal drainage is moderate. The soil is strongly acid and moderate in content of plant nutrients.

From 25 to 75 percent of the original surface soil has been removed by erosion, and in most places the plow layer now consists of a mixture of surface and subsoil materials. The thickness of the soil layers and the total depth to bedrock (about 14 to 32 inches) are generally less than for the rolling phase.

Use and management.—All of this soil has been cleared of its native vegetation; about half is cropped, a third pastured, and the rest left idle. Chiefly because of strong slope, moderately low fertility, and fairly shallow depth to bedrock, the soil is not well suited to crops requiring tillage but is capable of affording good grazing where properly fertilized, limed, and seeded. Areas that must be used for crops should be farmed in long rotations consisting chiefly of small grains, legume-and-grass hay, and pasture. Erosion must be carefully controlled, and therefore the soil should be kept under close-growing vegetation as much of the time as possible.

Fletcher silty clay loam, severely eroded hilly phase (Fe).—The slope range of this soil is mostly from 15 to 30 percent, but parts are somewhat smoother and have gradients of 7 to 15 percent. Shallow gullies are common in some areas, and a few of them, though crossable by machinery, are too deep to be obliterated by tillage. This soil is associated with other Fletcher soils. It is strongly acid and fairly low in plant nutrients. Its water-holding capacity is lower than that of

the less eroded phases. Surface runoff is rapid to very rapid, and internal drainage is moderate to slow.

Because it has lost practically all of the surface soil and in places part of the subsoil through erosion, this phase differs from Fletcher silt loam, hilly phase. The plow layer consists of yellowish-brown to reddish-yellow silty clay loam. Bedrock schist is at a depth of approximately 24 inches.

Use and management.—All of this phase has been cleared of native vegetation and cropped at some time. Like other hilly Fletcher soils, it is not suited to crops requiring tillage. Productivity for pasture is low in most areas, but it can be built up to a fair level. Adequate liming and fertilization and proper seeding with suitable grasses and legumes are required to obtain productive pasture. Particular care will probably be necessary to stabilize areas that are actively eroding. Such areas should not be grazed before a vigorous vegetative cover is established.

Fletcher slaty silt loam, hilly phase (FH).—This hilly soil is on 15- to 30-percent slopes. It has stronger slopes and a notably higher content of slate fragments throughout than Fletcher silt loam, rolling phase. Surface runoff is rapid, and internal drainage is moderate. The content of plant nutrients is moderate to low, and the general level of fertility is probably a little lower than for the less slaty Fletcher soils. The native vegetation was predominantly hardwoods, chiefly oaks, with some pine intermixed.

The surface layer, about 8 inches thick, is pale-yellow slaty silt loam in which there is enough slaty material to interfere materially with tillage. The subsoil is yellowish-brown to reddish-yellow friable slaty silty clay loam. Bedrock schist is at less than 30 inches.

Use and management.—Practically all of this soil is under native forest. Its slope, slatiness, and shallow depth to bedrock make it unsuited to crops requiring tillage. Where properly limed and fertilized it is capable of producing good grazing and hay. The slope, however, is a little too great for the use of heavy harvesting machinery. Areas that must be used for tilled crops should be handled in long rotations consisting chiefly of such close-growing crops as fall-sown small grains, legume-and-grass hay, and pasture crops. Tillage should be on the contour, and strip cropping should be practiced wherever feasible.

Fletcher slaty silt loam, eroded hilly phase (FF).—This soil occurs in the intermountain plateau section of the county and is associated with other Fletcher soils. It differs from the hilly phase of Fletcher slaty silt loam in being notably eroded. Some areas have a few shallow gullies, a number of which may be too deep to be obliterated by tillage. Surface runoff is rapid, and internal drainage is moderate. The soil is strongly acid and not high in content of plant nutrients.

From 25 to 75 percent of the original surface soil has been lost from much of the acreage, and the plow layer consists of a mixture of surface soil and subsoil material. The 4- to 5-inch plow layer is yellowish-brown slaty silt loam, and the subsoil is yellowish-brown to red-

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dish-yellow friable slaty silt loam. Bedrock schist is at less than 30 inches in most places.

Use and management.—All of this soil has been cleared of native vegetation. About half is pastured, and much of the rest is idle. Chiefly because of its hilly relief, high content of slate fragments, and relatively shallow depth to bedrock, this soil is not well suited to crops requiring tillage.

Most of the soil is well suited to pasture when properly limed, fertilized, and seeded. Areas that must be used for tilled crops should be farmed in long rotations consisting chiefly of small grains, legume-and-grass hay, and pasture. Tillage should be on the contour, and strip cropping would be feasible and beneficial. Adequate fertilization and liming are necessary if fairly high productivity for crops or pasture is to be maintained.

Fletcher slaty silt loam, severely eroded hilly phase (FE).—Slopes of this soil range chiefly from 15 to 30 percent. Surface runoff is rapid to very rapid, and internal drainage is moderate to slow. The water-holding capacity is lower than on the less eroded and uneroded Fletcher soils. There are some gullies, a few too large to be obliterated by tillage. The soil is strongly acid and moderately low in plant nutrients and organic matter.

Practically all the original surface layer and in places part of the subsoil have been eroded from this soil. The plow layer, consisting predominantly of subsoil material, is yellowish-brown slaty silty clay loam. The subsoil is of similar material but in places is more reddish. Bedrock schist is at a very shallow depth, in many places less than 16 inches from the surface.

Use and management.—All of this soil has been cleared of its original forest cover. About two-thirds of it is used for pasture; most of the rest is idle. Chiefly because of its strong slope and severely eroded condition, it is not suitable for either crops or pasture. Low fertility and unfavorable moisture conditions make a high level of productivity for crops or pasture difficult to maintain, and consequently erosion is difficult to arrest or restrain. Where at all possible, the soil should be reforested.

Fletcher slaty silt loam, eroded rolling phase (FG).—A higher content of slate fragments and moderate erosion differentiate this soil from Fletcher silt loam, rolling phase. The surface is rolling (7- to 15-percent slopes). There are a few shallow gullies, some of which are crossable by farm machinery but are not obliterated by tillage. The soil is strongly acid and not high in content of plant nutrients and organic matter. Surface runoff is medium, and internal drainage is moderate.

From 25 to 75 percent of the original surface layer has been removed by erosion. The plow layer in most places now consists of a mixture of the original surface soil and subsoil material. This layer is yellowish-brown or yellow slaty silt loam, and the subsoil is yellowish-brown grading to reddish-yellow friable slaty silt loam.

Included with this soil are about 45 acres still under native forest vegetation and therefore not materially eroded. Included also is a very small severely eroded acreage that has lost practically all of

the original surface soil and now has a plow layer consisting of subsoil material.

Use and management.—Much of this soil has been cleared of native vegetation, and nearly half is used for permanent pasture. A considerable acreage is idle, and a small part is used for crops. The soil is considered suitable for crops but is not high in productivity. Its high content of slate fragments interferes with cultivation. Small grains and hay are the best-suited crops, and good pasture can be established where liming and proper fertilization have been practiced. Areas that are to be frequently cultivated should be tilled on the contour.

Halewood loam, hilly phase (He).—This soil of the intermountain plateau uplands is underlain by granite, gneiss, and schist. It occupies slopes of 15- to 30-percent gradient and is associated with Hayesville soils. Compared with the Balfour soils, it has a firmer and deeper subsoil. Surface runoff is rapid, and internal drainage is moderate. The soil is moderately acid, very low in calcium, low in magnesium and phosphorus, fairly high in potash, and about medium in organic matter. The native vegetation consisted largely of white, post, black, and Spanish oaks, hickory, some yellow-poplar, sourwood, and shortleaf and white pines. Chestnut, prior to the blight, was the dominant species, and many dead chestnut trees are still standing. The undergrowth is chiefly azalea and mountain-laurel.

Profile description:

0 to ½ inch, brown to light-brown organic layer, mostly leafmold and forest litter.
½ to 5 inches, light-brown, brown, or yellowish-gray friable loam of well-developed fine crumb structure.
5 to 10 inches, pale-yellow friable porous loam of weak crumb structure; contains a few quartz gravel and some finely divided mica flakes.
10 to 40 inches, yellowish-brown or light reddish-brown brittle clay that has a good nut structure; breaks into irregular firm lumps when dry but is moderately friable when moist; contains small quantity of gravel and some finely divided mica flakes.
40 to 50 inches, yellow and reddish-brown friable clay material; parent material is disintegrated or partly disintegrated light granitic rock.

Use and management.—Practically all of this soil is in forest. It is suited to crops and pasture, but its strong slope, moderate internal drainage, and consequent susceptibility to erosion make it unsuited to frequent use for intertilled crops. Small grains and legume-and-grass mixtures used for hay and pasture are among the better suited crops. Lime and phosphorus fertilizer are especially required for the grasses and legumes, and complete fertilizer and additions of organic matter are needed if fairly high productivity is to be maintained. Tillage should be on the contour.

Halewood loam, eroded hilly phase (Hc).—Areas of this soil are associated with other Halewood soils. The soil is moderately acid, very low in calcium, low in magnesium and phosphorus, fairly high in potash, and medium to low in organic matter. Surface runoff is rapid, and internal drainage is moderate. There are some shallow gullies, only a very few of which are too deep to be obliterated by tillage. Some gravel occurs in places but not in quantities sufficient to interfere materially with tillage.

This soil differs from the hilly phase in having lost 25 to 75 percent of its original surface soil through erosion. Over most of the acreage the plow layer is yellowish-brown loam consisting of the remaining part of the original surface soil mixed with subsoil material. The total depth to bedrock ranges from 28 to 50 inches but is in most places about 40 inches.

Use and management.—All areas have been cleared and cultivated. Chiefly because runoff water is difficult to control, the soil is not well suited to crops requiring tillage. It produces good permanent legume-and-grass pasture (pl. 3, *A*) when adequately limed, fertilized, and seeded. If it is necessary to grow row crops, sod-forming or other close-growing vegetation should occupy the land 3 out of 4 years or a system of strip rotations should be used.

Halewood loam, steep phase (HF).—Steeper slopes and a shallower depth to bedrock distinguish this soil from the hilly phase. Slopes range from 30 to about 60 percent, and both surface soil and subsoil layers are thinner. The soil reaction and the content of mineral nutrients and organic matter are not greatly different from those of the hilly phase, and there is about the same type of forest growth. Areas are associated with the other Halewood soils in the intermountain plateau section. Surface runoff is rapid, and internal drainage is moderate.

Use and management.—Practically all of this soil is in forest. The strong slope makes it very susceptible to erosion and difficult to work. It is capable of producing good pasture, but lime and phosphorus are required if good vegetation is to be established.

Halewood loam, eroded steep phase (HD).—Areas of this soil are in the upland part of the intermountain plateau, where they are associated with other Halewood soils. The soil is medium acid and low in content of plant nutrients. Surface runoff is rapid to very rapid; internal drainage is moderate. A few areas have some gravel, but ordinarily not enough to interfere materially with cultivation. There are a few shallow gullies, most of which can be obliterated by tillage.

This phase differs from the steep phase in having lost 25 to 75 percent of its original surface soil through erosion. The plow layer, consisting of original surface soil mixed with subsoil material, is yellowish-brown loam to clay loam. The subsoil is brown or yellowish-brown brittle clay that breaks to irregular firm lumps. Below a depth of about 25 inches is yellow and reddish-brown friable clay, and at 30 inches or so is partly disintegrated granite, gneiss, and schist.

Use and management.—This land has been cleared of its native forest. Much is used for pasture, a smaller part is cropped, and some is idle. Chiefly because of its strong slope and eroded condition, it is not well suited to crops requiring tillage. It is suited to permanent pasture, and when properly limed, fertilized, and seeded, supports a productive growth of forage plants. Areas required for crops should be used in a long rotation so as to keep them under close-growing and sod-forming crops as much of the time as possible.

Halewood clay loam, severely eroded hilly phase (HA).—This soil occurs on 15- to 30-percent slopes and is associated with other Halewood soils. Surface runoff is rapid, and internal drainage is mod-

erate. Gullies are common; some of them are too deep to be obliterated by tillage. The water-holding capacity is much lower than that of the less eroded Halewood soils; consequently, the soil is more droughty. The reaction is medium acid. Organic-matter content is very low, and plant-nutrient content is low.

This soil differs from Halewood loam, hilly phase, in having lost practically all of the original surface soil and, in places, part of the subsoil through erosion. The plow layer consists of brown or yellowish-brown firm clay loam or clay. It is relatively hard when dry and somewhat plastic when wet and is much less favorable in tilth than plow layers of the less eroded Halewood phases. Some areas have a small content of gravel that ordinarily does not interfere with tillage. Under the plow layer, to a depth of 15 to 30 inches, is yellowish-brown or light reddish-brown brittle clay.

Use and management.—All this soil has been cleared of native vegetation. Over half is used for pasture, some is idle, and a small part is cropped. Yields are low, and the soil is very difficult to work and conserve. Moisture relations and tilth are very unfavorable. Accordingly, this soil is poorly suited to either crops or pasture, and where at all feasible, it should be reforested. Tracts to be reclaimed for pasture require adequate liming, fertilization, and seeding.

Halewood clay loam, severely eroded steep phase (HB).—Most bodies of this soil are in small areas associated with other Halewood soils. The relief is steep, the slopes ranging from 30 to 60 percent. Surface runoff is very rapid, and internal drainage is moderate. Small gullies are common, some of which are too large to be erased by tillage. In a few places gullying is in an advanced stage. The soil is medium to strongly acid, very low in organic matter, and usually low in plant nutrients.

This soil differs from Halewood loam, steep phase, in that it has lost practically all of the original surface soil and, in places, part of the subsoil through erosion. The plow layer is brown or yellowish-brown clay loam or clay, firm in place and lumpy when tilled. A few areas have some gravel, but not enough to interfere greatly with tillage. About 300 acres, however, are stony and contain bedrock fragments varying in size from gravel to large boulders or even small outcrops that interfere with tillage.

Use and management.—This soil has been cleared of its native hardwood forest. Much of it is now used for pasture, and a great part of the rest is idle. Chiefly because of its strong slope, low fertility, and unfavorable tilth and moisture relations, this soil is poorly suited to either crops or pasture. Where at all feasible, it should be reforested.

Halewood stony loam, hilly phase (HI).—Areas of this soil are associated with the other Halewood soils in the intermountain plateau section of the county. This soil differs from Halewood loam, hilly phase, chiefly in having enough stones to interfere with tillage. The surface and subsoil layers are generally thinner, and the depth to bedrock is usually less. The soil is medium acid, and the content of organic matter and plant nutrients approximates that of Halewood loam, hilly phase. Surface runoff is rapid, and internal drainage is moderate. The content of stones varies, and the stones range to large

boulder size. There are a few small bedrock outcrops. The native vegetation is mixed hardwood-and-pine forest.

Use and management.—Little of this soil is cleared, and most of the cleared acreage is used for pasture. Stoniness makes it impractical to clear this soil for crops, but a great part is suitable for pasture.

Halewood stony loam, eroded hilly phase (Hg).—This soil occupies areas that formerly were Halewood stony loam, hilly phase, but under cultivation they have lost 25 to 75 percent of the original surface soil by erosion. The soil is associated with other Halewood soils in the upland part of the intermountain plateau section of the county. It is medium acid, moderately low in organic matter, and not very high in plant nutrients. Surface runoff is rapid, and internal drainage is moderate. The content of stone varies; in places stones practically prohibit tillage. There are a few gullies; some are crossable by farm implements, but many are not obliterated by ordinary tillage.

The plow layer of this eroded hilly phase is a mixture of original surface soil material and upper subsoil material and in general is yellowish-brown stony loam or stony clay loam. The subsoil below 5 inches is yellowish-brown or light reddish-brown brittle stony clay that breaks into irregular firm lumps. At a depth of 30 to 35 inches is yellow and reddish-brown friable clay underlain at about 40 inches by disintegrated granite, gneiss, and schist. About 300 acres are severely eroded; the plow layer consists largely of subsoil material and gullies are more common.

Use and management.—All of this soil has been cleared of native vegetation. Approximately two-thirds is in pasture, some is in crops, and a small part is idle. Stoniness makes the soil poorly suited to crops requiring tillage. Most of the acreage is suited to permanent pasture, but liming, adequate fertilization, and probably seeding are required to establish a good stand of grass. The included severely eroded areas may be best used for forest.

Halewood stony loam, steep phase (Hj).—This soil differs from Halewood loam, hilly phase, in having steeper slopes that are 30 to 60 percent in gradient and stones in quantity sufficient to interfere greatly with tillage. Surface runoff is very rapid; internal drainage is moderate. The reaction is medium acid. The content of plant nutrients and organic matter is about the same as in Halewood loam, hilly phase. The native forest was mostly mixed oaks, and some dogwood, laurel, and rhododendron. Included are about 1,800 acres that have been eroded, but not to the extent that the surface soil is greatly altered.

Use and management.—All but about 1,800 acres of this soil is under native forest, and much of it once cleared is now under re-established forest. Strong slopes and stoniness make the soil unsuitable for crops requiring tillage. It is suited to permanent pasture, but removing the forest growth for the purpose of establishing pasture is not advisable. Compared with its value for pasture, the soil has a relatively high value for forest.

Halewood stony loam, eroded steep phase (Hh).—Areas of this soil were formerly classed as Halewood stony loam, steep phase. After being cleared they were eroded to the extent that 25 to 75 percent of

the original surface soil has been lost. Small gullies are common, some of which are too large to be removed by tillage. The soil has slopes of 30 to 60 percent. Surface runoff is very rapid; internal drainage is moderate. Reaction is medium acid. The content of plant nutrients and organic matter is not high.

The plow layer consists of yellowish-brown stony loam or stony clay loam. The subsoil, to a depth of about 25 inches, is yellowish-brown or light reddish-brown brittle stony clay. Below this is yellow and reddish-brown friable stony clay. Partly disintegrated granite, gneiss, and schist is at 30 to 40 inches.

Use and management.—All of this soil has been cleared of its native forest, and most of it has been cropped at some time. Chiefly because of steep slopes and stoniness, it is not suited to crops requiring tillage. It is fairly productive of pasture grasses and legumes, which respond well to liming and proper fertilization.

Hayesville loam, hilly phase (HQ).—Granite, gneiss, and schist are the materials from which this soil developed. Areas occur in the upland part of the intermountain plateau section on slopes of 15 to 30 percent. According to the average of several tests, reaction is strongly acid; content of calcium, phosphorus, and potash is very low; content of magnesium is low; content of nitrogen is medium; and content of organic matter is moderately high. Surface runoff is rapid, and internal drainage is slow to moderate.

Profile description (pl. 2, *B*):

0 to 6 inches, gray to yellowish-brown friable porous loam of granular structure; surface half inch consists of brownish woodland litter and leafmold.

6 to 32 inches, brownish-red to red moderately compact or heavy brittle clay of nut structure; sticky and plastic when wet; some mica flakes throughout.

32 inches +, variegated red, brown, gray, and yellow partly disintegrated mica schist.

Use and management.—Practically all of this soil is under native forest of various oaks, hickory, yellow-poplar, sourwood, dogwood, and maple. Locust and shortleaf pine predominate in cut-over areas. This moderately productive soil has a fairly high capacity for holding moisture available to plants. Moisture percolates at a somewhat slower rate than in several of the more permeable soils, as those of the Balfour, Porters, and Tusquitee series.

Chiefly because of its hilly slope, this soil is somewhat difficult to work and to conserve against losses from runoff. It is considered suitable for crops and pasture and responds well to good management under these uses. Row crops should not be grown frequently; long rotations in which small grains and close-growing hay and pasture crops predominate should be used. Field operations should be on the contour, and strip cropping may be feasible on longer, smoother slopes. Lime, organic matter, and phosphorus are among the chief amendments required to build this soil to a high state of fertility for both crops and pasture.

Hayesville loam, rolling phase (HR).—Most areas of this phase lie on ridge tops in association with the other Hayesville soils of the intermountain plateau section. Slopes range from 7 to 15 percent. The soil is strongly acid, and apparently its content of calcium, phosphorus, and potash is very low. The magnesium content is low, and

the supply of nitrogen and organic matter is medium. Surface runoff is medium, and internal drainage is moderate. Tilth is good, and water-holding capacity is fairly good.

The thickness of the surface and subsoil layers and the depth to bedrock are greater than in the hilly phase. The partly disintegrated bedrock is at an average depth of 35 inches. Gravel is common in some areas but is not sufficiently abundant to interfere materially with tillage.

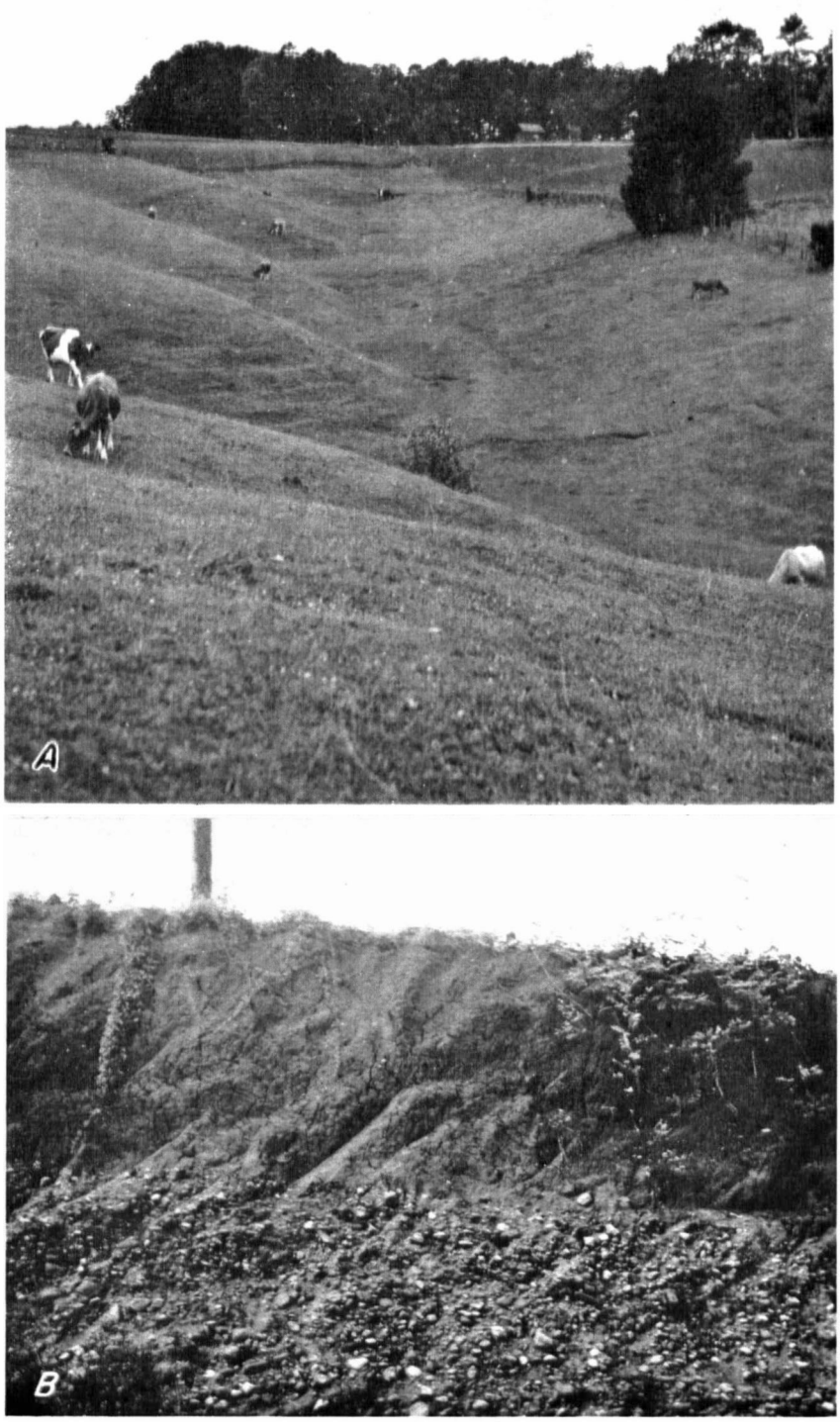
Use and management.—About three-fourths of this soil is under native forest; most of the rest is in crops or pasture. Little land is idle. Its relatively smooth surface, good tilth, favorable moisture relations, and ability to respond to good management make this soil well suited to most crops and pasture. Suitable crops are alfalfa, wheat, barley, corn, and many truck crops. Under proper management, which includes liming, fertilization, and incorporation of organic matter, the soil is suited to moderately short rotations.

Hayesville loam, undulating phase (Ht).—The smoothest of the Hayesville soils, this phase has a slope range of 2 to 7 percent. Most areas occupy the smooth, broader ridge tops in association with other Hayesville soils. This strongly acid soil has a moderate content of plant nutrients and organic matter. Surface runoff is medium, and internal drainage is moderate. The tilth and capacity to hold moisture available to plants are favorable. Gravel occurs in places but rarely is in quantities sufficient to interfere with cultivation.

The thickness of the separate layers and the total depth to bedrock of this soil are a little more than for the more sloping phases. The 7- or 8-inch surface layer is gray to yellowish-brown loam. Under native forest the surface inch is much darker and contains considerable organic matter. The subsoil, to a depth of about 36 inches, is brownish-red or red compact clay. Below this is variegated red, brown, gray, and yellow partly disintegrated bedrock granite, gneiss, and schist.

Use and management.—Much of this soil is still under native forest. A limited part is cropped, and smaller acreages are idle or pastured. This is one of the more desirable soils of the county for crops and pasture, for it responds well to fertilization and is easily worked and conserved. Its natural fertility is lower than that of the Congaree, State, Tusquitee, and Rabun soils, but it can be brought to a high state of productivity by proper fertilization practiced with other good management. It is suited to practically all crops commonly grown in the county and also to pasture. Where fertility is maintained at a high level and some care is taken to check erosion, intensive use for crops is practical.

Hayesville loam, steep phase (Hs).—Relief (slopes of 30 to 60 percent) is the chief difference between this and the hilly phase. This soil is therefore more susceptible to erosion when cleared. The profile is a little less deep to bedrock of granite, gneiss, and schist. Areas are in the upland part of the intermountain plateau section of the county and are associated with other Hayesville soils. Most of them are still in native hardwood forest, chiefly oak. The soil is strongly acid; very low in calcium, phosphate, and potash; low in magnesium; medium in nitrogen; and moderate in organic matter.



A, Good legume-and-grass pasture on Halewood loam, eroded hilly phase.
B, Exposure of Hiwassee clay loam, eroded undulating phase, showing gravelly material that occurs at 20 to 55 inches.

A, Wheat and alfalfa on Hayesville clay loam, eroded rolling phase.
B, Mixed red clover, timothy, and orchard grass being cut on Hayesville clay loam, eroded rolling phase.
C, Permanent pasture on Wilkes gravelly loam, severely eroded steep phase.

Surface runoff is rapid to very rapid, and internal drainage is slow to moderate.

A few areas contain some gravel, but rarely enough to interfere with tillage. A small acreage is eroded, and in this the plow layer consists of a mixture of original surface soil and subsoil materials.

Use and management.—The steep slope and the moderately slow permeability of the subsoil make this soil poorly suited to crops. When cleared and properly limed and fertilized, it is capable of producing good pasture. Areas that must be used for crops require very careful management, including use of long rotations consisting chiefly of fall-sown small grains and legumes and grasses for hay and pasture, adequate applications of lime and fertilizer, and use of supplemental practices to control runoff.

Hayesville clay loam, eroded hilly phase (HK).—Cleared and cultivated areas (slopes 15- to 30-percent) of Hayesville loam, hilly phase, that have lost 25 to 75 percent of the original surface soil by erosion are mapped in this phase. There are some gullies, a few of which are too deep to be removed by tillage. The reaction is strongly acid, and the content of organic matter and plant nutrients is medium to low. Surface runoff is rapid, and internal drainage is slow to moderate. Some areas have a small quantity of gravel throughout the soil mass, but commonly not enough to interfere materially with tillage.

The yellowish-brown to yellowish-red clay loam plow layer in most places consists of a mixture of original surface soil with subsoil material. The brownish-red to red moderately brittle clay subsoil is within plow depth over most of the acreage. The average depth to the disintegrated parent rock is about 28 inches.

Use and management.—All of this soil has been cleared of native vegetation. Probably more than half is used for crops, some is used for pasture, and a notable acreage is idle. Chiefly because of its hilliness and the relatively shallow depth at which the heavy clay subsoil occurs, this soil is not considered well suited to cultivated crops. It is capable of producing good grazing where properly limed, fertilized, and seeded. Areas required for crops should be used chiefly for small grains and sod-forming hay and pasture crops. Row crops should not be grown more often than once in 4 or 5 years, for erosion is difficult to control. All field operations should be on the contour, and strip cropping may be practical on long smoother slopes.

Hayesville clay loam, severely eroded hilly phase (HN).—Making up this phase are areas (slopes 15- to 30-percent) that if uneroded would be classed as Hayesville loam, hilly phase. Because of clearing and cultivation, they have since lost practically all of the original surface soil and, in places, a part of the upper subsoil through erosion. Small gullies are common; some, though crossable with farm machinery, are not removed by tillage. Surface runoff is rapid, and internal drainage is slow. The soil is strongly acid, low in content of plant nutrients, and very low in organic matter. The tilth of the plow layer is unfavorable, and the soil has little capacity for holding moisture available to crops.

Although the quantity of material removed varies widely, the plow layer consists largely of subsoil material. It is a reddish-brown com-

pact clay loam or clay, firm in place and cloddy when tilled. Some gravel occurs in places, but not enough to interfere materially with cultivation. A small acreage is stony, the fragments ranging to boulder size and interfering with tillage.

Use and management.—About half of this soil is in pasture, part is cropped, and the rest is idle. It is not productive and is very difficult to work and conserve because of its low fertility, low moisture-holding capacity, poor tilth, and hilliness. It is not well suited to crops or pasture and is probably best used for forest. If areas are used for pasture, they require liming, fertilization at least with phosphorus, and proper seeding. Deep-rooted hardy legumes would improve the tilth and organic-matter content.

Hayesville clay loam, eroded rolling phase (HL).—Areas of Hayesville loam, rolling phase, that have been changed by erosion are mapped in this phase. These areas, because of clearing and cultivation, are now so eroded that the subsoil is within plow depth over much of the acreage. They are mostly small and on ridge tops in association with other Hayesville soils. The soil occupies 7- to 15-percent slopes, is strongly acid, and is low in content of plant nutrients and organic matter. Surface runoff is medium, and internal drainage is slow to moderate. A quantity of gravel not sufficient to interfere with tillage occurs in some areas.

From 25 to 75 percent of the original surface soil has been eroded away, and the plow layer is a mixture of surface and subsoil material. In most places this layer is yellowish-red to reddish-brown clay loam, firmer in consistence or less friable than the 6- to 8-inch surface layer of Hayesville loam, rolling phase. The subsoil is brownish-red to red heavy or firm brittle clay. At a depth of about 26 inches is variegated red, brown, gray, and yellow partly disintegrated bedrock granite, gneiss, and schist.

Use and management.—All of this soil has been cleared, and most of it is cultivated. Much of it is now cropped, about 20 percent is idle, and the rest is in pasture. Although tilth and natural productivity are lower than for the rolling phase of Hayesville loam, this soil responds to good management and is suited to the crops commonly grown, including alfalfa (pl. 4, *A*) and red clover (pl. 4, *B*). Rotations of moderate length are feasible, but if the soil is to be maintained at a high level of productivity, row crops should be restricted and cultivation should be on the contour. Lime, phosphorus, and organic matter are the chief amendments required for most crops and pasture.

Hayesville clay loam, severely eroded rolling phase (HO).—Areas that if uneroded would be mapped as Hayesville loam, rolling phase, make up this phase. Erosion has removed more than 75 percent of the original surface soil and, in places, some of the upper subsoil. The few shallow gullies are crossable by farm machinery but generally are not removed by tillage. Surface runoff is medium to rapid, and internal drainage is slow. Reaction is strongly acid, and the content of plant nutrients and organic matter is low.

The degree of erosion varies widely, but in most areas the plow layer is composed of subsoil material. This plow layer is reddish-brown clay loam or clay, firm in place and cloddy when tilled. A few areas

contain some gravel, but not enough to interfere with tillage. The subsoil is brownish-red to red compact clay.

Use and management.—Because of erosion this soil has poor tilth, a restricted supply of moisture for plants, and a smaller supply of available plant nutrients than the uneroded Hayesville soils. Its productivity is very low, and it is difficult to work and conserve. It is not well suited to cultivated crops, but if properly limed, fertilized, and seeded, is capable of affording good grazing. Some time may be required to establish a good pasture stand, and care will be required to avoid overgrazing during dry periods and trampling during very wet periods. When a fairly high state of productivity is reestablished, growing alfalfa and red clover for hay may be feasible.

Hayesville clay loam, eroded steep phase (HM).—Areas of this soil occupy 30- to 60-percent slopes and are associated with other Hayesville soils in the intermountain plateau section. Areas of steep Hayesville loam that are now eroded to such extent that the plow layer consists of a mixture of the original surface soil and subsoil materials make up this phase. Surface runoff is very rapid, and internal drainage is slow to moderate. There are a few small gullies, some of which are too deep to be removed by tillage. The soil is strongly acid and moderately low in plant nutrients and organic matter.

The 4- to 6-inch plow layer, consisting of yellowish-red to brownish-red clay loam, is underlain by brownish-red or red compact clay. Below a depth of about 30 inches lies variegated red, brown, and gray partly disintegrated granite, gneiss, and schist.

Use and management.—All of this land has been cleared and cultivated at some time; nearly half is now in crops. Steep slopes and moderately slow permeability make the soil poorly suited to crops, difficult to work, and hard to maintain against erosion losses. Management that includes liming, fertilization, and seeding would make this soil suitable for pasture.

Hayesville clay loam, severely eroded steep phase (HP).—Practically all of this soil is in small tracts closely associated with other Hayesville soils in the upland part of the intermountain plateau. The soil occurs on 30- to 60-percent slopes and consists of areas, formerly Hayesville loam, steep phase, that have been severely eroded. Small gullies are common, and some of them are too deep to be obliterated by tillage. Surface runoff is very rapid, and internal drainage is slow. The soil is strongly acid, very low in organic matter, and moderately low in plant nutrients. The ability of the soil to absorb and hold moisture available to plants is limited. Tilth is unfavorable. A few areas have some gravel, but usually not enough to interfere with tillage.

Use and management.—All of this soil has been cleared and cropped, and at present nearly half of it is idle. Much of the rest is used for pasture. Low productivity, steep slope, and unfavorable moisture relations make this soil poorly suited to either crops or pasture.

Hayesville stony loam, hilly phase (Hw).—Like other Hayesville soils, this soil is in the upland part of the intermountain plateau. A content of stone sufficient to interfere greatly with tillage is the chief difference between this soil and the hilly phase of Hayesville loam. The soil is strongly acid and moderate in content of plant nutrients and

organic matter. Surface runoff is rapid and internal drainage is slow to moderate.

This soil has a yellowish-brown to brown stony loam surface soil and a reddish-brown heavy clay subsoil. The degree of stoniness varies from just enough to interfere with tillage to a quantity making up a considerable part of the soil mass. The parent material is from acid crystalline rocks—granite, gneiss, and schist.

Use and management.—This soil is still in forest and has not been eroded materially. The forest cover is chiefly hardwoods, with a few pine intermixed. If cleared of forest cover, the soil would be suited to grasses and legumes for grazing. It is not well suited to clean-tilled crops because of its stoniness and hilly relief. Areas needed for crops will require use of long rotations and supplementary measures for control of runoff.

Hayesville stony loam, rolling phase (Hx).—A smoother surface (7- to 15-percent slopes) and sufficient stone to interfere materially with tillage distinguish this soil from Hayesville loam, hilly phase. Areas are on ridge tops in the intermountain plateau section, where they are associated with other Hayesville soils. The soil is strongly acid; very low in content of calcium, phosphate, and potash; low in magnesium; and medium in nitrogen and organic matter. Surface runoff is medium, and internal drainage is moderate. Except for the stones, which vary from gravel size to large boulders, tilth is good. The soil holds both water and plant nutrients available to crops. The native vegetation consists chiefly of oak and hickory, with some yellow-poplar, sourwood, dogwood, and maple intermixed.

The surface 6 inches is yellowish-brown friable stony loam. Below this and continuing to a depth of 32 inches is brownish-red to red moderately compact or heavy stony clay of nut structure. This compact clay is sticky and plastic when wet and has some mica flakes scattered throughout. Below 32 inches is variegated red, brown, gray, and yellow clay and partly disinegrated schist, granite, and gneiss.

Use and management.—All of this soil is under its native forest. It is suited to many crops, including corn, tobacco, and certain truck crops. Small grains and sod-forming hay and pasture crops are especially good. The stones interfere with plowing, hand cultivation, mowing, and other field operations. Workability of many areas can be improved by removing the larger stones. Rotations of moderate length are suited; row crops should not be grown frequently, for runoff water is a hazard, at least on the more strongly sloping parts.

Hayesville stony clay loam, eroded hilly phase (Hu).—Composing this soil are areas of the hilly phase of Hayesville stony loam that have lost from 25 to 75 percent of the surface soil through erosion. These areas are on 15- to 30-percent slopes in the intermountain plateau section of the county, where they are associated with other Hayesville soils. Surface runoff is rapid, and internal drainage is moderate to slow. The reaction is strongly acid, and the content of plant nutrients and organic matter is moderately low. There are a few gullies, some of which may not be removed by tillage. Stones occur in numbers sufficient to interfere materially with tillage.

The plow layer is yellowish-red to brownish-red stony clay loam. The subsoil is brownish-red to red compact stony clay. Partly disin-

tegrated bedrock of granite, gneiss, and schist is at a depth of about 30 inches.

Use and management.—At some time all of this soil has been cleared and cultivated. About half is now used for pasture, some is idle, and the rest is cropped. It is not well suited to row crops because of its stoniness and hilly slopes. Properly fertilized and limed, it is productive of legume-and-grass hay or pasture. The first step in building this soil into productive pasture land should be that of getting a good grass cover on the more eroded parts.

Hayesville stony clay loam, eroded rolling phase (Hv).—This soil occupies areas formerly classed as Hayesville stony loam, rolling phase. Most areas are small and are associated with other Hayesville soils. Slopes range from 7 to 15 percent. Surface runoff is medium, and internal drainage is moderate. The stones vary from gravel to large boulder size. The soil is strongly acid and low in organic matter. There are a few shallow gullies, most of which can be obliterated by tillage. Tilth and moisture relations are a little less favorable than for Hayesville stony loam, rolling phase.

Because of clearing and cultivation, this soil has lost 25 to 75 percent of its original surface soil through erosion. The subsoil is within plow depth over a great part of the acreage. The plow layer in most places consists of yellowish-brown to yellowish-red stony clay loam.

Use and management.—Although all of this soil has been cleared and cropped at some time, only about half of it is now used for crops. Approximately a third is in pasture, and the rest is idle. This soil is suited to tilled crops and pasture, but the stones interfere materially with many field operations. Most of the crops commonly grown in the county are suited. Among these are corn, tobacco, and such truck crops as beans, potatoes, and cabbage.

Rotations of at least moderate length should be used, for erosion becomes active on the more sloping parts where row crops are grown frequently. The soil is as productive of pasture as Hayesville stony loam, rolling phase, but liming, fertilization, and proper seeding are required if a good stand of forage is to be established.

Hiwassee clay loam, eroded undulating phase (H_2).—Areas of this soil occupy 2- to 7-percent slopes on relatively smooth broad remnants of stream terraces that lie as moderately low hills in the intermountain plateau part of the county, generally near the largest streams and particularly near the French Broad River. Surface runoff is medium, and internal drainage is moderate. Reaction is moderately to strongly acid. The parent material is of alluvium originally developed from granite, gneiss, and schist. The soil is distinguished by its brown surface soil (browner than that of Balfour and Hayesville soils), uniform dark-red color throughout the subsoil, and somewhat gravelly (rather than the partly disintegrated rock of the Balfour and Hayesville soils) substratum (pl. 3, *B*). It is somewhat more slowly permeable than the Tusquitee, State, and similar soils because its subsoil is moderately dense or compact and usually lies within a few inches of the surface.

Profile description:

0 to 6 inches, brown to slightly reddish-brown friable clay loam; slightly plastic and sticky when wet; consists of upper subsoil material mixed with remnants of the original surface soil.

6 to 14 inches, brownish-red or dark-red (maroon) compact brittle clay; moderately plastic and very sticky when wet but crushes to friable mass when dry.

14 to 40 inches +, brownish-red clay or clay loam; a little lighter colored and somewhat more friable than the layer above; irregular beds of gravel of variable thickness alternating with mixtures of soil material and gravel at a depth averaging 50 inches.

A variable but generally small quantity of mica flakes is scattered throughout this soil, and in places there is some gravel on the surface and in the subsoil. The depth to the gravel bed ranges from 30 to 70 inches. In a few places the degree of erosion varies—the plow layer may consist almost entirely of the original surface layer, or on a few of the most exposed slopes or knobs it may consist almost entirely of subsoil material.

Use and management.—This is one of the more productive soils of the high stream terraces and uplands of the county. Its fertility, smooth surface, fairly good tilth, and ability to hold moisture and plant nutrients make it favorable for crops. It is particularly productive of alfalfa, clover, small grains, and corn. It is not suited to truck crops, especially root crops, for its relatively compact subsoil deters their development and interferes with handling.

Under proper management, moderately short rotations can be used and, on all except the most sloping parts, supplementary water control practices need not be exacting. Pasture is productive under proper management, but since in this area of the county there is less land suitable for crops than for pasture, most of this soil is best used for crops.

Hiwassee clay loam, eroded rolling phase (Hz).—Found in association with the eroded undulating phase, these soil areas occupy the higher terraces along the largest streams, especially the French Broad River. Slopes range from 7 to 15 percent. The soil is medium acid and usually moderately high in fertility. Surface runoff is medium, and internal drainage is moderate. The plow layer, consisting of original surface soil mixed with part of the upper subsoil, is reddish-brown clay loam.

Use and management.—All of this soil has been cleared and cultivated. About three-fourths of it is used for crops, and much of the rest is idle. It is suited to cultivated crops and pasture but because of its firm nature and its slope, not to truck crops or frequent row crops. Under proper management, including liming and fertilization, it is well suited to moderately long rotations. Alfalfa and other legumes and small grains are especially well suited. It is important to grow a close-growing or sod-forming crop a great part of the time to prevent erosion. Pasture is productive where it has been limed and fertilized.

Hiwassee clay loam, eroded hilly phase (Hy).—Slopes of this eroded soil range from 15 to 30 percent. Areas are associated with other Hiwassee soils on the high stream terraces. Surface runoff is rapid, and internal drainage is moderate to slow. There are a few

shallow gullies in places; some of these are too deep to be filled by tillage. Because of the heavy or moderately compact plow layer, absorption of moisture is moderately slow. The water-holding capacity is lower than for the eroded undulating phase. Reaction is strongly acid. The content of plant nutrients and organic matter is moderate.

Much of this soil has a reddish-brown clay loam plow layer consisting of original surface soil material and subsoil mixed. In many places, however, all of the original surface layer has been eroded away. In these the plow layer consists of brownish-red firm brittle clay subsoil material. The thickness of the soil over gravel beds or bedrock varies greatly. In places bedrock or gravel may be at the surface, but in others they may be at a depth of several feet.

Use and management.—About two-thirds of this soil is used for crops; the rest is in pasture or lying idle. Chiefly because of its strong slope and relatively compact subsoil, the soil is fairly difficult to work and notably subject to erosion. It is not well suited to crops requiring tillage. Like the other Hiwassee soils it responds well to proper management, and when properly limed and fertilized, affords good pasture. Areas that must be used for crops should be farmed in long rotations that seldom include row crops. Small grains and legumes and grasses for hay and pasture should predominate. The addition of organic matter would improve tilth.

Iredell-Halewood stony loams, hilly phases (IA).—This complex occurs on uplands in the intermountain plateau section and consists of small areas of Halewood and Iredell soils so intricately associated that separate areas could not be mapped. Surface runoff on both soils is rapid. Internal drainage of the Iredell is very slow, whereas that of the Halewood is moderate. Both soils are moderately acid, medium in calcium and nitrogen, low in potash, very low in phosphorus, and high in magnesium and organic matter.

The Halewood soil has a light-brown or brown loam surface layer about 5 inches thick, and underlying this is about 5 inches of pale-yellow friable loam. Below about 10 inches is yellowish-brown brittle but friable clay loam or clay. The Halewood soil developed from such acidic igneous and metamorphic rocks as granite, gneiss, and schist.

The Iredell soil in this complex has a brownish-gray clay loam surface soil with a greenish cast. Underlying at a depth of about 6 inches is moderate yellowish-brown heavy clay or clay loam. Below a depth of approximately 20 inches is mottled olive-yellow, yellow, and gray plastic clay underlain by basic rocks. Numerous black specks are common throughout the subsoil.

Use and management.—Approximately two-thirds of the complex has been cleared, but much of this is idle. In great part the rest of the cleared land is used for pasture, but a small acreage is cropped. The Iredell parts of the complex are not well suited to cultivated crops, chiefly because they have plastic subsoil. Legumes and grasses grown for pasture are well suited if properly limed and fertilized.

Made land (MA).—Areas greatly altered by the activities of man constitute this land type. Such areas consist of fills for buildings, storage land, or playgrounds. The largest area is occupied by the

business section of Asheville; other small areas are playgrounds and stadiums for the larger schools of the county. These areas have no agricultural value.

Masada loam, undulating phase (Mo).—This soil of the high stream terraces is commonly associated with soils of the Hiwassee series and more or less with Hayesville and Halewood soils of adjacent upland areas. Both the surface and subsoil are lighter colored than the respective layers of the Hiwassee soils. The soil occupies slopes of 2 to 7 percent. It is medium to strongly acid, low to medium in calcium and magnesium, very low to low in phosphorus, medium to fairly high in potash, and medium in nitrogen and organic matter. Surface runoff is medium, and internal drainage is moderate. The native vegetation was predominantly hardwoods.

Profile description:

0 to 6 inches, brownish-gray to light-brown friable loam; upper half inch consists of forest litter and leafmold.
6 to 30 inches, yellowish-brown grading to light brownish-red heavy or firm clay; some mica flakes.
30 inches +, light reddish-brown friable clay streaked with yellow; some mica flakes and round gravel; irregular beds of gravel at depths averaging 30 inches.

Some gravel occurs throughout the soil mass, but in only a few places is it abundant enough to interfere materially with cultivation. A few areas are eroded, but little of the acreage is sufficiently eroded to change the plow layer.

Use and management.—Nearly all of this phase has been cleared, and much of it is cropped. Probably one-fifth is idle. Although its fertility is somewhat less than that of Hiwassee clay loam, eroded undulating phase, this soil responds well to proper fertilization and management. Tilth and permeability are somewhat better than for the Hiwassee soil, and this soil is therefore better suited to truck crops. In rotations of moderate length it is suited to the crops commonly grown in the county, including alfalfa, red clover, corn, small grains, and most of the truck crops. Pasture does well, but most of the acreage is probably best used for cultivated crops, as there are not many soils so suited.

Masada loam, rolling phase (Mr).—A more rolling surface distinguishes this phase from the undulating phase. The thickness of the surface layer averages less, and the depth to gravelly material is more variable and, on the average, less. The soil is medium to strongly acid. Its fertility is moderate to low. Surface runoff is medium to rapid, and internal drainage is moderate. Other Masada soils and Hiwassee soils are associated with this phase.

Use and management.—Most of this soil has been cleared and cropped, and approximately three-fourths of it is used for tilled crops. Probably 10 percent is under native forest. The soil is well suited to corn, small grains, alfalfa, clovers, and grasses. Except for its slope, which makes it less well suited than the undulating phase, it is well suited to such truck crops as beans, potatoes, and spinach. Because of its rolling surface, row crops should be grown only once every 3 years and tillage should be on the contour. Observations indicate that burley tobacco of high quality can be grown. Perma-

nent pasture is productive, but adequate applications of lime and fertilizer, especially phosphorus, are required to maintain a good vegetative cover.

Masada loam, eroded rolling phase (ME).—The chief characteristics distinguishing this soil from the undulating phase are its more rolling relief and its loss of 25 to 75 percent of the surface soil through erosion. Small gullies occur in places, and some of these are too deep to be obliterated by ordinary tillage. Surface runoff is medium to rapid, and internal drainage is moderate. This soil is associated with Hiwassee soils, other Masada soils, and in places with Hayesville and Halewood soils of the adjacent upland.

Over most of the acreage the plow layer is yellowish-brown loam or clay loam consisting of the original surface soil mixed with subsoil materials. The subsoil below the plow layer is yellowish-brown to reddish-brown heavy firm clay grading to light brownish red. Gravelly material is at 24 to 48 inches.

Use and management.—Although this phase has lost some of its original surface layer through erosion, it is suited to moderately intensive use. In general, 3-year rotations are well suited. Most of the commonly grown crops, including corn, truck crops, tobacco, and alfalfa, are adapted. Adequate applications of lime and fertilizer are required. Tillage operations should be on the contour, and other water control measures may be necessary on the more sloping parts. Pasture does well if properly limed and fertilized.

Masada loam, eroded hilly phase (MD).—Areas of this soil occupy 15- to 30-percent slopes and are associated with other Masada soils. Erosion has removed 25 to 75 percent of the original surface soil from this phase. The plow layer now consists of yellowish-brown loam or clay loam. Surface runoff is rapid, and internal drainage is moderate. The fertility is somewhat less than that of the eroded hilly Hiwassee clay loam, but moisture relations and tilth are somewhat more favorable for crops. A few shallow gullies occur in places, some of which are a little too deep to be obliterated by tillage.

Use and management.—Most of this soil has been cleared and cropped at some time, and part of it is now used for crops. A notable acreage has been seeded to pasture. Crops requiring tillage are not well suited because of the strong slope and moderately eroded condition.

Where the soil must be used for crops, long rotations consisting chiefly of small grains and hay crops should be used, and supplementary means of controlling runoff are required to prevent further erosion. The smoother areas on the longer slopes may be managed in a system of strip cropping. Adequate fertilization is especially needed, for a luxuriant vegetative cover must be obtained that will effectively control runoff. Where at all feasible, this phase probably is best used as permanent pasture and meadow. Sufficient applications of lime and fertilizer, especially phosphorus, are needed for pasture crops.

Masada gravelly loam, rolling phase (MC).—A somewhat stronger slope in places and a moderate content of gravel are the chief characteristics distinguishing this soil from the undulating phase of Masada

loam. Slopes are from 2 to 15 percent. The gravel ranges up to about 6 inches in size and is abundant enough to interfere somewhat with tillage. Surface runoff is medium to rapid, and internal drainage is moderate.

Use and management.—Practically all of this soil has been cleared of its native hardwood forest, and a great part of it is now used for tilled crops or pasture. A small part is too gravelly to be cultivated and is limited to pasture. The tillable areas are well suited to most of the crops commonly grown, including corn, tobacco, certain truck crops, hay, and small grains. In many places the larger stones could be removed to advantage. Rotations of moderate length are required, for the more sloping areas are subject to erosion if row crops are grown on them frequently. Proper fertilization and liming will bring a good response from tilled crops as well as pasture.

Masada gravelly loam, eroded rolling phase (MB).—Areas of this soil are on 7- to 15-percent slopes and are associated with Hiwassee and other Masada soils on high stream terraces. This soil differs from Masada loam, undulating phase, chiefly in having rolling relief, in containing enough gravel to interfere materially with cultivation, and in being moderately eroded. It represents areas of Masada gravelly loam, rolling phase, that have lost from 25 to 75 percent of the surface soil through erosion. Surface runoff is medium to rapid, and internal drainage is moderate. There are some small gullies in places, a few of which are a little too deep to be removed by tillage.

The plow layer consists of reddish-brown gravelly loam or gravelly clay loam. The subsoil, to a depth of approximately 30 inches, is yellowish-brown heavy or firm clay that grades to light brownish red. Irregular beds of gravel are below this layer.

Use and management.—All of this soil has been cleared and cultivated at some time. More than half is now used for crops, about a fourth for pasture, and the rest is idle. The soil is suitable for crops requiring tillage, but chiefly because of its gravelly nature and rolling slope, it is not well suited to row crops—especially truck crops. Best suited are small grains and hay and pasture. The soil responds to proper fertilization and liming. Where it is cultivated, field operations should be done on the contour. Strip cropping may be practical in places. Pasture is productive where the soil is properly limed, fertilized, and seeded.

Porters loam, steep phase (PC).—Widely distributed areas of this soil occur on 30- to 60-percent slopes on the mountains. They lie at somewhat higher elevations than the Hayesville and other soils of the intermountain plateau. This soil is associated with the Ashe soils and lies adjacent to the Hayesville and Halewood soils. The parent rocks are granite, gneiss, and schist. The soil is medium acid, low in calcium, medium in magnesium, low to very low in phosphorus, fairly high to medium in potash, medium in nitrogen, and high in organic matter. Surface runoff is rapid, and internal drainage is moderate to rapid. The natural vegetation is red, black, and chestnut oaks, maple, sourwood, and hickory. The undergrowth is chiefly azalea, rhododendron, laurel, fern, galax, and trailing-arbutus. Chestnut was the predominant tree until it was killed by the blight.

Profile description:

0 to 10 inches, brown to dark-brown friable loam.
10 to 25 inches, brown to yellowish-brown friable loam to clay loam that breaks to nutlike fragments.
25 inches +, gray and brown partly disintegrated granite, gneiss, or schist.

Some rock fragments occur in places, but not enough to interfere materially with tillage. Parts have some mica.

Use and management.—Nearly all of this soil is under cut-over native forest. Steep slopes and moderately shallow depth to bedrock make it poorly suited to crops, but a great part is well suited to pasture. The soil absorbs and holds moisture for plants well, and grasses and legumes produce good pasture where properly limed and fertilized.

Porters loam, eroded steep phase (PB).—Constituting this soil are areas formerly occupied by Porters loam, steep phase, that have been cleared and cultivated. As a result, they have lost 25 to 75 percent of their original surface soil through erosion. The strongly acid soil is moderate in fertility, although it contains somewhat less nitrogen and organic matter than the steep phase. Slopes range from 30 to 60 percent. Surface runoff is very rapid, and internal drainage is moderate. Permeability and moisture-holding capacity are favorable. A small acreage has been severely eroded and has a yellowish-brown clay loam plow layer. Gullies are common in the more severely eroded parts.

The plow layer consists of brown loam or clay loam, and the subsoil is more nearly yellowish-brown clay loam. Partly disintegrated bedrock of granite, gneiss, and schist is usually at 20 to 25 inches, though in places the depth is somewhat greater.

Use and management.—All of this soil has been cleared and used for crops, but most of it is now in pasture. Mainly because of its strong slope and moderately shallow depth to bedrock, it is not suited to crops. If it is properly fertilized and limed, it supports good pasture. Some care is required to control grazing, for a protective cover effective against erosion must be maintained.

Porters loam, eroded hilly phase (PA).—Milder slopes and the loss of 25 to 75 percent of the original surface soil through erosion are the chief differences between this soil and the steep phase. Small areas are in the mountain section of the county and are associated with the other Porters soils. The soil has rapid surface runoff and moderate internal drainage. It is medium acid, is moderate in fertility, absorbs and retains moisture well, and has good tilth. A small acreage still under native forest is not eroded and therefore has a thicker surface layer free of subsoil admixture.

The plow layer, consisting of a mixture of original surface soil and subsoil materials, is light-brown friable loam. The subsoil is brown to yellowish-brown friable clay loam or fine sandy clay loam. Partly disintegrated bedrock of granite, gneiss, and schist is at a depth of 25 to 30 inches.

Use and management.—Much of this soil has been cleared and cropped, and nearly half is now used for crops. Although suited to both pasture and crops, it is not suitable for frequent row crops because of its hilly relief. Moderately long rotations consisting chiefly of

small grains and grass-and-legume hay and pasture are required to maintain productivity. Both corn and truck crops produce well if infrequently grown, for tilth, moisture relations, and general fertility are favorable. Contour tillage should be practiced, and other supplemental means of controlling runoff may be feasible.

Porters stony loam, steep phase (Pf).—Stones ranging from gravel to large boulder size materially interfere with tillage on this soil. In addition, there are a few rock outcrops. Fairly large areas of this phase occur on 30- to 60-percent slopes throughout the mountainous part of the county. Surface runoff is very rapid, and internal drainage is moderate. The ability of the soil to absorb and hold moisture is favorable, its reaction is medium acid, and its fertility is moderate.

The 10-inch surface layer is brown to dark-brown friable stony loam. The subsoil, to a depth of about 25 inches, is brown to yellowish-brown friable stony loam or stony clay loam. Below the subsoil lies partly disintegrated granite, gneiss, and schist.

Use and management.—Native forest covers most of this soil. Steep slope and stoniness make it poorly suited to crops, but it will produce good grazing if grass and legumes have been established. Some of the steeper, more stony parts should remain in forest.

Porters stony loam, eroded steep phase (Pe).—This soil comprises areas occupied by Porters stony loam, steep phase, that have been cleared and cultivated and have lost 25 to 75 percent of the original surface layer through erosion. It occurs in the mountainous section of the county and is associated with other Porters soils. Relief is steep, and surface runoff is very rapid. The soil material is permeable and absorbs and retains moisture well. Fertility is moderate, and reaction is medium acid. The plow layer is brown stony loam consisting of a mixture of original surface soil and subsoil materials. A small included severely eroded acreage has a plow layer of yellowish-brown clay loam subsoil material.

Use and management.—All of this phase has been cleared and cropped, but most of it is now in pasture. A small part is idle. Mainly because of its steep slopes and stoniness, it is not suited to crops requiring tillage. The steepest and stoniest parts are probably better used for forest, but the larger part is suited to permanent pasture when properly limed and fertilized. Care is required to avoid overgrazing, as erosion becomes active when a good vegetative cover is not maintained.

Porters stony loam, eroded hilly phase (Pd).—A greater quantity of stone throughout, less steep slopes, and an eroded condition distinguish this soil from the steep phase of Porters loam. Most areas are on ridge tops or upper slopes in the mountainous section of the county, where they are associated with steeper Porters soils. The soil is medium acid and moderate in fertility. It holds moisture and plant nutrients well. In places it has small gullies, most of which can be removed by tillage. Surface runoff is rapid, and internal drainage is moderate to rapid.

Approximately 25 to 75 percent of the original surface layer has been eroded away. The plow layer now consists of brown friable but moderately heavy loam that contains stones of gravel to boulder size in

numbers sufficient to interfere with or almost prohibit tillage. The subsoil is brown to yellowish-brown friable clay loam with numerous stones throughout. Gray and brown partly disintegrated granite, gneiss, or schist is at 25 inches.

Use and management.—Nearly all of this soil has been cleared and cropped at some time. A small part, however, is still under native forest and therefore has not been materially eroded. Chiefly because of its hilliness and stoniness, this soil is not well suited to crops. If properly limed and fertilized, it is capable of supporting good pasture. Moisture relations are moderately favorable, and response to fertilization is good. Areas that must be cropped should be used in long rotations consisting chiefly of small grains and legumes and grasses grown for hay and pasture. Supplementary practices to control runoff may be required, for erosion is active when the soil is not covered.

Porters stony loam, very steep phase (PG).—This soil of the mountain uplands occupies some of the steeper parts of those tracts consisting predominantly of Porters soils. Slopes exceed 60 percent. The soil is medium acid, moderate in fertility, and moderate in content of organic matter. It is permeable to both moisture and roots. Surface runoff is very rapid, and internal drainage is moderate. The loose stones would make tillage very difficult.

The surface layer is brown to dark-brown stony loam. The subsoil is brown to yellowish-brown friable stony clay loam. Bedrock of granite, gneiss, or schist is at a markedly shallower depth than in the less steep Porters soils, and in places it outcrops. Over a great part of the acreage the soil probably is 20 to 25 inches deep to bedrock.

Use and management.—All of this soil is under native forest consisting mainly of oak, hickory, pine, spruce, and hemlock. In some places there is a dense undergrowth of laurel and rhododendron. Mainly because of its very steep slopes and stoniness, this soil is not well suited to either crops or pasture and should remain in forest.

Rabun clay loam, eroded hilly phase (RA).—This soil occupies upland parts of the intermountain plateau and is on slopes of 15 to 30 percent. Its subsoil somewhat resembles that of the Hayesville soils in color, but its surface soil is darker brown. It developed over basic igneous rock, whereas the Hayesville soils developed over more acidic igneous rock. This medium acid soil is relatively fertile. According to several tests, it is low to high in content of calcium and magnesium, medium to high in nitrogen, low in phosphorus, very low to medium in potash, and medium to high in organic matter. Surface runoff is rapid, and internal drainage is moderate. Permeability of the subsoil is fair to moderate. The native vegetation was predominantly hardwood forest consisting of oak, hickory, and yellow-poplar, with some beech, birch, dogwood, sourwood, and serviceberry included.

Profile description:

0 to 14 inches, reddish-brown moderately friable clay loam that breaks to irregular lumps; upper 5 inches, because of moderate soil erosion, consists of a small part of the original surface layer mixed with the upper part of the subsoil.

14 to 33 inches, reddish-brown or red heavy or firm clay, slightly sticky when wet but breaking into irregularly shaped hard brittle lumps when dry.

33 to 54 inches, slightly more reddish heavy or moderately compact but friable clay; some mottles in lower part that appear to be partly decomposed rock; bedrock usually at a depth of about 60 inches, but deeper in places.

Included with this soil is a small acreage still under native forest. Its surface 8 inches is more nearly brown than reddish brown and more nearly silt loam in texture.

Use and management.—Nearly all of this soil has been cleared of native vegetation. About a third is used for crops, a fairly large part is idle, and a small part is in pasture. Chiefly because of its hilliness and slow permeability, the soil is somewhat difficult to work, and runoff water accumulates rapidly during periods of rainfall. For these reasons, it is not well suited to intensive use.

The soil is suitable for cultivation if long rotations consisting of small grains, legumes, and grasses are used. Row crops should not be grown frequently, and close-growing crops should be used much of the time to stabilize the soil. Truck crops are not well suited because the relatively heavy nature of this soil prevents good development of root crops and also makes tillage difficult. The soil responds well to proper fertilization and liming and is productive of alfalfa, small grains, and corn. Legume-and-grass pasture is productive and of good quality, provided it is properly limed, fertilized, and seeded.

Ramsey shaly silt loam, steep phase (Re).—This soil occurs on slopes of 30 to 60 percent in association with other Ramsey soils in the mountainous part of the county. It is shallow to bedrock of shale, slate, sandstone, and quartzite. According to some tests, its content of magnesium, calcium, phosphorus, and organic matter is low and its supply of potash is medium. It is strongly acid and generally low in fertility. Surface runoff is very rapid, and internal drainage is moderate to rapid. The soil is permeable but low in water-holding capacity. The native vegetation consists of sassafras, locust, yellow-poplar, dogwood, blackjack oak, maple, wild cherry, huckleberry, bamboo briers, and some rhododendron.

Profile description:

0 to 6 inches, yellowish-gray to dark yellowish-brown friable and porous shaly silt loam that contains abundant rock fragments.
6 to 14 inches, brownish-yellow to brown friable shaly silt loam underlain by partly disintegrated rock.

Use and management.—All of this soil has been cleared and cropped, but much of it is now abandoned or idle. Some areas are pastured, and a small part is cropped. Shallow depth to bedrock, steep slopes, high content of shale, and low fertility make the soil poorly suited to either crops or pasture. Forest seems a better use. Areas that must be used for pasture or crops should be carefully handled and adequately fertilized. A vegetative cover that will effectively aid in conserving the soil must be established and maintained.

Ramsey shaly silt loam, eroded steep phase (Ro).—Constituting this phase are areas which were formerly Ramsey shaly silt loam, steep phase, but from which much of the surface soil has been removed. The soil is shallow to bedrock. There are small gullies, some of which are too deep to be obliterated by ordinary tillage. Some parts have been severely eroded and have a plow layer of brownish-yellow friable shaly silt loam. Areas are associated with other Ramsey soils. Surface runoff is very rapid but internal drainage is rapid.

Use and management.—All of this soil has been cleared and cropped. A notable part is now abandoned or idle, some is pastured, and a

small part is cropped. Because of its shallow depth to bedrock, steep slope, high content of shale, and low fertility, this soil is poorly suited to either crops or pasture. All of it seems better suited to forest. Areas that must be used for pasture or crops should be carefully handled and adequately fertilized to establish and sustain a vegetative cover effective in conserving the soil.

Ramsey shaly silt loam, hilly phase (RD).—Less steep slopes are the main difference between this soil and the steep phase. The depth to bedrock may also average a little greater. Areas usually occupy 15- to 30-percent slopes on ridge tops in tracts made up dominantly of Ramsey soils. This strongly acid soil has low fertility and fairly low water-holding capacity. Surface runoff is rapid, and internal drainage is rapid. The native vegetation is like that on the steep phase.

Use and management.—Chiefly because of its low fertility and shallowness to bedrock, this soil is not well suited to tilled crops or pasture. Nonetheless, it is somewhat better suited to these uses than the steep phase. Areas that must be used for pasture or crops require heavy fertilization and should be farmed in a rotation consisting nearly or entirely of close-growing small grains and legume-and-grass hay or pasture. Most areas should be reforested.

Ramsey shaly silt loam, eroded hilly phase (RB).—Areas of the hilly phase affected by erosion make up this soil, which is strongly acid, low in fertility, and hilly (15- to 30-percent slopes). Surface runoff and internal drainage are rapid. The soil is associated with other Ramsey soils. Included is an inextensive severely eroded acreage cut by small gullies and having a plow layer of subsoil material.

The plow layer, a mixture of the original surface layer and subsoil material, is very shaly brownish-yellow friable silt loam about 5 inches thick. Bedrock lies at a shallow depth, in many places not deeper than 12 inches.

Use and management.—Although this soil has been cleared and cropped, little of it is now cultivated. Part is pastured, and the rest is idle. Because of shallowness to bedrock, low fertility, and high content of shaly material, the soil is poorly suited to either crops or pasture. Where it must be used for pasture or cultivated crops, it should be well fertilized and limed and kept under close-growing vegetation as much of the time as possible.

Rock outcrop (RF).—This land type consists of bare exposures of granite, gneiss, or slatelike rock. The quantity of soil material is so small that the vegetation is scant or entirely lacking. Much of the land is very steep or precipitous, and a great part is associated with steep phases of the Ashe, Porters, and Ramsey soils. The land has little or no agricultural value.

Rough gullied land (Hayesville and Halewood soil materials) (RG)—Areas of Hayesville and Halewood soils so severely eroded or gullied as to be of practically no value for either crops or pasture compose this land type. Small relatively uneroded patches are included; but over much of the area all of the surface soil and in places much subsoil material have been washed away, leaving an intricate pattern of gullies. Consequently, there is very rapid runoff and slow to very

slow internal drainage. The separate areas are small and are associated chiefly with Hayesville and Halewood soils.

Use and management.—All areas have been cleared of native forest and cropped. They are now either idle or are occupied by re-established forest. This land has little value for pasture and can best be used for forest. Some areas could be planted to white and shortleaf pines (pl. 5, *A*). Mulching to aid in reestablishing forest cover might be worth while. In places it may be practical to sow lespedeza to hasten stabilization of the soil.

State loam (SB).—This soil is confined to low stream terraces along the larger streams of the county. Slopes of most areas range from 2 to 7 percent, but a small acreage has slopes of 7 to 15 percent. The parent material has washed or was derived from granite, gneiss, or schist. Surface runoff is slow to medium, and internal drainage is moderate. The soil is permeable to moisture and roots and is medium acid. According to some tests it is medium in content of nitrogen, low in phosphorus, medium to low in potash, and medium in supply of organic matter. It has good tilth and favorable moisture relations, as it has a relatively high capacity for holding moisture available to plants. The original forest was predominantly hardwoods with an undergrowth of mountain-laurel and rhododendron.

Profile description:

0 to 8 inches, light-brown to brown very friable loam that crumbles to weak granules.

8 to 18 inches, yellowish-brown friable clay loam through which are distributed a few mica flakes; breaks into irregular lumps that easily crush to a fine mass; slightly sticky when moist.

18 to 37 inches, yellowish-brown friable clay loam streaked with gray and very dark brown and containing some mica flakes; beds of sand and gravel at a depth of about 35 inches, although depth varies greatly.

This soil is relatively uniform. In a few places a small quantity of gravel is intermixed, but not enough to interfere materially with cultivation.

Use and management.—Much of this soil has been cleared and is now being cropped. A small acreage is used for pasture, and a little is idle. This is one of the most desirable soils in the county for agricultural use. It is fertile and smooth, has very good tilth characteristics, and retains moisture and plant nutrients well. All crops commonly grown, including alfalfa and several truck crops, are well suited.

The soil is well suited to intensive use, and if properly limed and fertilized, can be used for row crops several years in succession. Where cropped, some means of maintaining organic matter should be practiced, such as turning under legume cover crops at least one in 3 years. The soil is capable of producing good pasture but is exceptionally well suited to row crops. Inasmuch as the acreage of soils suited to row crops is limited in this area, it is advisable to use this soil for more intensive crops rather than for pasture.

State gravelly loam (SA).—A quantity of gravel sufficient to interfere materially with cultivation differentiates this soil from the associated State loam. Relief is undulating, though a small acreage has slopes ranging up to 15 percent. Surface runoff is medium, and internal drainage is moderate. The fertility and content of organic matter may be a little lower than for the loam, but in general fertility

A, Stand of shortleaf pine that has become established on Rough gullied land (Hayesville and Halewood soil materials).
B, Young shortleaf pine growth on land too eroded for crops.

is relatively high in comparison with that of other soils in the county.

Use and management.—This soil is well suited to crops requiring tillage as well as to pasture. Stones make it much less suitable for truck crops, as they interfere with field work. Corn, small grains, alfalfa, clover, and grass are among the better suited crops. The soil responds well to proper fertilization and under good management can be expected to produce relatively high yields.

Stony colluvium (Tusquitee soil material) (Sc).—Most areas of this land type are on mountain foot slopes along the upper reaches of the streams where the stream gradient is relatively steep and the valleys are narrow. The land consists of local alluvium and colluvium that has been washed chiefly from Porters and Halewood soils. Parts of it, however, are predominantly general alluvium and are therefore somewhat like Congaree soils. All of the material is very stony and extremely difficult to work or cultivate. Relief ranges from nearly level to moderately hilly, but the predominant slope is 2 to 7 percent. Surface runoff is medium to rapid, and internal drainage rapid.

The soil material is brown to dark-brown friable loam to a depth of about 25 inches. Below this is somewhat lighter brown material. The entire soil contains a great abundance of rocks ranging from gravel size to 15 inches or more in diameter. Bedrock is at a variable depth; in some places it is 2 or 3 feet from the surface, and in others 6 feet or more. In a few places the soil material is similar to that of Congaree fine sandy loam, but it differs in containing much rock. A few areas are commonly known as riverwash and consist of brownish-yellow sand or a mixture of brownish-yellow sand and semiangular rock fragments.

Use and management.—Though unsuited to crops requiring tillage, small parts of this land type are used for corn and other row crops. Such use requires much labor, but the productivity is generally relatively high. Much of the acreage produces some pasture, but a small part is relatively unproductive even for this use.

Stony rough land (Porters soil material) (Sd).—Areas of this land are widely distributed on steep to very steep relief over the mountain section. Rock outcrops and loose stone with some admixture of soil material compose this land type. Bedrock and stone are predominantly granite, gneiss, and schist; the intermixed soil material is generally brown loam similar to the soil material of the Porters soils. Small areas are lighter colored and shaly and resemble the Ramsey soils. The Porters soil material predominates generally, but Ramsey soil material is dominant on the Swannanoa Mountains and along the Blue Ridge in the eastern part of the county. A few areas in the higher parts of the mountains have considerable organic matter intermixed with the soil material and resemble the Burton soil. Surface runoff on this land is very rapid, and some parts gully rapidly when cleared of forest.

Use and management.—Practically all of this land is under native forest, its best use. Almost none of it is suitable for crops requiring tillage, but small areas of the less stony parts are of some value as pasture.

Tate silt loam, undulating phase (Tb).—This permeable soil consists of colluvium derived principally from shale, slate, conglomerate,

and quartzite or sandstone. It occupies 2- to 7-percent slopes on foot slopes and is associated chiefly with Ramsey soils. Small areas are widely distributed, especially throughout the intermountain plateau part of the county along the narrow valleys extending into the mountains. The soil is strongly acid and medium in fertility. Under native forest the content of organic matter is relatively high. Surface runoff is slow to medium, and internal drainage is moderate. The tilth and water-holding capacity of the surface soil are favorable. The native forest was predominantly maple, yellow-poplar, chestnut, locust and post, white, and chestnut oaks. The common undergrowth consists of dogwood, rhododendron, and huckleberry.

Profile description:

0 to 8 inches, gray to pale-brown friable silt loam.
8 to 32 inches, brownish-yellow to yellowish-brown firm moderately friable silty clay loam or silty clay; breaks under some pressure into irregular fragments easily crushed to nut size.
32 inches +, mottled gray, brown, and yellow friable to very slightly plastic silty clay loam or silty clay that contains some shale fragments.

There is some mica throughout the soil, and bedrock is commonly at a depth of 3 feet or more.

Use and management.—A small part of this soil is still under native forest. Much of the cleared acreage is in crops, some is in pasture, and a little is idle. One of the more desirable soils for crops because of smooth slope, good tilth, and good response to fertilization and proper management, this soil is suited to corn, alfalfa, small grains, and truck crops. Runoff is a hazard only on the limited acreage having moderate slope. Where adequate fertilizer, lime, and organic matter are supplied, practically all of the phase can be used intensively for row crops. Pasture is productive where properly fertilized and limed, but the soil is generally much more useful for cultivated crops.

Tate silt loam, rolling phase (Ta).—A stronger slope is the chief difference between this and the undulating phase. Surface runoff is medium to rapid, and internal drainage is moderate. The soil is strongly acid, medium in content of plant nutrients, good in tilth characteristics, and relatively high in moisture-holding capacity. The areas are widely distributed, especially throughout the intermountain plateau section.

Use and management.—All but about 20 percent of this phase has been cleared. Much of this is used for crops, and a small part is idle. Favorable tilth, good moisture-holding capacity, and ability to respond to proper fertilization make this soil well suited to tilled crops as well as to pasture. Its rolling or sloping surface, however, makes it less well suited to intensive use for row crops and makes tillage a little more difficult. Corn, small grains, most truck vegetables, hay, burley tobacco, and most other commonly grown crops are well suited.

Rotations of moderate length that limit growing row crops to about 1 year in 3 or 4 are best. Where relatively short rotations are used, contour tillage should be followed, and strip cropping may be practical in places. If properly fertilized and limed, pasture produces well, but most of the acreage is needed for more intensive crop use.

Toxaway silt loam (Tc).—This nearly level soil consists of alluvium derived from soil materials originally from granite, gneiss, and

schist. It is widely distributed on first bottoms along the main streams of the county, especially in the intermountain plateau section where the bottom lands have appreciable width. Practically all areas are subject to overflow. Surface runoff is very slow, and internal drainage is slow to very slow. In most areas the water table is at a moderately shallow depth; during drier periods it is about 2 feet below the surface and during much of the wetter periods it is at or within a few inches of the surface. The soil is strongly acid and relatively fertile. It is low to medium-high in content of calcium and magnesium, medium in content of nitrogen, low to very low in phosphorus and potash, and high in organic matter. The native forest consisted chiefly of water-loving hardwoods, including certain oaks, willow, beech, birch, and ash. An undergrowth of rhododendron and mountain laurel predominated in places.

Profile description:

0 to 26 inches, very dark-gray to almost black friable silt loam containing a great quantity of organic matter.

26 inches +, bluish-gray friable silt loam with some yellow and brown mottlings; coarser alluvium such as sand and gravel may occur at a depth of 3 or 4 feet.

The dark layer ranges from 8 to 26 inches thick. Internal drainage varies noticeably; some areas are high enough above the water table to have natural drainage that will permit production of crops.

Use and management.—Practically all of this soil has been cleared and cropped. About 50 percent is now used for pasture, and 20 percent for crops requiring tillage. A small acreage lies idle. Internal drainage is the chief factor limiting the suitability. Some areas that have been artificially drained and those having better natural drainage are well suited to a wide variety of crops, especially corn, hay, and such truck crops as potatoes and snap beans. Alfalfa is not suited, because the water table is too high.

Where fertility is maintained at a high level, intensive cultivation can be practiced many years in succession. Most truck crops and legumes and grasses require lime, and some fertilization will benefit all the general crops grown. It is not unusual to lose part or all of one crop out of four or five because of damage caused by overflow. If properly fertilized and limed, pasture is notably productive because moisture relations favor good growth during the drier parts of the growing season.

Tusquitee loam, rolling phase (Te).—This soil consists of areas of local alluvium and colluvium that lie as gentle foot slopes below Porters and other upland soils. It occupies 7- to 15-percent slopes and is widely distributed throughout the valleys. The soil is medium to strongly acid. Soil tests show that it is medium to very low in content of calcium, medium to low in magnesium, very low to low in phosphorus, very low to medium in potash, and moderately high in organic matter. The tilth of the plow layer is favorable, and the capacity for holding moisture available to plants is high. Surface runoff is medium, and internal drainage is moderate. The native vegetation was chiefly deciduous forest consisting of maple, yellow-poplar, locust, and post, white, and chestnut oaks. There was a variable undergrowth of dogwood, laurel, rhododendron, and huckleberry.

Profile description:

0 to 13 inches, brown friable loam of fine granular structure.
13 to 32 inches, yellowish-brown friable clay loam of moderate nut structure.
32 inches +, brown loam mottled somewhat with yellow and gray; grades at variable depths, usually at 40 to 50 inches, to beds of loose rock fragments with which some soil material is intermixed.

A small quantity of mica occurs throughout this soil. In places there are some stones, but nowhere enough to interfere materially with cultivation.

Use and management.—Much of this soil is cleared. About half of it is cropped, chiefly to corn, and the rest is mostly in pasture. It is one of the more desirable agricultural soils of the county because it is fertile, fairly easy to work and conserve, and retains both moisture and plant nutrients well. It is suited to practically all crops commonly grown, including alfalfa, truck crops, and tobacco.

Moderately short rotations can be used, but some care is required to control runoff water. A 3-year rotation consisting of a row crop, a small grain, and a hay crop is well suited. On most areas field operations should be on the contour. Although this soil is relatively fertile, it responds well to liming and fertilization. Where moderately short rotations are used, a legume winter cover crop turned under every 3 years will do much to maintain the supply of organic matter at a high level. Pasture is productive, but it is better to use for permanent pasture the more sloping soils that are less well suited to tillage.

Tusquitee loam, eroded rolling phase (TD).—This soil consists of areas, now eroded, that were formerly the rolling phase. It is widely distributed in the valleys and lies adjacent to the rolling to steep upland areas occupied chiefly by Porters, Halewood, and Hayesville soils. It is associated with other Tusquitee soils. The relief is predominantly rolling or sloping but in some parts is hilly, the slopes ranging up to 15 percent. The reaction is moderately to strongly acid. Fertility is moderate, or generally a little lower than that of the rolling phase. Tilth is a little less favorable than that for the rolling phase but relatively good in comparison with that for many eroded soils of the uplands. Surface runoff is medium to rapid, and internal drainage is moderate. The soil holds plant nutrients and moisture available for growing crops.

Areas have eroded to such extent that the plow layer is a mixture of surface soil and subsoil materials. The plow layer, to a depth of 5 inches, is yellowish-brown friable loam grading to clay loam in places.

Use and management.—All of this soil has been cleared of native forest, and at least two-thirds of it is used for crops. Like the rolling phase, it is well suited to agricultural use and is favored for production of crops requiring tillage. Corn, alfalfa, small grains, tobacco, and the various truck crops produce well. Moderately short rotations are suitable, but some care is required to avoid further erosion. Field operations should be on the contour. To aid in conservation and to supply some organic matter, a close-growing crop should be grown during winter. Pasture is productive, but use of the soil for tilled crops is advisable, considering the scarcity of soils suitable for such use.

Tusquitee loam, undulating phase (TF).—A smoother surface is the chief difference between this and the rolling phase. Areas are

widely distributed on 2- to 7-percent foot slopes in the valleys, especially in the intermountain plateau section, and are associated with other Tusquitee soils. The foot slopes consist of colluvium and local alluvium, most of which has been transported from such soils as the Porters and Halewood. Many areas lie adjacent to the hilly to steep soils of the upland. Surface runoff is slow to medium, and internal drainage is moderate. Reaction is medium to strongly acid, content of plant nutrients and organic matter is relatively high, tilth is good, and moisture-holding capacity is high.

The 10- to 20-inch surface soil is brown friable loam, and the subsoil is yellowish-brown friable clay loam. There are some gravel and stones, but in no place do they interfere materially with cultivation.

Use and management.—A small part of this soil is under native forest, about one-fourth is in pasture, and much of the rest is cropped. It is one of the best soils in the county for tilled crops. Row crops, especially corn and potatoes, predominate. Tobacco, truck crops, and alfalfa and other general farm crops are also well suited.

Lime is needed, especially for legume hay and most crops other than potatoes. Some fertilizer is required to maintain a high level of productivity, and organic matter is needed at intervals of two or three years. Supplementary practices for erosion control are generally not necessary, for the soil is very permeable to moisture and only very gently sloping. It is easily worked and can be tilled under a relatively wide range of moisture conditions. The soil is well suited to permanent pasture, but lime and some fertilizer are required to obtain the most luxuriant growth of forage plants. Since the acreage of soils so well suited to intensive use is limited in comparison with the acreage of soils suitable for pasture, it is usually advisable to use this soil intensively for crops.

Tusquitee stony loam, rolling phase (TL).—Varying quantities of stones ranging from small gravel to boulder size distinguish this soil from the rolling phase of Tusquitee loam. In some places stones barely interfere with cultivation, but in others they prohibit use of all implements except hand tools. The soil is widely distributed in valleys and is associated with other Tusquitee soils. Areas occupy 7- to 15-percent slopes, usually adjacent to hilly and steep soils of the uplands, especially the Porters and Halewood.

The 10- to 20-inch surface layer is brown friable stony loam. The subsoil is yellowish-brown very friable stony clay loam. The soil becomes more stony with depth, and at 3 or 4 feet is commonly underlain by a mass of rock fragments in which some soil material is intermixed. This soil has a relatively high water-holding capacity and approximately the same level of fertility as the rolling phase of Tusquitee loam. It is permeable to roots and moisture. The reaction is strongly acid.

Use and management.—A little more than half of this phase is covered by native forest; much of the rest is cropped, principally to corn, hay, and tobacco. Most of the crops commonly grown in the county are well suited, although stones limit the usefulness for those requiring intensive cultivation and hinder harvesting with mowers, reapers, and other machinery.

Row crops, especially corn, are well suited where hand tillage is practiced. Some areas can be improved by removing the larger

stones. Except for its stoniness, this soil is well suited to row crops where fertility and organic matter are maintained at a sufficiently high level. If row crops are grown frequently, some care is required to control runoff. Contour tillage should be practiced, and where erosion becomes active, such close-growing crops as small grains and hay should be included in the rotation. This soil is productive of pasture, but the carrying capacity and quality are increased by lime and phosphorus. Many of the more stony areas are better used for permanent pasture than for crops requiring tillage.

Tusquitee stony loam, eroded rolling phase (TH).—This soil consists of areas that were formerly Tusquitee stony loam, rolling phase, but from which 25 to 75 percent of the original surface soil has eroded. It is widely distributed on 7- to 15-percent slopes in valleys throughout the county. The soil is medium to strongly acid and moderate in general level of fertility. Except for the stones in the soil, tilth is favorable. Nevertheless, because of the heavier nature of the material, tilth is less desirable than that of the rolling phase. The soil is permeable to roots and moisture and holds water available to plants.

The plow layer over much of the acreage is a mixture of original surface soil and subsoil materials. Where this mixing has occurred, the layer may be yellowish-brown stony loam or stony clay loam.

Use and management.—All of this soil has been cleared and cropped. Probably half of it is now used for crops. Corn, tobacco, small grains, hay, and truck vegetables are grown and produce fairly high yields. The soil is suited to crops requiring tillage, but the numerous stones interfere with field operations. The more stony areas can be tilled only with hand tools.

Moderately short rotations are well suited, and where stones do not interfere too much, row crops requiring intensive tillage can be grown. Crops respond well if properly limed and fertilized; lime is especially required for legumes and most truck crops. Pasture has a relatively high carrying capacity where limed and fertilized, and many of the more stony areas are better used for permanent pasture than for tilled crops.

Tusquitee stony loam, undulating phase (TM).—The main difference between this soil and the rolling phase is in slope. This phase consists of local alluvium and colluvium made up of materials washed chiefly from such soils of the upland as the Porters and Halewood. Areas occupy 2- to 7-percent slopes and are associated with other Tusquitee soils in valleys, especially in the intermountain plateau section. Surface runoff is medium, and internal drainage is moderate to rapid. The soil is medium to strongly acid and moderately fertile. Its tilth is good, and it is permeable to roots and moisture.

The 10- to 20-inch surface soil is brown friable stony loam. The subsoil is yellowish-brown friable stony clay loam. Below a depth of approximately 32 inches is brown friable loamy material somewhat mottled with yellow and gray that grades into beds of loose rock fragments with which some soil material is intermixed. The rock fragments range from gravel to large boulder size and are abundant enough to interfere with or, in a few places, prohibit cultivation.

Use and management.—About half of this soil is under native forest; a large part of the rest is cropped. Much of the soil is well suited to practically all the crops commonly grown. It could be farmed intensively, but the stones would greatly interfere with tillage and with use of mowers, reapers, and like heavy machinery. The soil holds moisture available for crops and responds well to proper fertilization. Pasture grasses do well, especially where lime and phosphorus have been added. The more stony areas are best used as pasture, but such use may not be feasible because in most communities much of the acreage is needed for row crops.

Tusquitee stony loam, hilly phase (Tk).—Hilly or strongly sloping relief of 15 to 30 percent differentiates this soil from the rolling phase. The soil consists of colluvial or local alluvial materials transported mainly from Porters and Halewood soils of the upland. Areas are associated with other Tusquitee soils in the valleys and lie adjacent to hilly and steep upland soils. The soil is medium to strongly acid and relatively high in content of plant nutrients and organic matter. Surface runoff is rapid; internal drainage, moderate.

The 8- to 16-inch surface layer is brown stony loam. The subsoil is yellowish-brown very friable stony clay loam. Usually underlying the subsoil is a mixture of rock fragments and some soil material. Bedrock is at a depth of several feet.

Use and management.—More than half of this phase is under native forest; most of the rest is used to about equal extent for crops and pasture. The soil is suitable for tilled crops, but because of strong slopes and stoniness, it is not well suited to crops that must be intensively cultivated. Hay and small grains are among the crops better suited.

Moderately long to long rotations should be used because the soil is erodible when in the loose condition required for cultivated crops. Much hand cultivation is necessary for row crops because stones in many areas impede use of larger implements. The soil is productive of both crops and pasture when properly limed and fertilized. Nonetheless, much of the acreage may be best used for pasture because of stone content, strong slope, and susceptibility to erosion.

Tusquitee stony loam, eroded hilly phase (Tg).—Areas of this soil are associated with the other Tusquitee soils and are widely distributed on 15- to 30-percent slopes throughout the valleys, especially in the intermountain plateau section. Practically all areas are adjacent to hilly and steep soils of the upland. This soil represents areas of Tusquitee stony loam, hilly phase, that have lost from 25 to 75 percent of the original surface soil through erosion. The plow layer, consisting of remnants of original surface soil mixed with subsoil material, is generally brown stony clay loam. This medium to strongly acid soil is at least moderately fertile, although somewhat lower in fertility than the hilly phase. Surface runoff is rapid, and internal drainage is moderate.

Use and management.—All of this soil has been cleared and cropped at some time. More than half is now used for crops, predominantly corn and hay, and possibly a third is idle. The soil is fairly well suited to tilled crops grown in long rotations, but because of its stoniness and strong slope, it probably is better for hay crops and pasture. Lime

and phosphate are especially required for legumes and most of the truck crops. The more stony and eroded parts can be used for permanent pasture. If properly fertilized and limed, pastures can produce good vegetation of relatively high carrying capacity.

Warne silt loam (WA).—Bodies of this soil lie on low terraces of the larger streams and consist of alluvium derived predominantly from granite, gneiss, and schist. Many areas are in gentle depressions and are associated with Altavista and State soils. The soil is strongly acid and usually low in fertility. According to tests, it is medium to low in content of calcium, magnesium, and nitrogen; very low to low in phosphorus; very low to medium in potash; and medium to low in organic matter. Surface runoff is slow, and internal drainage is slow to very slow. A few areas with gentle slopes have moderate external drainage. Tilth is moderately favorable, but permeability is decidedly slow because the subsoil is compact and lies at a shallow depth. The water-holding capacity is not very high, apparently because the subsoil contains much clay. The original forest cover was predominantly deciduous hardwood—oak, maple, yellow-poplar, and some chestnut.

Profile description:

0 to 10 inches, brownish-gray or gray friable silt loam.
10 to 25 inches, yellowish-gray compact or heavy silty clay or clay mottled with brown and brownish yellow; plastic when wet and very hard when dry; some mica flakes in places but a notably smaller quantity than in Hayesville and Porters soils.
25 inches +, mottled gray and brownish-gray compact or heavy silty clay; plastic when wet and very hard when dry.

The surface soil varies from 7 to 14 inches thick. Most areas are free of gravel, but some have gravel in quantities not sufficient to interfere with tillage.

Use and management.—A great part of this soil has been cleared of its native forest. Nearly half of it is used for pasture, and about a fourth for crops; the rest is idle. Corn is the predominant crop, and yields generally are low. The soil is considered suited to crops requiring tillage, but its value for such use is limited by slow internal drainage, compact subsoil, and low fertility. Small grains, corn, and certain hay and pasture plants are therefore the crops best suited. Better internal drainage and increased fertility and organic-matter supply would improve productivity. Damage to crops can be expected during wetter seasons. Truck crops, especially root crops, are not suited. When adequately limed, fertilized, and seeded, pasture does well.

Wehadkee silt loam (WB).—Widely distributed areas of this soil are on first bottoms of large streams and readily subject to overflow. Usually the bodies occupy slight depressions in association with Congaree and Chewacla soils. Surface runoff is very slow and sometimes ponded; internal drainage is very slow. The parent material is alluvium originally derived mainly from granite, gneiss, and schist. The original forest consisted of alder, willow, hornbeam, and like water-loving trees. Reaction is medium acid. Fertility is moderately high. According to tests, the soil is medium to low in content of calcium, low to medium in magnesium, medium in nitrogen, low to very low in phosphorus, low in potash, and medium to moderately high in

organic matter. Tilth is fairly good. Ordinarily, abundant and often excessive moisture is held available to plants.

Profile description:

0 to 6 inches, dark-gray to brownish-black loam or silt loam with some gray and brown mottling.
6 to 20 inches, gray friable loam or silt loam mottled with rust brown; much finely divided mica throughout; water table within 10 or 12 inches of surface during much of year and at or near the surface part of the time.

Use and management.—About 80 percent of this soil has been cleared, practically all of which is used for pasture. The pasture on most areas is not of high quality, as it consists chiefly of water-loving grasses and sedges. Bulrushes and sedges predominate in the wettest areas. Crops are not well suited, because the soil has very slow drainage and is susceptible to flooding. In some places the soil can be made more productive for pasture by improving drainage and applying lime. Drainage may not be practical because of the great cost or the lack of satisfactory outlets.

Wilkes gravelly loam, steep phase (WE).—A mixture of acidic and basic metamorphic rocks—chiefly granite, gneiss, and schist—underlie this soil of the intermountain uplands. Most areas occupy slopes of 30 to 60 percent, but a small acreage has smoother slopes of 15 to 30 percent. The soil is medium acid and moderately high in general level of fertility. According to tests, it is high in content of calcium, magnesium, and organic matter; medium in nitrogen; very low in phosphorus; and low in potash. Surface runoff is rapid, and internal drainage moderate to rapid. The water-holding capacity is fairly low because bedrock is at a relatively shallow depth. The native forest was a mixture of deciduous hardwoods and pine. The important species are shortleaf pine, post oak, locust, dogwood, and sourwood. In places there is an undergrowth of huckleberry, briers, weeds, and grasses.

Profile description:

0 to 4 inches, grayish-brown to brownish-gray gravelly loam; mellow and friable.
4 to 14 inches, yellowish-brown friable gravelly fine sandy loam or fine sandy clay.
14 inches +, partly disintegrated or weathered acidic and basic rocks with a small quantity of soil material intermixed.

Mica fragments are common throughout the soil. The content of stone varies. In some places stones practically prohibit cultivation, and in others they are much less abundant. The depth to bedrock ranges up to about 30 inches, but there are places where bedrock outcrops.

Use and management.—All of this phase is under native forest. Mainly because of shallow depth to bedrock, occasional outcrops, and steep slopes, it is poorly suited to either crops or pasture and should remain in forest.

Wilkes gravelly loam, eroded steep phase (WC).—Loss of 25 to 75 percent of its original surface soil through erosion differentiates this soil from the steep phase. Areas occupy benchlike positions on the upland in the intermountain plateau and are associated with other Wilkes soils. The soil is medium to strongly acid, low in content of plant nutrients, and poor in tilth. It has a low capacity for holding

water available to plants. Surface runoff is very rapid; internal drainage is moderate to rapid. The first few inches is yellowish-brown gravelly loam or clay loam consisting of remnants of the original surface soil mixed with part of the subsoil. In places gravelly material is so abundant that it practically prohibits tillage.

Use and management.—All of this soil has been cleared and cropped at some time, but it should be reforested. It is poorly suited to either crops or pasture because of its gravelly nature, shallow depth to bedrock, strong slope, and unfavorable moisture conditions.

Wilkes gravelly loam, severely eroded steep phase (WD).—Areas which were formerly Wilkes gravelly loam, steep phase, that have been severely eroded compose this soil. The plow layer consists almost wholly of subsoil material. Bedrock is at shallow depths, and rock outcrops are fairly common. The content of gravel varies widely but in places almost prohibits any kind of cultivation. Gullies are common; some of them are too long and deep to be obliterated by tillage. Surface runoff is very rapid; internal drainage, moderate to rapid. The soil is strongly acid and low in fertility. Areas are in the intermountain plateau section in association with other Wilkes soils.

Use and management.—All of this phase has been cleared and cropped at some time. Much of it is now open pasture (pl. 4, *C*). Chiefly because of its strong slope, gravelly nature, shallow depth to bedrock, and unfavorable moisture relations, it is poorly suited to either crops or pasture. Its best use is probably forest, and development of forest cover should be encouraged.

SOIL USE, MANAGEMENT, AND PRODUCTIVITY

In this section the soils of the county are grouped in five classes according to their suitability for agricultural use, and the soils of each class are placed in subgroups according to the management they require. Following the discussion of land classes and management groups are (1) a table listing suitable crops, rotations, and water-control measures; (2) another table giving fertilizer recommendations; and (3) discussions of water control on the land, general agricultural practices, and productivity.

LAND CLASSES AND MANAGEMENT GROUPS

According to their relative suitability for the agriculture now practiced, the soils of Buncombe County are placed in five land classes—First-, Second-, Third-, Fourth-, and Fifth-class soils. The soils of no one class are ideal for agriculture, but First-class soils more nearly approach the ideal than do Second-class soils, and, in like manner, the soils of each succeeding class are further from the ideal than those of the classes preceding.

Before soils can be placed in land classes, a rating of their suitability for agriculture must be made, and this is done by considering three major characteristics—workability, conservability, and productivity—that need definition.

Workability refers to the ease with which tillage, harvesting, and other field operations can be performed on a soil. Texture, structure, consistence, organic content, moisture conditions, stoniness, and slope are important characteristics that affect workability.

Conservability indicates the ease or difficulty of conserving the soil and maintaining its productivity and workability.

Productivity refers to the capacity of a soil to produce crops under prevailing management and under intensified management. A soil may be productive of a crop but not well suited to it because of poor workability, poor conservability, or both.

The relative suitability of a soil for agricultural use [5] is determined by considering all three factors in combination. A soil ideal for agriculture would therefore be high in workability, conservability, and productivity. It would be productive of a large number of important crops and easily worked, and it could be conserved with minimum effort. All soils of this county fall short of the ideal, but they differ widely in degree of shortcoming.

The relative suitability of the soils was determined on the basis of the experience of farmers, extension workers, experiment station personnel, vocational agriculture teachers, soil surveyors, and others who work with the soil. A farmer, for example, knows that some soils on his farm are more desirable for certain crops than others, and by gathering and evaluating information of this kind and making comparisons among farms, the soils were ranked as First-, Second-, Third-, Fourth-, or Fifth-class soils. Cattle are fairly important on many farms in this county; therefore, the suitability of soils for permanent pasture was considered in evaluating their suitability. Where information based on experience with a particular soil was lacking, that soil was ranked by comparing it with other soils of similar characteristics for which information was available.

Land classes express the relative suitabilities of soils for agriculture, but it does not follow that all soils in a given land class should have the same management. In fact, they may require widely different management because the three factors used in the evaluation differ. One soil may be high in productivity but hard to conserve; another, easy to conserve but low in productivity. Management practices must be designed to remedy the defects of the soil in question.

In the following pages each of the five land classes is discussed separately. Following the introductory discussion of each land class is a table that gives the soils the land class includes and the acreage of each soil in crops, idle cropland, open pasture, and forest. In the table the soils are grouped according to the management they require. For example, all First-class soils are listed in one table, and in this table all soils under the subheading Group 1–A require similar management. The nature of soils in group 1–A and the management they require are described following the table. The arrangement used for group 1–A is followed for all other management groups. The crops and rotations suitable for each management group are listed in table 9; fertilizer recommendations are given in table 10.

FIRST-CLASS SOILS

First-class soils are good to excellent for crops and very good to excellent for pasture. They differ somewhat in characteristics but are relatively similar in suitability for agriculture. Each is moderately

[5] The term "use" in this report refers to broad uses of soils, as for (1) tilled crops, small grains, and annual hay crops; (2) for permanent pasture; and (3) for forest.

well supplied with mineral plant nutrients, and in comparison with soils of the other classes, fairly high in natural productivity. Even the most fertile, however, will respond to additions of certain amendments for some crops.

All are well drained, yet they retain moisture fairly well and therefore tend to insure an even and generally adequate supply for plant growth. Good tilth is easily maintained, and the range of moisture conditions suitable for tillage is comparatively wide.

The soils are moderately well supplied with organic matter, and their physical properties favor movement of air and moisture and the free penetration of roots to all parts of the subsoil. None has any adverse condition or property, as stoniness or unfavorable relief. The problem of conserving fertility and soil material is relatively simple. Each soil is suitable for intensive use if special management practices are applied.

About 62 percent of the total acreage occupied by First-class soils is in crops, 11 percent is idle cropland, 13 percent is in pasture, and 14 percent is in forest. The First-class soils are listed by management groups in table 4, and the estimated percentage of each soil in crops, idle cropland, open pasture, and forest is given.

TABLE 4.—*First-class soils of Buncombe County, N. C., listed by management groups and the estimated percentage of each in crops, idle cropland, open pasture, and forest*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
GROUP 1–A:	*Percent*	*Percent*	*Percent*	*Percent*
Hayesville loam, undulating phase	15	10	5	70
Hiwassee clay loam, eroded undulating phase	90	10	----	----
Masada loam, undulating phase	65	20	5	10
GROUP 1–B:				
Altavista loam, undulating phase	80	10	10	----
State loam	75	10	5	10
Tate silt loam:				
Undulating phase	55	10	20	15
Rolling phase	50	15	15	20
Tusquitee loam:				
Undulating phase	50	5	25	20
Rolling phase	40	10	20	30
Eroded rolling phase	65	10	25	----
GROUP 1–C:				
Congaree fine sandy loam	75	10	15	----
Congaree silt loam	80	10	10	----
Congaree-Tate loams	70	15	15	----

MANAGEMENT GROUP 1–A

The undulating well-drained soils of management group 1–A have a firm subsoil and are deep over bedrock. They have a reddish subsoil that is permeable to roots and moisture and retains moisture for plant growth relatively well. Bedrock is 30 inches or more from the surface. None of these strongly acid soils contains stone or gravel in quantities sufficient to interfere with farming operations. Except for the

Hiwassee soil, they are easily worked and conserved. The surface layer of the Hiwassee soil contains enough clay to make tillage a little difficult, and some care must be taken in tilling it when moisture content is very high or very low. The Masada and Hiwassee soils are on high stream terraces, whereas the Hayesville is on uplands of the intermountain plateau.

Present use and management.—Except on the Hayesville soil, most of the acreage of soils in group 1–A is either cropped or pastured. Corn, small grain, hay, some truck crops, and a small acreage of tobacco are grown.

Crop rotations are not commonly practiced. Sometimes one row crop is alternated with another, but frequently one crop is grown several years in succession. The rotations that are used normally consist of a row crop grown the first year, small grain the next year, and then lespedeza or clover for 1 or 2 years. Potatoes and tobacco are row crops used in such a rotation, and rye or wheat are the more common small grains. Another rotation consists of alternate crops of corn and rye. Legumes in the rotation are beneficial in maintaining high crop yields.

The corn crop commonly receives 200 to 300 pounds of 16-percent phosphate or its equivalent an acre, and manure is added where available. Vegetable crops are fertilized fairly heavily, 400 to 600 pounds of 6–8–6 [6] or 5–10–5 being common treatment. Some farmers apply 1,000 to 2,000 pounds of lime an acre for truck crops other than potatoes. Usually little lime is used for other crops. No special practices for water control are used. The land is generally broken in spring for row crops, and the rows are often run without regard to the lay of the land. Sometimes the rows are laid approximately on the contour (without the use of a level).

Use suitability and management requirements.—The soils of group 1–A are well suited to practically all commonly grown crops and under proper management are well suited to intensive use. Properly managed they can be maintained at a high level of productivity, even under frequent use for row crops or in short rotations.

These soils respond well to liming and proper fertilization with nitrogen, phosphorus, and potash. Two tons of ground limestone an acre is a suitable initial application for alfalfa. Legumes aid in maintaining nitrogen and organic matter, especially if they are grown as green-manure crops. Crimson clover is particularly well suited as a cover crop to be turned under in spring. Boron deficiency is not uncommon on these soils, and boron applications should always be made for alfalfa. The findings of soil tests should be the basis for the quantity of boron added to fields for alfalfa or any other crop.

At least the more sloping areas should be tilled on the contour. Light to moderately heavy implements are satisfactory for tillage, although the Hiwassee soil is somewhat more difficult to till or plow than many of the more permeable soils. Where considerable organic matter is added, the tilth of Hiwassee soil should improve.

All of these soils are well suited to permanent pasture, but in order to maintain a vigorous vegetation for grazing, lime and phosphorus

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

and proper seeding are generally required. Where weedy or brushy growth encroaches, clipping is essential.

MANAGEMENT GROUP 1–B

The well-drained soils of group 1–B have a permeable subsoil. They are on colluvial slopes and low stream terraces, have gently sloping or smooth relief, and are deep to bedrock. They are moderately fertile to fertile but strongly acid. Moisture relations for crops are particularly favorable because these soils hold moisture available to plants during drier periods. No soil contains sufficient stone to interfere materially with cultivation.

Present use and management.—Soils of group 1–B are used mainly for crops; only small areas are in pasture or forest. Corn, small grains, hay, and truck crops are commonly grown. Truck crops are especially important, as they do well and Asheville affords a large market for fresh produce.

Regular rotations are not ordinarily practiced. Sometimes a row crop is grown several years in succession. Where rotations are used, the more common practice is to grow a row crop the first year, small grain the next year, and then lespedeza or clover for 1 or 2 years. A 2-year rotation of corn and rye, with crimson clover as a cover crop following the corn, is also used.

Corn generally receives 200 to 300 pounds of 18-percent phosphate or a low-grade complete fertilizer. For vegetable crops greater quantities of fertilizer are used, applications of 500 to 1,000 pounds of 6–8–6 or 5–10–5 being common. Some areas are treated with 1,000 to 2,000 pounds of lime an acre for all truck crops except potatoes. Little lime is used for other crops. No special water-control practices are used, and the land is usually broken late in spring for row crops.

Use suitability and management requirements.—The soils of group 1–B are productive, easily worked and conserved, and suitable for practically all crops grown in the county. They are well suited to intensive use for row crops if their fertility is maintained at a high level. The Altavista soil is especially well suited to early truck crops, and the State and Tusquitee to beans, tomatoes, and leafy vegetables. The Tate soils are somewhat less suited to truck crops but are well suited to small grains, beans, potatoes, corn, and legume-and-grass hay.

Although these soils are relatively fertile, they require some fertilization and addition of organic matter if their fertility is to be maintained at a high level. Lime is required, especially for the legumes and grasses and some of the truck crops. Special water-control practices are not necessary, and only the more sloping soils of the group require cultivation on the contour. Tillage is not difficult and usually can be done adequately with relatively light implements.

All of these soils are very productive of pasture, especially where they have been treated with proper quantities of lime and some phosphorus. Seeding may be required in places, and clipping is necessary where weedy or brushy growth has encroached.

MANAGEMENT GROUP 1–C

Group 1–C soils are nearly level well-drained loams on first bottoms. They are notably fertile, permeable, and strongly acid. Except dur-

ing periods of overflow, moisture relations are particularly favorable for practically all crops grown. Although flooding is a hazard to crops, it does benefit the soils by leaving fresh deposits of alluvium.

Present use and management.—Most of the acreage is cultivated, especially to corn and wheat. Less common are rye, oats, lespedeza, and tobacco. These soils are especially well suited to corn, truck crops, and hay and pasture.

No definite rotation is in common use, and in many areas corn is grown several years in succession. A 2-year rotation of corn and rye, with a cover crop of crimson clover following the corn, is sometimes used. In a few places small grains are cut for hay, and in others they are grazed or turned under as a green-manure crop to be followed by corn. Crimson clover is also used as a green-manure crop to be followed by corn on a few farms. Potatoes are followed by rye and lespedeza or clover for 1 or 2 years in a few places.

Little fertilization is practiced for corn. Potatoes and truck crops, however, are fertilized with 500 to 800 pounds of 5–10–5 or 6–8–6. Manure is seldom used, but lime is used for most truck crops other than potatoes. Where small grains are grown, 300 to 400 pounds of 18-percent phosphate fertilizer are commonly applied. No special water-control practices are followed, and the land is generally broken late in winter or early in spring.

Use suitability and management requirements.—Because of their smooth surface, relatively high fertility, and permeability, the soils of group 1–C are well suited to intensive use. They are easily tilled and conserved. Most areas are small, and the acreage on any one farm is generally limited. For this reason, it is considered a good practice to use these soils intensively for row crops, thereby leaving the more sloping upland soils for longer rotations and permanent pasture.

Lime is required for legumes and vegetables other than potatoes. Although these soils are fertile, practically all crops can be expected to respond to at least moderate applications of fertilizer. Special practices for controlling runoff water are not required, and heavy tillage implements are not necessary, as the soils are easily tilled.

All of these soils are productive of good quality pasture, although the more sandy type is somewhat less so than are the finer textured types. Pasture can be expected to respond to lime and fertilizer.

SECOND-CLASS SOILS

Second-class soils are fair to good for crops and fair to very good for pasture. They are more diverse than First-class soils. Among themselves they differ greatly in productivity, workability, and conservability, but each soil is moderately deficient in one or more characteristics important in determining these three conditions. This deficiency is detrimental to the physical suitability of the soil for agricultural use. Second-class soils therefore are not so good for agriculture as any of the First-class soils but better for that purpose than any of the Third-class soils.

About 46 percent of the acreage of Second-class soils is used for crops, 12 percent is idle cropland, 14 percent is open pasture, and 28 percent is under forest. The Second-class soils are listed by management groups in table 5, and the estimated percentage of each soil in crops, idle cropland, open pasture, and forest is given.

TABLE 5.—*Second-class soils of Buncombe County, N. C., listed by management groups and the estimated percentage of each in crops, idle cropland, open pasture, and forest*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
GROUP 2–A:	*Percent*	*Percent*	*Percent*	*Percent*
Altavista loam, eroded rolling phase	85	15	----------	--------
Balfour loam:				
Rolling phase	----------	5	----------	95
Eroded rolling phase	50	15	35	--------
Fletcher silt loam:				
Rolling phase	5	----------	----------	95
Eroded rolling phase	30	15	55	--------
Hayesville loam, rolling phase	10	5	10	75
Hayesville clay loam, eroded rolling phase	65	20	15	--------
Hiwassee clay loam, eroded rolling phase	75	25	----------	--------
Masada loam:				
Rolling phase	75	5	10	10
Eroded rolling phase	90	5	5	--------
GROUP 2–B:				
Balfour fine sandy loam, rolling phase	5	5	----------	90
Edneyville fine sandy loam	40	35	----------	25
GROUP 2–C:				
State gravelly loam	60	15	15	10
Tusquitee stony loam:				
Rolling phase	25	5	10	60
Eroded rolling phase	50	15	35	--------
Undulating phase	30	5	15	50
GROUP 2–D:				
Chewacla silt loam	75	10	5	10
Chewacla fine sandy loam	80	10	10	--------
Toxaway silt loam	20	20	50	10

MANAGEMENT GROUP 2–A

The soils of group 2–A are rolling well-drained loams, silt loams, and clay loams with firm subsoil. The Fletcher soils, however, have a somewhat more open or permeable subsoil. All are strongly acid and moderately fertile. They are moderately deep over bedrock and hold moisture available to crops fairly well. Most of their acreage is in the upland part of the intermountain plateau; the rest is on high stream terraces.

Present use and management.—The soils of group 2–A are used for general farming. Corn, small grains, and lespedeza are the chief crops.

Systematic rotations are not commonly followed, but a rotation of corn, small grain, and 2 years of lespedeza is used on a few farms. Where this rotation is used, the first crop of lespedeza is cut for hay; the second is used for seed and the residue is turned under or grazed. In a few places, corn, followed by a cover crop of crimson clover, is grown several years in succession.

Corn is commonly fertilized with 200 to 400 pounds an acre of 5–10–5 mixture, or its equivalent, and sometimes a side dressing of

100 to 300 pounds of 16–0–0 is used. Available manure is added to land for corn in spring. Small grains commonly receive about 300 pounds of 18-percent phosphate fertilizer an acre at the time of seeding in fall. Many farmers make an additional application of nitrogen fertilizer as a top dressing in spring following seeding. A few farmers apply a small quantity of lime to cornland. The land is commonly plowed in spring, and little tillage is done on the contour.

Use suitability and management requirements.—The soils of group 2–A are considered well suited to most general farm crops grown in the county, including corn, wheat, barley, alfalfa, clover, and grass. Observations indicate they are also well suited to apples. Mainly because of their rolling relief, moderately long rotations (4 to 5 years) are required. A rotation of corn, small grain, and 2 years of lespedeza is suitable where adequate fertilization and proper tillage practices are followed. A rotation of corn, small grain, 1 year of lespedeza, and 4 years of alfalfa is well suited. These soils are too rolling for frequent growing of row crops but are sufficiently productive to be useful as cropland where livestock farming is practiced. Alfalfa is therefore thought to be one of the best crops.

If productivity is to be maintained at a high level, the soils must be fertilized and limed, and organic matter added regularly. Where alfalfa or other legume hays are grown, 2 tons of ground limestone an acre and applications of phosphate and potash are particularly required. Regular applications of boron may be necessary.

Tillage operations are somewhat more difficult on these soils than on First-class soils because slopes are stronger and the plow layer of the eroded phases is generally firm. Some care is required in tilling, for these eroded soils are inclined to puddle and thereby lose their favorable structure and tilth. All tillage should be on the contour because of the rolling relief, and in places strip cropping may be practical. Terracing may be feasible under some conditions, but before it is undertaken the advice of the county agricultural agent should be sought.

All of these soils are well suited to permanent pasture. They are generally needed for crops, however, because soils suited to crops are limited on most of the farms. Moderate applications of lime and phosphorus, proper seeding, and the clipping of weeds and brushy growth are important requirements for establishing and maintaining good pasture.

MANAGEMENT GROUP 2–B

The soils of group 2–B are rolling well-drained fine sandy loams with moderately firm subsoil. They are in the upland part of the intermountain plateau. They have a moderate depth to bedrock and absorb and hold moisture well. The fertility and organic-matter content are moderately low. These strongly acid soils are easily worked and conserved, although their rolling surface makes the use of large machinery somewhat more difficult than on more gently sloping soils and requires measures to retard runoff. Sandiness makes tillage easy and allows cultivation under a wide range of moisture conditions.

Present use and management.—The soils of group 2–B are used for general farming. Corn, small grains, and lespedeza are the chief crops; some truck crops are grown.

The rotations most frequently followed consist of corn, small grain, and lespedeza for grazing or hay. Corn followed by crimson clover is also a common rotation. In some places one row crop follows another without any cover or sod crop.

Land for corn is treated with 200 to 400 pounds of 5–10–5 or similar fertilizer, and sometimes a top dressing of 100 to 300 pounds of 16–0–0 is added. Where available, manure is applied to the cornland in spring. If manure is used, less mixed fertilizer is applied. Small grains receive about 300 pounds of 18-percent phosphate fertilizer, or its equivalent, an acre. Truck crops receive fairly heavy applications, generally 600 to 1,200 pounds of 4–10–6 or 6–8–6.

These soils are usually plowed in spring, and most tillage is carried on without much regard for the contour. A few farmers, however, practice contour cultivation on all fields.

Use suitability and management requirements.—Soils of group 2–B are considered suitable for practically all crops commonly grown, including tobacco and many truck crops. They are of special value for root crops because of their friable open nature, and potatoes grown on them are generally of much better than average quality. Because of their rolling surface, rotations of moderate length (3 to 5 years) are required if productivity of the soils is to be maintained. Moderate applications of lime and regular additions of fertilizer and organic matter are necessary to maintain a high state of fertility.

Pasture is productive when limed, seeded, and properly fertilized, especially with phosphorus. The soils are not so desirable for pasture, however, as are many of the finer textured soils, particularly those of groups 1–A, 1–B, 1–C, and 2–A.

MANAGEMENT GROUP 2–C

Group 2–C comprises undulating and rolling stony soils with permeable subsoil. Stones are present in quantity sufficient to interfere with field operations, but in other features these fertile soils are favorable for tilled crops. They consist of colluvial and alluvial materials and are deep over bedrock. Their position, along with favorable consistence and texture, gives them moisture relations favorable for both crops and pasture. The problem of conserving against losses through runoff is not great.

Present use and management.—Corn, hay, and grass for pasture are the principal crops. Where the stones are less abundant or have been removed, the soils are well suited to potatoes and some other truck crops, tobacco, small grains, and other general farm crops.

Regular rotations are not commonly practiced. In places the same row crops are grown year after year. A few farmers alternate crops to some extent. Where the rotation is potatoes or tobacco followed by rye or wheat, lespedeza or clover follows for 1 or 2 years. Another rotation used to some extent is corn followed by tobacco, after which rye is seeded to lespedeza or clover.

Corn commonly receives 200 pounds of 18-percent phosphate or low-grade fertilizer an acre and may be side-dressed with 100 to 200 pounds of 16–0–0. Some manure is added where it is available. Vegetable crops are fertilized fairly heavily—500 to 800 pounds of 6–8–6 or 5–10–5 being the usual treatment. The soils are usually plowed

or broken in spring for row crops. Small grains are sown in fall. Seedbeds for these crops do not receive much preparation, and contour cultivation is not practiced.

Use suitability and management requirements.—Except for their stoniness, these soils are well suited to intensive use for row crops, including potatoes and other truck crops. Because of the stones, much of the acreage may be best used for corn and grazing. Land suitable for crops is limited in most communities, however, and therefore removal of the stones by hand may be worth while.

In order to make a greater acreage of these soils available for crops, rotations of moderate length (3 to 4 years) are required, especially on the more sloping parts. A rotation of corn followed by grass-and-clover meadow for 3 to 5 years is well suited. Where the stones are less abundant or have been removed, growing of green beans, cabbage, peppers, potatoes, or other truck crops and following with rye, corn, and meadow has been found a practice well suited to soils of this nature in adjacent counties.

Fertilization and liming must be practiced regularly to maintain a high level of fertility. Lime and phosphorus are the chief amendments required for alfalfa, red clover, and like crops.

These soils are well suited to pasture if limed and fertilized. They have moisture relations favorable for prolonged grazing. Lime and phosphorus should improve grazing. Clipping weeds and brushy growth, though it may be difficult on such stony soils, can be expected to help maintain vegetation of good quality.

MANAGEMENT GROUP 2–D

These imperfectly drained soils of group 2–D are on first bottoms. They are nearly level, fertile, moderately deep to gravel or bedrock, subject to overflow, and strongly acid. The surface layers are relatively high in organic matter, and the sublayers are moderately friable or friable. All the soils retain plant nutrients well. Except during periods of high water they have favorable moisture relations for many crops and pasture if they are artificially drained. Although floodwaters are a hazard to crops, they are beneficial to the extent that they aid in maintaining fertility.

Present use and management.—Practically all the acreage of group 2–D soils is used for crops, principally corn and hay. Some truck crops are grown. Short rotations or continuous use for row crops is the common practice. Heavy applications of fertilizer are made for truck crops; smaller quantities are applied for some other crops. Part of the acreage has been improved by artificial drainage. Some land is drained by open ditches, some by covered or boxed ditches, and a little by tile. Stream channels have been straightened in a few areas to remove runoff more rapidly.

Use suitability and management requirements.—Increased internal drainage is the chief requirement for improving the productivity of group 2–D soils. In the natural state of drainage, much of the acreage is well suited to corn, soybeans, and moisture-tolerant clovers and grasses. Areas well drained by artificial means are well suited to the crops just mentioned and to a variety of truck crops, including potatoes and green beans.

Many of the truck crops, as well as the clovers and grasses, respond well to lime and fertilization, especially with phosphorus and potash. Addition of organic matter is less required than for other soils suited to crops. Care must be taken in working these soils, for their tilth becomes unfavorable if they are cultivated when wet.

Pasture is of good quality where drainage is adequate and lime and phosphorus have been applied. Weeds and brush require clipping if a good vegetation for grazing is to be maintained. Although these soils produce good pasture, most of them probably should be used for row crops. There are extensive areas of other soils suited to pasture but poorly suited to crops, whereas soils well suited to intensive cultivation are limited.

THIRD-CLASS SOILS

Third-class soils are poor to fair for crops and fair to good for pasture. They are less suitable for the commonly grown crops than First- and Second-class soils but more favorable than the Fourth- and Fifth-class soils.

About 29 percent of the total acreage of Third-class soils is cropped, 15 percent is idle cropland, 25 percent is open pasture, and 31 percent is under forest. The Third-class soils are listed by management groups in table 6, and the estimated percentage of each soil in crops, idle cropland, open pasture, and forest is given.

TABLE 6.—*Third-class soils of Buncombe County, N. C., listed by management groups and the estimated percentage of each in crops, idle cropland, open pasture, and forest*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
GROUP 3-A:	*Percent*	*Percent*	*Percent*	*Percent*
Ashe loam, eroded hilly phase	----	20	80	----
Porters loam, eroded hilly phase	35	10	30	25
Tusquitee stony loam:				
Hilly phase	25	5	15	55
Eroded hilly phase	60	30	10	----
GROUP 3-B:				
Halewood loam, hilly phase	5	----	----	95
Hayesville loam, hilly phase	5	----	5	90
Rabun clay loam, eroded hilly phase	30	30	15	25
GROUP 3-C:				
Ashe stony loam, rolling phase	10	10	10	70
Fletcher slaty silt loam, eroded rolling phase	15	35	45	5
Hayesville stony loam, rolling phase	5	5	----	90
Hayesville stony clay loam, eroded rolling phase	45	20	35	----
Masada gravelly loam:				
Rolling phase	60	10	20	10
Eroded rolling phase	60	15	25	----
GROUP 3-D:				
Warne silt loam	25	20	40	15
GROUP 3-E:				
Buncombe loamy fine sand	45	15	30	10
Buncombe gravelly loamy fine sand	35	15	40	10

MANAGEMENT GROUP 3-A

The soils of group 3–A are hilly and though moderately deep to bedrock are not so deep as many smoother soils. They are notably permeable and hold plant nutrients and moisture for growing crops. They are strongly acid and low to moderately high in fertility. Stones interfere with cultivation only on the Tusquitee soils. Much of the acreage is at moderately high to high elevations in the mountainous part of the county.

Present use and management.—Part of the acreage of group 3–A soils has never been cleared. Some areas are used for permanent pasture and crops. Corn, rye, truck crops, and clovers and grasses for meadow and pasture are all grown. Cabbage, green beans, and potatoes are the main truck crops.

Three of the more common rotations are (1) corn the first year, clover and grass for 2 years, and then cabbage or potatoes for 1 year; (2) corn the first year, snap beans followed by rye the second year, clover for 2 years, and cabbage the last year; and (3) corn the first year, followed by rye, then grass and clover for 2 years, and potatoes, cabbage, or beans the last year.

Lime is commonly applied to all truck crops except potatoes. The rate of application is 800 to 1,000 pounds of 6–8–6, 5–10–5, 8–8–8, or the equivalent in other mixtures. Manure is applied to cornland, much of it being placed on the more eroded or galled spots. Some well-rotted manure is used for cabbage, and a little for potatoes. Corn receives some fertilizer unless it is grown in rotation with truck crops. Little lime or fertilizer is applied to pasture.

Use suitability and management requirements.—Strong slopes make soils of group 3–A unsuitable for short rotations or intensive production of row crops. Their steepness makes them hard to work, and runoff is difficult to control where close-growing crops do not dominate in the rotation. Tilth is good, and the soils can be worked under a comparatively wide range of moisture content. Moderate to long rotations of fall-sown small grains, clovers, grasses, alfalfa, and other close-growing crops that survive the winter are well suited.

On farms having enough acreage of soils better suited to tilled crops, these hilly soils are probably best used for permanent pasture of clover and grass. Corn, potatoes, snap beans, and other row crops can be grown where necessary, but the soils cannot be maintained if such crops are grown oftener than once in 4 or 5 years. Apples are well suited if the soils are fertilized and runoff control is adequate.

Manure brings good response, especially on the more eroded or galled spots. About 1½ tons of lime an acre is required during each rotation for good yields of legumes, grasses, and most truck crops. Phosphorus and potash ordinarily bring a good response. Some pastures may be deficient in potash. If legumes are abundant in the crop rotation or in the permanent pasture, applications of nitrogen are not so necessary. These soils are relatively porous, and therefore plant nutrients probably leach out rapidly. Consequently, fertilizer should be added in two light applications rather than a single heavy one.

All field operations, especially those concerned with tillage, should be on the contour. Strip cropping is probably of value on longer slopes.

All the soils are well suited to pasture, but they require liming and fertilization, especially with phosphorus, if a luxuriant and desirable pasture vegetation is to be established. Weedy and brushy growth develops in most places but can be reduced by clipping.

MANAGEMENT GROUP 3–B

The well-drained soils of group 3–B are hilly, moderately deep to bedrock, firm in the subsoil layers, and more slowly permeable than the hilly Ashe, Porters, and Tusquitee soils of group 3–A. The general level of fertility is moderately high. All except the Rabun soil have good tilth. The Rabun soil is more difficult to till than the others because it has a firmer or heavier plow layer. Runoff is rapid, but all the soils rate fairly well in holding plant nutrients and moisture available to crops.

Present use and management.—The Halewood and Hayesville soils of this group are almost entirely under native forest, and some of the Rabun soil is idle. The cultivated areas are used chiefly for corn, small grains, and hay.

Use suitability and management requirements.—Strong slopes and slow permeability are the main factors making soils of group 3–B unsuitable for short rotations or intensive use for row crops. Their hilliness makes them hard to work, and control of runoff is difficult where close-growing crops do not dominate in the rotation. The tilth of the uneroded acreage is good, but tilth is somewhat unfavorable where the subsoil is within plow depth. This condition prevails in the Rabun soil and in eroded parts of others in this group. Cultivation of these eroded areas when wet may develop extremely unfavorable structure or tilth.

Long rotations of fall-sown small grains, clovers, grasses, alfalfa, and other close-growing crops that survive the winter are well suited. On farms having enough land better suited to tilled crops, these hilly soils are probably best used for permanent pasture of clover and grass. Corn, potatoes, green beans, and other row crops can be grown, but productivity of the soils cannot be maintained if a row crop is used more than once in a 5- or 6-year rotation.

Manure brings a good response, especially on the more eroded or galled spots. About 2 tons of lime an acre is required for good yields of legumes, grasses, and most truck crops. The response to phosphorus and potash is ordinarily good. Where legumes are abundant in the rotation or pasture, applications of nitrogen are not so necessary. Tillage should be on the contour. Strip cropping may be a feasible aid in controlling runoff on longer slopes.

MANAGEMENT GROUP 3–C

Group 3–C soils differ from those of group 1–A chiefly in containing enough stone or gravel to interfere with tillage. They have rolling relief and firm subsoils, but the Ashe and Fletcher soils have somewhat more open or permeable subsoil than the rest. All are well drained, strongly acid, moderately fertile, moderately deep over bedrock, and fairly good in holding moisture available to crops. Most of the acreage is on the intermountain plateau; the Ashe soil, however, is in high parts of the mountains.

Present use and management.—Soils of group 3–C are used for corn, small grain, lespedeza, clover, grass, and other general farm crops. Systematic rotations are not usually practiced, but a sequence of corn, small grain, and lespedeza is used to some extent.

The most common amendment is 18-percent superphosphate, which is applied at the rate of 200 to 300 pounds an acre for corn and at the rate of 300 to 400 pounds an acre for small grains. Corn is side-dressed with 16 to 32 pounds of nitrogen an acre; manure is applied to galled spots and to cornland in general. Little lime is used.

No special tillage practices are employed, and the land is generally broken late in winter or early in spring. Hillside ditches of too steep decline are established in some fields. Contour tillage is practiced in a few places.

Use suitability and management requirements.—Soils of group 3–C are suited to general farm crops, but stoniness makes tillage and other field work difficult. Truck and other crops requiring intensive cultivation therefore are not well suited. Small grains, legumes, and grasses are among the better suited crops. Many tree fruits, apples especially, can be grown.

Rotations lasting 4 to 6 years are best. A suitable rotation consists of corn the first year, small grain the second, and clover-and-grass meadow for 2 years. Another suitable rotation is corn the first year, small grain the second year, lespedeza following the small grain, and alfalfa for 3 years. In areas where erosion is most difficult to control it may be best to substitute barley for corn, providing the fertility of the soil is high enough.

When crop rotations such as those previously mentioned are adequately fertilized and properly cultivated, the organic-matter content and moisture-absorbing capacity of the soils can be increased and runoff held in check. All the soils require lime and some fertilizer, particularly phosphorus, if they are to produce good yields.

Supplementary practices to control runoff are necessary, especially on the more sloping and eroded areas. Tillage should be on the contour for most of the acreage, strip cropping may be possible in many areas, and terracing may be feasible. Before deciding to terrace, however, farmers should consult the county agricultural agent.

Plowing for corn should generally be done in spring. The soils can be plowed in other seasons, provided they are not worked down but left rough through the winter. Eroded areas, especially those on Hayesville soils, must be carefully cultivated, for they puddle easily if worked too wet and break to a coarse cloddy mass when plowed too dry.

All soils of this group are well suited to pasture, but liming and fertilization, especially with phosphorus, are required to establish a good stand of desirable forage. Weeds and brush are detrimental to pastures in most places but can be controlled by adequate clipping.

MANAGEMENT GROUP 3–D

Warne silt loam, the only member of group 3–D, lies on low stream terraces. It has nearly level relief, a tight or compact subsoil, and very retarded internal drainage. It is strongly acid and low in plant nutrients.

Present use and management.—Corn is the dominant crop, hay crops are next in importance, and pasture occupies much of the acreage.

Use suitability and management requirements.—The compact subsoil and low fertility of Warne silt loam limit its range of suitability for crops and its productivity. During wet periods it contains excessive moisture, and in dry periods the supply of moisture held available to plants soon becomes limited.

Improved internal drainage and additions of fertilizer, lime, and organic matter are needed to bring productivity to a high level. Where drainage is not improved, redtop, timothy, lespedeza, and some clovers are suited. If drainage is improved artificially and lime and fertilizer are applied, moderately short rotations made up of corn, small grains, and hay crops are suited.

Open ditches are the best practical means of drainage. The subsoil is too tight for effective tile drainage. In fact, the subsoil is so compact that alfalfa, tobacco, truck crops, and tree fruits are not suited even to the drained areas.

Runoff may cause erosion on the more sloping parts. Excess water and the unfavorable soil consistence greatly limit the periods during which cultivation can be done. The plow layer puddles or becomes cloddy if tilled when too wet, and cultivation is extremely difficult when the soil is too dry.

This soil is productive of pasture when properly limed and fertilized. Artificial drainage is not so valuable for pasture as it is for tilled crops.

MANAGEMENT GROUP 3–E

The soils of group 3–E are on first bottoms, usually near stream channels, and are subject to overflow. They are very sandy and open, or loose. They are nearly level to gently undulating, strongly acid, and low in content of plant nutrients and organic matter.

Present use and management.—Much of the acreage of group 3–E soils is cleared, and about half of the land cleared is cropped. Corn, truck vegetables, and some hay crops occupy much of the tilled acreage; most of the rest is in pasture. Systematic crop rotations are not commonly practiced.

Use suitability and management requirements.—The soils of group 3–E are moderately suited to corn, truck vegetables, other row crops, some hay crops, and crops used for winter grazing. Heavy fertilization, applications of organic matter, and some liming are required for good yields. Green-manure crops and legume cover crops turned under are especially valuable. The nutrients these crops contain leach out more slowly than do those in commercial nitrogen fertilizer. Furthermore, the organic matter from these crops improves the soils in capacity to hold plant nutrients and water.

Fertilizer should be applied frequently in small quantities to keep the loss through leaching at a minimum. Where fertility is held at a high level, either short crop rotations or continuous use for row crops is feasible. These soils are less suited to permanent clover-and-grass pasture than many of the finer textured ones. The sod does not develop so well, and the stand soon dies during dry weather.

Tillage and cultivation are extremely easy, and weeds can be eradicated much more easily than on more productive soils. Erosion pre-

sents no problems, but some scouring occurs during overflows. Flooding is a hazard, however, and crops are commonly damaged once in every 4 or 5 years.

FOURTH-CLASS SOILS

Fourth-class soils are very poor to poor for crops but fair to very good for pasture. In general, conditions of natural productivity, workability, and conservability are such that crops requiring tillage are poorly suited. Nonetheless, the soils are productive enough to be useful for pasture. In natural fertility and capacity to hold moisture available for plants, they are fair to very good. Steep slopes, compact soil material, shallow depth to bedrock, and large content of stone or rock outcrops are the chief factors making these soils poorly suitable for crops. Some soils of this group have only one of these unfavorable characteristics; others have two or more.

The Fourth-class soils are listed by management groups in table 7, and the estimated percentage of each soil in crops, idle cropland, open pasture, and forest is given.

MANAGEMENT GROUP 4–A

Soils of group 4–A are predominantly steep and moderately shallow to bedrock. They have a loam or stony loam surface layer, are notably permeable, and are fair to moderate in fertility. All are in the upland part of the mountain section at higher elevations than soils in the upland part of the intermountain plateau.

Present use and management.—Practically the entire acreage of group 4–A soils is under forest. Mainly because of strong slopes, they are difficult to work and conserve. They should not be cleared for crops, but, except for the steepest parts that are shallow to bedrock, much of their acreage is fair to good for pasture.

Use suitability and management requirements.—Areas of group 4–A soils cleared for pasture should receive an initial application of 2 tons of ground limestone an acre and then 1 ton every 4 or 5 years. From 75 to 100 pounds of phosphoric acid an acre applied at seeding time and a like application every 3 years will be of great value in establishing and maintaining a good clover-and-grass sod. Potash generally aids greatly in developing and maintaining good grazing vegetation.

The application of fertilizer and lime to steep soils entails considerable work. It is difficult to get the materials to the fields and hard to distribute them. High-grade fertilizer is therefore preferable. When phosphate is to be applied, 45-percent triple superphosphate is much better than lower grade materials. Only 175 to 225 pounds of 45-percent triple phosphate is required to get an application of 75 to 100 pounds of acid phosphate an acre, whereas 500 to 600 pounds of 18-percent phosphate would have to be applied.

Where it is necessary to use these soils for crops, rotations must be long, fertilization adequate, and tillage practices appropriate. Corn, wheat or rye, and 5 or 6 years of grass-legume hay or pasture is one of the more suitable rotations. Tillage should be on the contour, and strip cropping may be practical. The more galled or thinner spots may require special attention, and many of them are probably best kept under permanent sod.

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TABLE 7.—*Fourth-class soils of Buncombe County, N. C., listed by management groups and the estimated percentage of each in crops, idle cropland, open pasture, and forest*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
GROUP 4–A:	*Percent*	*Percent*	*Percent*	*Percent*
Ashe loam, steep phase	---	---	40	60
Burton stony loam	---	---	10	90
Porters loam, steep phase	---	5	5	90
Porters stony loam, steep phase	---	---	5	95
GROUP 4–B:				
Fletcher silt loam, hilly phase	---	---	5	95
Fletcher slaty silt loam, hilly phase	---	---	---	100
Halewood loam, steep phase	---	---	---	100
Halewood stony loam:				
Hilly phase	5	---	5	90
Steep phase	---	---	---	100
Hayesville loam, steep phase	---	---	5	95
Hayesville stony loam, hilly phase	---	---	5	95
Iredell-Halewood stony loams, hilly phases	5	40	15	40
GROUP 4–C:				
Ashe stony loam, eroded hilly phase	5	---	85	10
Porters loam, eroded steep phase	5	5	90	---
Porters stony loam:				
Eroded steep phase	5	10	85	---
Eroded hilly phase	20	20	45	15
GROUP 4–D:				
Balfour clay loam, severely eroded rolling phase	30	45	25	---
Fletcher silt loam, eroded hilly phase	55	20	25	---
Fletcher silty clay loam, severely eroded hilly phase	15	45	40	---
Fletcher slaty silt loam, eroded hilly phase	10	45	45	---
Halewood loam:				
Eroded hilly phase	35	20	45	---
Eroded steep phase	20	15	65	---
Halewood stony loam:				
Eroded hilly phase	25	10	65	---
Eroded steep phase	10	5	85	---
Hayesville clay loam:				
Eroded hilly phase	55	20	25	---
Severely eroded rolling phase	30	45	25	---
Eroded steep phase	40	10	50	---
Hayesville stony clay loam, eroded hilly phase	30	25	45	---
Hiwassee clay loam, eroded hilly phase	65	10	25	---
Masada loam, eroded hilly phase	80	10	10	---
GROUP 4–E:				
Stony colluvium (Tusquitee soil material)	15	10	30	45
GROUP 4–F:				
Wehadkee silt loam	---	---	80	20

MANAGEMENT GROUP 4–B

Soils of group 4–B are hilly to steep and moderate or somewhat shallow in depth to bedrock. They have a loam, stony loam, silt loam, or slaty silt loam surface layer and a firm predominantly reddish sub-

soil. They are moderately permeable but less so than soils of group 4–A. All are moderately fertile and moderately to strongly acid. They occur entirely in the upland part of the intermountain section at elevations less than those of soils in the upland part of the mountain section.

Present use and management.—Group 4–B soils are almost entirely under forest. Chiefly because of their strong slope, they are more difficult to work and conserve than soils of group 4–A. Also, erosion is generally more active on these soils because they are firmer and have a more slowly permeable subsoil. Stoniness adds to the difficulty of tillage.

Use suitability and management requirements.—Soils of group 4–B should not be cleared for crops, but much of their acreage will produce fair to good pasture under careful management. Areas cleared for pasture should receive 2 tons of ground limestone an acre the first application and then 1 ton an acre every 4 or 5 years. From 75 to 100 pounds of phosphoric acid an acre applied at seeding time and a like application every 3 years will help establish and maintain a good clover-and-grass sod. Potash may aid materially in developing and maintaining a good stand of vegetation. Nearly all the fertilizer must be applied by hand. Therefore, high-analysis phosphate fertilizer is preferred for these steep soils because it weighs less per unit of nutrient.

If use of these soils for crops is necessary, the rotation must be long, fertilization adequate, and tillage practices appropriate. A rotation of corn, wheat or rye, and 5 or 6 years of grass-legume hay or pasture is most nearly suitable. Field operations should be on the contour; strip cropping may be practical. The more galled or thinner spots may require special attention, and many of them are best kept under permanent sod.

MANAGEMENT GROUP 4-C

The soils of group 4–C occupy areas where the soils were in group 4–A before they were cleared and eroded. They have hilly to steep slopes, loam and stony loam surface layers, and moderately shallow depth to bedrock. They are permeable, moderately to strongly acid, and low to moderate in fertility. All are in the mountain section; they lie at higher elevations than soils of the upland part of the intermountain plateau section. Because of erosion, the soil of the plow layer now consists of remnants of the original surface soil mixed with upper subsoil and materials.

Present use and management.—All the soils of group 4–C have been cleared. Much of the acreage is pastured, most of the rest is cropped, and a small part is idle. Corn and hay are the main crops. A common practice is to grow corn for 1 year, and then grass and legumes for hay or pasture for several years. Some farmers grow corn and small grains; a few add lespedeza to extend the rotation to 4 or 5 years. Lime is commonly applied to hay or pasture. Some manure is used, especially on the more eroded or galled parts. Plowing is generally done in spring; a few farmers practice some form of strip cropping. Hillside ditches have been built in places, but many of them are so steep they are virtually active gullies.

Use suitability and management requirements.—Soils of group 4–C are difficult to work and conserve, mainly because of their strong slopes. Stoniness adds to the difficulty of tilling some of them, and much of the cultivation must be done by hand. Many areas will produce fair to good pasture. Some parts deeper to bedrock and less steep are suitable for apples, cherries, and other tree fruits. Where land is required for corn or other row crops, those crops should be grown in a rotation with rye or wheat followed by a grass-legume mixture grown for hay or pasture. In this rotation the sod crop should last 3 to 5 years.

Lime and fertilizer, especially phosphorus, are needed to maintain good pasture, row crops, or small grains. Manure is particularly useful in improving the productivity of galled spots. High-analysis fertilizer is especially useful on these steep soils because less labor is required to apply it. Phosphorus can be applied in the form of 45-percent triple superphosphate much more easily than in the form of 18-percent phosphate. All cultivation should be on the contour; strip cropping is advantageous where the lay of the land permits.

MANAGEMENT GROUP 4-D

The soils of group 4–D occupy areas where the soils were in group 4–B before they were cleared and eroded. Slopes range dominantly from hilly to steep, although a small acreage is rolling. All the soils have been eroded to such extent that the plow layer is entirely subsoil material or a mixture of the original surface soil with subsoil material. In texture the surface layers range from loam to clay loam and, in many of the soils, they are stony. The subsoils, predominantly firm and reddish, are moderately permeable but less so than corresponding layers in soils of groups 4–A and 4–C. Soils of group 4–D are medium to strongly acid and low to moderate in fertility. The more eroded parts have poor tilth and low water-holding capacity. All soils of the group are in the upland part of the intermountain plateau and consequently at lower elevations than soils of the upland part of the mountain section.

Present use and management.—All the soils of group 4–D have been cleared. Much of the land is in pasture, some is cropped, and the rest is idle. Corn, small grains, and hay are the principal crops. Corn is commonly alternated with small grains or grass and legumes grown for hay or pasture. A few farmers use a 4- or 5-year rotation of corn the first year, small grain the second, and lespedeza for 2 or 3 years. Where legumes and grasses follow a small grain, they are sown in the small grain in spring. Some farmers apply 1 to 2 tons of lime an acre every 4 or 5 years. Manure is especially valuable to these eroded soils and is used in some areas.

Most plowing is done in spring. Some farmers practice a form of strip cropping. A few hillside ditches have been built, but many of them are so steep they are virtually gullies.

Use suitability and management requirements.—Because of strong slopes, stoniness, or erosion, or a combination of these, these soils are poorly suited to crops. Most of the acreage is productive enough for use as pasture. Some parts deeper to bedrock and less steep are suitable for apples, cherries, and like tree fruits.

Because soils of this group have firmer subsoil than those of group 4–C, they absorb water more slowly and therefore require more careful management to control runoff. It is more important to maintain a good vegetative cover, and sod crops should make up the greater part of the rotation in areas that must be used for tilled crops. Cultivated areas should be used in a rotation consisting of a row crop for 1 year, small grain the next year and, seeded in the small grain, a grass-legume for hay or pasture that remains for 5 or 6 years.

Lime and fertilizer, especially phosphorus, are necessary for good yields of pasture, row crops, and small grains. Manure is especially valuable because it improves tilth, moisture-holding capacity, and fertility. Much effort is required in applying amendments to these soils. Use of high-analysis fertilizer is therefore distinctly advantageous. For this reason, 45-percent (or higher, if available) phosphate material is preferred to that of lower analysis. All cultivated land should be tilled on the contour, and strip cropping is best where the slope permits.

MANAGEMENT GROUP 4-E

Group 4-E consists of one mapping unit—Stony colluvium (Tusquitee soil material). This land is made up of alluvium and colluvium so stony that use for tilled crops is not suitable. It is nearly level to strongly sloping, well drained, fairly high in fertility, permeable, and moderately to strongly acid.

Present use and management.—Much of this land is under forest; most of the rest is pastured or cropped. A few areas are used as a source of gravel and stone for road construction or for dwellings and other buildings.

Use suitability and management requirements.—Stony colluvium (Tusquitee soil material) is usually best for pasture or forest. The most stony parts, however, are of little value for pasture. Grass and legumes ordinarily grow well on all but the stoniest parts, but the stand varies according to the content of rock fragments. Moisture relations are comparatively favorable. In the least stony parts application of lime and fertilizer may be justified by improvement in the pasture.

If the less stony areas are needed for crops on farms where better soils are not available, they should be used only for those crops that can be tended with hand tools and that do not require mowing or reaping. Row crops, chiefly corn, are therefore best. Areas not especially subject to erosion can be used continuously for intertilled crops for long periods, provided enough fertilizer is applied. The value of many tilled areas can be improved by removing the larger stones.

MANAGEMENT GROUP 4-F

Group 4–F consists of Wehadkee silt loam, which is nearly level, poorly drained, and subject to overflow. It is fertile but medium to strongly acid. Tilth is fairly good during the short periods when the soil is not wet, and ordinarily abundant moisture is held available for plants.

Use suitability and management requirements.—Much of the soil is used for pasture, its best use. Its value for pasture could be im-

proved by more adequate drainage and liming. The volunteer vegetation on undrained areas consists in large part of the less palatable grasses and sedges. Drained areas, properly limed and seeded, should be productive of timothy, redtop, lespedeza, and some clovers. Some areas might be drained enough for tilled crops, but many lie too low for adequate drainage. The practicability of artificial drainage depends on the cost, the degree of improvement possible, and how greatly the farmer needs land suitable for wider use.

FIFTH-CLASS SOILS

Fifth-class soils are very poor to poor for crops and pasture. In general, all are low in natural productivity and very difficult to work, very difficult to conserve, or both. Steep slopes, compact soil material, shallowness to bedrock, large content of stone or bedrock outcrops, and low content of available plant nutrients are the chief characteristics making these soils poor for crops and pasture.

The Fifth-class soils are listed in table 8, and the estimated percentage of each soil in crops, idle cropland, open pasture, and forest is given.

TABLE 8.—*Fifth-class soils of Buncombe County, N. C., and the estimated percentage of each in crops, idle cropland, open pasture, and forest*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
	Percent	*Percent*	*Percent*	*Percent*
Ashe stony loam:				
Steep phase				100
Eroded steep phase			100	
Fletcher slaty silt loam, severely eroded hilly phase	5	30	65	
Halewood clay loam:				
Severely eroded hilly phase	20	20	60	
Severely eroded steep phase	3	22	75	
Hayesville clay loam:				
Severely eroded hilly phase	30	20	50	
Severely eroded steep phase	10	45	45	
Made land				
Porters stony loam, very steep phase				100
Ramsey shaly silt loam:				
Steep phase				100
Eroded steep phase	15	30	55	
Hilly phase				100
Eroded hilly phase	10	45	45	
Rock outcrop				100
Rough gullied land (Hayesville and Halewood soil materials)		30	10	60
Stony rough land (Porters soil material)				100
Wilkes gravelly loam:				
Steep phase			5	95
Eroded steep phase	5	8	87	
Severely eroded steep phase	5	20	75	

MANAGEMENT GROUP 5

Fifth-class soils have not been subdivided into management groups because, on the whole, they are best suited to forest. Present knowledge concerning differences in forest management requirements for these soils is not sufficient to justify separation. Rock outcrop and Made land, however, are not well suited even to forest. The soils differ markedly in some characteristics but generally are low in productivity and very difficult to work and conserve.

Forest management practices.—Most of the management practices employed in production of forest may be grouped as follows: (1) Maintaining a full stand of desirable species, (2) systematic cutting and weeding of trees, (3) harvesting mature trees in such way that desirable species may succeed them, and (4) controlling fires, browsing, trampling, and damage from other causes within possible limits.

Agricultural use and management.—Small areas of Fifth-class soils, chiefly of the Ashe, Fletcher, Halewood, Hayesville, Ramsey, and Wilkes series that are somewhat less steep, stony, or severely eroded, are being used for pasture and crops. Even the better Fifth-class soils, however, have slopes of 30 to 60 percent, are eroded in many places, and are low to moderate in fertility. It is expensive, if not impracticable, to maintain satisfactory yields of tilled crops on these soils.

Where production of tilled crops is attempted on Fifth-class soils, adequate applications of lime and fertilizer and reasonable supporting practices for control of water are needed. Application of amendments and careful selection and rotation of crops are especially necessary to develop and maintain a heavy vegetation. Strip cropping is usually required if productivity is to be sustained for any length of time.

Applications of lime and fertilizer, particularly phosphorus, and other good management practices are required to maintain pasture. In general, legumes should make up much of the pasture sod, and it is good practice to apply 1 to 1½ tons of ground limestone and 75 to 100 pounds of phosphoric acid an acre every 4 to 6 years. It is difficult to apply these materials and to control weeds because slopes are steep and the areas inaccessible.

Vegetation should be reestablished on Rough gullied land (Hayesville and Halewood soil materials). Most farmers probably will do this gradually for economic reasons. To the extent feasible, ditches, terraces, or other means of diverting the water from the gullied areas should be used. After the water is diverted, it may be advisable to mulch the areas and seed a mixture of lespedeza and suitable grasses. Kudzu might be used to provide a more permanent cover, or seedlings of suitable trees such as black locust and white pine might be planted to follow lespedeza. The less sloping parts may be gradually brought back to a level of productivity that will make them suitable for pasture.

CROP ADAPTATIONS, ROTATIONS, AND FERTILIZER REQUIREMENTS

Suitable crops and crop rotations and required supplementary practices for control of water on the land are given by soil management groups in table 9.

TABLE 9.—*Suitable crops and crop rotations and required supplementary water-control practices for soil management groups of Buncombe County, N. C.*

Management group and soil	Suitable crops	Rotations [1]	Supplementary water control measures	Remarks
GROUP 1-A:				
Hayesville loam, undulating phase Hiwassee clay loam, eroded undulating phase Masada loam, undulating phase	Corn, alfalfa, small grain, truck crops, clover, grasses.	1. Corn, crimson clover, alfalfa, alfalfa, alfalfa, alfalfa 2. Corn, small grain, lespedeza 3. Cabbage or potatoes, small grain, lespedeza 4. Snap beans, small grain, lespedeza 5. Corn, small grain, lespedeza, alfalfa, alfalfa, alfalfa, alfalfa	Contour tillage	Most forested areas could be cleared and cropped; test soils for lime requirements before seeding alfalfa.
GROUP 1-B:				
Altavista loam, undulating phase State loam Tate silt loam: Undulating phase Rolling phase Tusquitee loam: Undulating phase Rolling phase Eroded rolling phase	Corn, small grain, truck crops, tobacco, hay.	1. Corn, crimson clover, alfalfa, alfalfa, alfalfa, alfalfa 2. Corn, small grain, lespedeza 3. Cabbage or potatoes, small grain, lespedeza 4. Snap beans, small grain, lespedeza 5. Corn, small grain, lespedeza, alfalfa, alfalfa, alfalfa, alfalfa 10. Corn, crimson clover 6. Tobacco, corn, hay, hay (Ladino clover and orchard grass or red clover, timothy, and orchard grass). 7. Tobacco; small grain; fescue, Ladino clover, and orchard grass pasture 2 years. 8. Tobacco, orchard grass, orchard grass 9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years.	do	Do.
GROUP 1-C:				
Congaree fine sandy loam Congaree silt loam Congaree-Tate loams	Corn, hay, truck crops, small grain.	10. Corn, crimson clover 9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years. 4. Snap beans, small grain, lespedeza 3. Cabbage or potatoes, small grain, lespedeza 2. Corn, small grain, lespedeza		Do.
GROUP 2-A:				
Altavista loam, eroded rolling phase Balfour loam: Rolling phase Eroded rolling phase Fletcher silt loam: Rolling phase Eroded rolling phase Hayesville loam, rolling phase Hayesville clay loam, eroded rolling phase Hiwassee clay loam, eroded rolling phase Masada loam: Rolling phase Eroded rolling phase	Small grain, grass, clover, alfalfa, corn.	1. Corn, crimson clover, alfalfa, alfalfa, alfalfa, alfalfa 2. Corn, small grain, lespedeza 3. Cabbage or potatoes, small grain, lespedeza 4. Snap beans, small grain, lespedeza 6. Tobacco, corn, hay, hay 7. Tobacco; small grain; fescue, Ladino clover, and orchard grass pasture 2 years. 8. Tobacco, orchard grass, orchard grass 9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years.	Contour tillage	Do.

GROUP 2-B:				
Balfour fine sandy loam, rolling phase Edneyville fine sandy loam	Truck crops, corn, small grain, clover, grass, tobacco.	2. Corn, small grain, lespedeza 3. Cabbage or potatoes, small grain, lespedeza 4. Snap beans, small grain, lespedeza 6. Tobacco, corn, hay, hay 7. Tobacco; small grain; fescue, Ladino clover, and orchard grass pasture 2 years. 8. Tobacco, orchard grass, orchard grass 9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years. 11. Orchard (apple), grass	do	Plant fruit trees on the contour; strips between tree rows can be farmed in any rotation for a few years after the trees are planted; take precautions against erosion.
GROUP 2-C:				
State gravelly loam Tusquitee stony loam: Rolling phase Eroded rolling phase Undulating phase	Corn, small grain, grass, clover, tobacco, pasture, orchards.	6. Tobacco, corn, hay, hay 7. Tobacco; small grain; fescue, Ladino clover, and orchard grass pasture 2 years. 8. Tobacco, orchard grass, orchard grass 9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years. 11. Orchard (apple), grass 2. Corn, small grain, lespedeza 3. Cabbage or potatoes, small grain, lespedeza 4. Snap beans, small grain, lespedeza 12. Continuous hay 13. Continuous pasture 14. Corn, small grain, hay, hay	do	Plant fruit trees on the contour; strips between tree rows can be used for rotation 14 a few years; most of the rotations listed lend themselves to strip cropping; removal of larger stones improves these soils as cropland.
GROUP 2-D:				
Chewacla silt loam Chewacla fine sandy loam Toxaway silt loam	Corn, truck crops, hay.	10. Corn, crimson clover 9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years. 14. Corn, small grain, hay, hay	Artificial drainage generally improves these soils.	
GROUP 3-A:				
Ashe loam, eroded hilly phase Porters loam, eroded hilly phase Tusquitee stony loam: Hilly phase Eroded hilly phase	Small grain, clover, orchards, hay, pasture.	14. Corn, small grain, hay, hay (orchard grass, timothy, and red clover). 12. Continuous hay 13. Continuous pasture 4. Snap beans, small grain, lespedeza 5. Corn, small grain, lespedeza, alfalfa, alfalfa, alfalfa, alfalfa 3. Cabbage or potatoes, small grain, lespedeza 2. Corn, small grain, lespedeza 7. Tobacco; small grain; fescue, Ladino clover, and orchard grass pasture 2 years. 8. Tobacco, orchard grass, orchard grass 9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years.	Contour tillage and strip cropping.	Grow sod crops on these soils 2 to 4 years or more during the rotation; manage orchards as for group 2-B.
GROUP 3-B:				
Halewood loam, hilly phase Hayesville loam, hilly phase Rabun clay loam, eroded hilly phase	do	12. Continuous hay 13. Continuous pasture 14. Corn, small grain, hay, hay (orchard grass, timothy, and red clover). 11. Orchard (apple), grass 5. Corn, small grain, lespedeza, alfalfa, alfalfa, alfalfa, alfalfa 15. Snap beans or corn, hay, hay, pasture, pasture 16. Cabbage or potatoes, hay, hay, pasture, pasture 17. Tobacco, small grain, hay, hay, pasture, pasture	do	Pasture period may be extended several years by applying phosphate and potash periodically.

[1] Rotations are numbered 1 to 17 and are listed by order of preference for each management group of soils.

TABLE 9.—*Suitable crops and crop rotations and required supplementary water-control practices for soil management groups of Buncombe County, N. C.*—Continued

Management group and soil	Suitable crops	Rotations [1]	Supplementary water control measures	Remarks
GROUP 3-C: Ashe stony loam, rolling phase Fletcher slaty silt loam, eroded rolling phase Hayesville stony loam, rolling phase Hayesville stony clay loam, eroded rolling phase. Masada gravelly loam: Rolling phase Eroded rolling phase	Small grain, crimson clover, orchards, hays including clover and alfalfa, pasture.	1. Corn, crimson clover, alfalfa, alfalfa, alfalfa, alfalfa 4. Snap beans, small grain, lespedeza 8. Tobacco, orchard grass, orchard grass 9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years. 11. Orchard (apple), grass 12. Continuous hay (orchard grass, timothy, and red clover) 13. Continuous pasture (Ladino clover and orchard grass) 14. Corn, small grain, hay, hay (orchard grass, timothy, and red clover). 15. Snap beans or corn, hay, hay, pasture, pasture 16. Cabbage or potatoes, hay, hay, pasture, pasture 17. Tobacco, small grain, hay, hay, pasture, pasture	Contour tillage and strip cropping.	Test soil for lime requirement before seeding alfalfa; apply 30 to 40 pounds of agricultural borax an acre for alfalfa; manage orchards as for group 2-B.
GROUP 3-D: Warne silt loam	Corn, small grain, hay, pasture.	9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years. 10. Corn, crimson clover 12. Continuous hay (fescue, orchard grass, Ladino clover) 13. Continuous pasture (fescue, orchard grass, Ladino clover) 14. Corn, small grain, hay, hay (orchard grass, Ladino clover)	Artificial drainage by ditches should improve this soil.	
GROUP 3-E: Buncombe loamy fine sand Buncombe gravelly loamy fine sand	Corn, truck crops, small grain, hay, pasture.	9. Peas or beans, corn, small grain, lespedeza or clover hay 2 years. 10. Corn, crimson clover 14. Corn, small grain, hay, hay (orchard grass, Ladino clover)	----------	Add fertilizer in split applications—2 or more applications of smaller quantities; organic matter especially needed; seedbed should be packed.
GROUP 4-A: Ashe loam, steep phase Burton stony loam Porters loam, steep phase Porters stony loam, steep phase	Legume and grass pasture.	11. Orchard (apple), grass 12. Continuous hay (red clover, timothy, orchard grass) 13. Continuous pasture (orchard grass, Ladino clover) For areas required for crops: 14. Corn, small grain, hay, hay (red clover, timothy, orchard grass). 15. Snap beans or corn, hay, hay, pasture, pasture 16. Cabbage or potatoes, hay, hay, pasture, pasture 17. Tobacco, small grain, hay, hay, pasture, pasture	Strip cropping on areas that must be used for crops requiring tillage.	

GROUP 4-B:				
Fletcher silt loam, hilly phase	do	11. Orchard (apple), grass (orchard grass, Ladino clover) 12. Continuous hay (red clover, timothy, orchard grass) 13. Continuous pasture (Ladino clover, orchard grass) For areas required for crops: 14. Corn, small grain, hay, hay 15. Snap beans or corn, hay, hay, pasture, pasture 16. Cabbage or potatoes, hay, hay, pasture, pasture 17. Tobacco, small grain, hay, hay, pasture, pasture	do	
Fletcher slaty silt loam, hilly phase				
Halewood loam, steep phase				
Halewood stony loam:				
Hilly phase				
Steep phase				
Hayesville loam, steep phase				
Hayesville stony loam, hilly phase				
Iredell-Halewood stony loams, hilly phases				
GROUP 4-C:				
Ashe stony loam, eroded hilly phase	do	11. Orchard (apple), grass (orchard grass, Ladino clover) 12. Continuous hay (red clover, timothy, orchard grass) 13. Continuous pasture (orchard grass, Ladino clover)	Continuous sod	
Porters loam, eroded steep phase				
Porters stony loam:				
Eroded steep phase				
Eroded hilly phase				
GROUP 4-D:				
Balfour clay loam, severely eroded rolling phase.	do	11. Orchard (apple), grass 12. Continuous hay (red clover, timothy, orchard grass) 13. Continuous pasture (Ladino clover, orchard grass) For areas that are required for crops: 14. Corn, small grain, hay, hay 15. Snap beans or corn, hay, hay, pasture, pasture 16. Cabbage or potatoes, hay, hay, pasture, pasture 17. Tobacco, small grain, hay, hay, pasture, pasture	do	Stabilize erosion before grazing; fence off areas of active erosion until they are healed; if absolutely required for tilled crops, practice strip cropping and use rotations 14, 15, 16, and 17; adequate fertilization and organic matter necessary to maintain a vigorous effective vegetative cover.
Fletcher silt loam, eroded hilly phase				
Fletcher silty clay loam, severely eroded hilly phase.				
Fletcher slaty silt loam, eroded hilly phase				
Halewood loam:				
Eroded hilly phase				
Eroded steep phase				
Halewood stony loam:				
Eroded hilly phase				
Eroded steep phase				
Hayesville clay loam:				
Eroded hilly phase				
Severely eroded rolling phase				
Eroded steep phase				
Hayesville stony clay loam, eroded hilly phase				
Hiwassee clay loam, eroded hilly phase				
Masada loam, eroded hilly phase				
GROUP 4-E:				
Stony colluvium (Tusquitee soil material)	do	11. Orchard (apple), grass (Ladino clover, fescue) 12. Continuous hay (red clover, orchard grass, timothy) 13. Continuous pasture (Ladino clover, orchard grass)		Least stony parts may be suitable for intensive use for row crops.
GROUP 4-F:				
Wehadkee silt loam	do	2. Continuous hay 13. Continuous pasture	Artificial drainage.	

[1] Rotations are numbered 1 to 17 and are listed by order of preference for each management group of soils.

TABLE 9.—*Suitable crops and crop rotations and required supplementary water-control practices for soil management groups of Buncombe County, N. C.*—Continued

Management group and soil	Suitable crops	Rotations [1]	Supplementary water control measures	Remarks
GROUP 5:				
Ashe stony loam:				
Steep phase				
Eroded steep phase				
Fletcher slaty silt loam, severely eroded hilly phase.				
Halewood clay loam:				
Severely eroded hilly phase				
Severely eroded steep phase				
Hayesville clay loam:				
Severely eroded hilly phase				
Severely eroded steep phase				
Made land				
Porters stony loam, very steep phase	Forest		Maintain permanent forest.	Forest areas should remain in forest; areas cleared should be reforested; mulching of severely eroded parts and damming of gullies may be advisable; areas that must be grazed require adequate liming, fertilizing, and seeding; take precautions against overgrazing, for a good sod must be maintained.
Ramsey shaly silt loam:				
Steep phase				
Eroded steep phase				
Hilly phase				
Eroded hilly phase				
Rock outcrop				
Rough gullied land (Hayesville and Halewood soil materials).				
Stony rough land (Porters soil material)				
Wilkes gravelly loam:				
Steep phase				
Eroded steep phase				
Severely eroded steep phase				

[1] Rotations are numbered 1 to 17 and are listed by order of preference for each management group of soils.

In table 10 fertilizer requirements are listed by crop rotations and management groups, and dates for planting crops and applying fertilizer are given. The following general principles should be followed in applying plant nutrients to crop rotations:

Nitrogen.—Nitrogen should be applied to corn, small grains, truck crops, and other nonlegumes.

Phosphorus.—Clover, alfalfa, and truck crops make best use of phosphorus.

Potash.—Potash should be applied uniformly throughout the rotation because all crops benefit from it about equally. Also, this element leaches readily from the soil and does not carry over well from one crop to the next.

Lime.—Lime should be used mainly for clovers, alfalfa, lespedeza, other legumes, and some truck crops. Test soil samples before applying to see that lime is needed, for much of the land in this county has been limed. If crop is to benefit from lime, make the application several months before seeding or planting; for example, apply lime when land is prepared for the small-grain crop if lespedeza is to follow the small grain. In general, lime should be applied once every 4 or 5 years.

Manure.—Corn, alfalfa, tobacco, and like field crops make the greatest response to manure. Manure is particularly valuable in rejuvenating galled and eroded spots. For each ton of manure applied fertilizer requirements are reduced by 12 pounds an acre of nitrogen (N), 6 pounds of phosphoric acid (P_2O_5), and 12 pounds of potash (K_2O).

GENERAL AGRICULTURAL PRACTICES

Almost none of the farm land of Buncombe County has been terraced, and because slopes are prevailingly steep, terracing is not recommended. Farmers practice contour tillage on most steep land; strip cropping is becoming more common. The farmers usually run their contours without aid of a level, judging by eye alone.

Much of the small acreage of poorly drained land has been improved by artificial drainage. Open ditches or covered box-type ditches made of poles, slab rock, or tile are used to remove excess water.

Most of the cropland except that on south-facing slopes is broken in spring, usually during March and April. Whenever possible, south-facing slopes are broken in November and December.

Crop rotation is practiced on some of the better farms. On soils of the bottom lands, stream terraces, and colluvial slopes one of the rotations consists of potatoes, rye, corn, and lespedeza. The progression of crops is as follows: Potatoes the first year, rye following the potatoes and turned under in the spring of the second year, corn the second summer, wheat following the corn, and lespedeza seeded in the small grain. Another rotation consists of corn, small grain (rye or wheat), and lespedeza. Corn is grown the first year, small grain the second, and lespedeza (sown in the small grain in spring) the third. The lespedeza is cut for hay, and the land is then plowed for the corn crop to follow. A third rotation consists of tobacco, rye sown early in September and turned under as a manure crop, and corn following and benefiting from the turned-under small grain and the residue of the fertilizer from the tobacco crop. On some areas of bottom land, corn is followed by crimson clover each year. The clover is turned under as a manure crop for the corn. In other localities corn and small grains are rotated. In some areas corn is grown year after year without an intervening crop.

The rotations practiced on Hayesville, Halewood, Balfour, and Fletcher soils consist of small grains and lespedeza followed by corn, or red clover followed by corn.

TABLE 10.—*Fertilizer requirements by crop rotations [1] and management groups, and dates for planting crops and applying fertilizer on soils of Buncombe County, N. C.*

Crop rotation and soil management groups	Planting date	Fertilizing date	Fertilizer elements required [2]			Remarks
			Nitrogen (N)	Phosphorus (P_2O_5)	Potash (K_2O)	
			Lb. per acre	*Lb. per acre*	*Lb. per acre*	
ROTATION 1 (for groups 1-A, 1-B, 2-A, and 3-C):						
Corn	May 1–June 1	At planting	15	30	30	Plow under crimson clover for alfalfa; heavy applications of lime needed; apply 20 to 30 pounds agricultural borax when seeding alfalfa, and 15 to 25 pounds annually; for best results use a fertilizer that contains borax for alfalfa.
		6 to 8 weeks after planting.	65–100	0	0	
Crimson clover	Last corn cultivation		0	0	0	
Alfalfa	Aug. 1–30	At seeding	20	120	120	
Do			0	45	135	
Do			0	45	135	
Do			0	45	135	
ROTATION 2 (for groups 1-A, 1-B, 1-C, 2-A, 2-B, 2-C, and 3-A):						
Corn	May 1–June 1	At planting	15	30	30	
		6 to 8 weeks after planting.	65–100	0	0	
Small grain	Sept. 20–Oct. 10	Mar. 15–Apr. 1	9	36	18	
Lespedeza hay	Mar. 15–Apr. 1		16–32	0	0	
ROTATION 3 (for groups 1-A, 1-B, 1-C, 2-A, 2-B, 2-C, and 3-A):						
Cabbage	Mar. 15–May 1	At setting	60	80	60	On steeper soils or eroded areas continue lespedeza 1 or 2 years longer and add potash and phosphorus; heavier applications of lime used for cabbage than for potatoes.
		3 weeks after setting	32	0	0	
Or potatoes	Mar. 15–May 15	At planting	60	80	60	
Small grain	Sept. 20–Oct. 10	Mar. 15–Apr. 1	16–32	0	0	
Lespedeza	Mar. 15–Apr. 1		0	0	0	
ROTATION 4 (for groups 1-A, 1-B, 1-C, 2-A, 2-B, 2-C, 3-A, and 3-C):						
Snap beans	Apr. 1–June 15	At planting	32	96	32	On steeper or eroded soils continue lespedeza 1 or 2 years longer and add more potash and phosphorus.
		At flowering	32	0	0	
Small grain	Sept. 20–Oct. 10		0	0	0	
Lespedeza	Mar. 15–Apr. 15		16–32	0	0	
ROTATION 5 (for groups 1-A, 1-B, 3-A, and 3-B):						
Corn	May 1–June 1	At planting	15	30	30	Plow under lespedeza for the alfalfa; heavy applications of lime needed; apply 20 to 30 pounds agricultural borax to alfalfa at seeding and subsequent applications as the condition of the stand indicates need; it is preferable to use an alfalfa fertilizer.
		6 to 8 weeks after planting.	60–90	0	0	
Small grain	Sept. 20–Oct. 10	Mar. 15–Apr. 1	9	36	18	
Lespedeza	Mar. 15–Apr. 15		16–40	0	0	
Alfalfa	Aug. 1–30	At seeding	20	120	120	
Do		Mar. 1–15	0	45	135	
Do		do	0	45	135	
Do		do	0	45	135	

ROTATION 6 (for groups 1-B, 2-A, 2-B, and 2-C):						
Tobacco	May 15–30	May 1–15	30	90	90	
Corn	May 1–June 1	At planting	15	30	30	
		6 to 8 weeks after planting.	65–100	0	0	
Hay [3]	Last corn cultivation		0	60	60	
Do		Mar. 1–15	0	45	135	
ROTATION 7 (for groups 1-B, 2-A, 2-B, 2-C, and 3-A):						
Tobacco	May 15–30	May 1–15	36	108	108	Graze clover; keep land in sod longer where more strongly sloping and more eroded.
Small grain	Sept. 20–Oct. 10	Mar. 15–Apr. 1	16–32	0	0	
Fescue, orchard grass, Ladino clover	Aug. 15–Sept. 15		20	120	120	
Do			0	45	135	
ROTATION 8 (for groups 1-B, 2-A, 2-B, 2-C, 3-A, and 3-C):						
Tobacco	May 15–30	May 1–15	36	108	108	Keep steeper soils and those more eroded in grass 1 or 2 years longer and apply additional fertilizer.
Orchard grass	Mar. 1–30	Mar. 1–30	20	40	40	
Do			0	0	0	
ROTATION 9 (for groups 1-B, 1-C, 2-A, 2-B, 2-C, 2-D, 3-A, 3-C, 3-D, and 3-E):						
Peas or beans	Apr. 1–June 15	At planting	40	120	40	Keep steeper soils in hay 1 or 2 years longer and apply additional phosphorus and potash.
		At flowering stage	32	0	0	
Corn	May 1–June 1	At planting	25	50	50	
		6 to 8 weeks after planting.	72–96	0	0	
Small grain	Sept. 20–Oct. 10		12	48	24	
Lespedeza or clover hay			32	0	0	
Do			0	48	48	
ROTATION 10 (for groups 1-B, 1-C, 2-D, 3-D, and 3-E):						
Corn	May 1–June 1	At planting	25	50	50	Artificial drainage would greatly improve some soils for this rotation.
		6 to 8 weeks after planting.	72–96	0	0	
Crimson clover	At last corn cultivation.		0	0	0	
ROTATION 11 (for groups 2-B, 2-C, 3-B, 3-C, 4-A, 4-B, 4-C, 4-D, and 4-E):						
Orchard (apple)		During dormant season	[4]	0	0	Apply enough phosphorus and potash to maintain a good grass sod.
Grass						
ROTATION 12 (for groups 2-C, 3-A, 3-B, 3-C, 3-D, 4-A, 4-B, 4-C, 4-D, 4-E, and 4-F):						
Continuous hay (red clover, timothy, orchard grass).		At seeding	12	72	72	When seeding or reseeding the hay sow in small grain or corn, or other clean-cultivated crop; clover and grass respond well to lime.
		To maintain stand	0	36	108	
ROTATION 13 (for groups 2-C, 3-A, 3-B, 3-C, 3-D, 4-A, 4-B, 4-C, 4-D, 4-E, and 4-F):						
Continuous pasture (Ladino clover, orchard grass, fescue).		At seeding	20	120	120	Do.
		To maintain stand	0	45	135	

See footnotes at end of table.

TABLE 10.—*Fertilizer requirements by crop rotations* [1] *and management groups, and dates for planting crops and applying fertilizer on soils of Buncombe County, N. C.*—Continued

Crop rotation and soil management groups	Planting date	Fertilizing date	Fertilizer elements required [2]			Remarks
			Nitrogen (N)	Phosphorus (P_2O_5)	Potash (K_2O)	
			Lb. per acre	*Lb. per acre*	*Lb. per acre*	
ROTATION 14 (for groups 2-C, 2-D, 3-A, 3-B, 3-C, 3-D, and 3-E):						
Corn	May 1–June 1	At planting	20	40	40	Rotation may be used on steeper slopes by keeping soils in hay or pasture 1 or 2 more years and applying additional fertilizer.
		6 to 8 weeks after planting.	48–72	0	0	
Small grain	Sept. 10–Oct. 10		9	36	18	
Hay	Mar. 15–Apr. 1		32	0	0	
Do		Mar. 15–Apr. 1	0	36	108	
ROTATION 15 (for groups 3-B and 3-C):						
Snap beans	Apr. 1–June 15	At planting	48	144	48	
		At flowering stage	32	0	0	
Or corn	May 1–June 1	At planting	20	40	40	
		6 to 8 weeks after planting.	48–72	0	0	
Hay (Ladino clover, orchard grass, or red clover and timothy).	Last corn cultivation		0	0	0	
Do		Mar. 1–30	0	45	135	
Pasture			0	45	135	
Do		Mar. 1–30	0	50	50	
ROTATION 16 (for groups 3-B and 3-C):						
Cabbage	Mar. 15–May 1	At setting	60	80	60	
		3 weeks after setting	32	0	0	
Or potatoes	Mar. 20–Apr. 15	At planting	60	80	60	
Hay (grass and clover)	Aug. 1–Sept. 15		0	45	135	
Do			0	45	135	
Pasture		Mar. 15–Apr. 15	0	45	135	
Do			0	45	135	
ROTATION 17 (for groups 3-B and 3-C):						
Tobacco	May 15–30	May 15–30	36	108	108	
Small grain	Sept. 10–Oct. 10	Mar. 15–Apr. 1	16–32	0		
Hay (orchard grass, timothy, and Ladino and red clovers).	Aug. 15–Sept. 15	Aug. 15–Sept. 15	20	120	120	
Do		Mar. 1–15	0	45	135	
Pasture			0	45	135	
Do			0	45	135	

[1] Rotations other than those specified may be adapted to the various management groups, provided they make the most practicable contribution to the system of farming used and permit proper conservation of soil.

[2] Select a commercial fertilizer that will provide the elements required in the quantity specified. See page 93 for general rules for applying fertilizer and reduction in quantities when manure is used.

[3] A grass-legume mixture, as (1) red clover and timothy, (2) Ladino clover and orchard grass, or (3) Ladino and red clovers, timothy, and orchard grass.

[4] Apply nitrogen fertilizer around tree at rate of 1½ ounces for each year tree is old; for example, 6 ounces to a tree 4 years old.

On the Ashe soils one of the following rotations is sometimes used. In the first rotation, corn is grown, then grass and clover for 2 years, and finally potatoes or snap beans. In the second rotation, snap beans or potatoes are grown, then small grain and clover for 2 years, potatoes or beans again for 1 year, small grain turned under, corn following the small grain, and finally a grass mixture (orchard grass and red clover) sown in the corn. In the third rotation, corn is grown the first year, followed by small grain sown in August and grass and clover sown in the grain in March, and potatoes or snap beans the third or fourth year.

On Porters, Tusquitee, and State soils the rotation commonly consists of corn and grass-clover mixtures. Corn is grown 1 or 2 years and followed by grass and clover. The grass-and-clover mixture is cut for hay the first year and then pastured 3 or 4 years.

In this county on upland soils grass-clover mixtures are usually cut the first year for hay and then pastured 2 to 4 years, or until the land is cultivated again. Grass-clover mixtures and small grains are seeded in corn late in July or August, the corn being harvested in fall or early in winter. Lespedeza is generally seeded in small grains in spring.

Commercial fertilizer is used throughout the farming areas for practically all crops. Most of the fertilizer is applied to subsistence crops and orchards, but the heaviest single applications are made for tobacco and truck crops. These general statements on use of fertilizer do not take into account phosphate fertilizer supplied by the Tennessee Valley Authority or the Agricultural Adjustment Administration (now the Production and Marketing Administration). The phosphate supplied by those agencies has been and is being used chiefly for improving sod crops.

The application of commercial fertilizer ranges from 200 to 1,000 pounds an acre. The grades most used are 6–8–6, 4–10–6, 5–10–5, 3–9–6, 0–18–0, and 16–0–0. Superphosphate, the fertilizer most used for corn and small grains, is applied at the rate of 300 to 400 pounds an acre for corn and at a rate of 200 to 400 pounds an acre for small grains. A few farmers apply 200 to 300 pounds an acre of 4–10–6, 6–8–6, or 5–10–5 to land used for corn or wheat. Some phosphate fertilizer (0–18–0 or its equivalent) is applied at the rate of 300 pounds an acre for pasture.

All the manure is applied in spring to eroded places in cornfields or in fall to eroded areas in small-grain land. The rate of application is 4 to 6 tons an acre.

The use of lime has gradually increased. Some lime is used on truck crops, a part on subsistence crops, and a little on lower slopes or less steep areas in pastures. The usual initial application is 1 to 2 tons an acre, but soils of the bottom lands may receive 2 to 4 tons.

WATER CONTROL ON THE LAND

The undisturbed natural vegetative cover, now found only in a few protected forests, effectively controlled water that fell on the land. Man disrupted this comparatively stabilized condition in clearing land for crops and pasture. Now, less water enters the soil, and total runoff is not only much greater but also much more uneven. In periods of higher runoff great quantities of soil material are carried

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away and floods severely damage lowland crops. Because of this, control of runoff is a major problem in the proper management of the soils.

The changes in land use necessary for runoff control are: (1) Cropping systems that provide maximum protective cover for the land throughout the year, (2) reduction in acreage of row crops, (3) use of less sloping lands for row crops, (4) increase in acreage of hay and forage crops, (5) improvement of permanent pasture, and (6) careful management of woodlands. A definite plan for controlling surface runoff by engineering methods should be used to supplement these adjusted cropping methods where feasible. Such engineering measures are contour tillage, strip cropping, and hillside ditches or diversion channels. Terraces may be constructed on slopes of less than 15 percent but are not recommended except in special cases. The use of permanent strips of sod crops and the vegetating of all waterways and field outlets of terraces and channels are important. Control of soil losses will result from control of runoff, whether it be accomplished by mechanical or vegetative means, or both.

Runoff is the major water-control problem, but drainage merits some consideration. A few low-lying bottoms, low terraces, and some slightly depressed areas at the base of slopes have been drained by open or covered ditches. Other areas could be drained successfully, but the practicability of this depends on the cost, degree of improvement to be expected, and the actual drainage condition of the areas involved.

Deepening and straightening of channels will accelerate the flow of streams and thus reduce the flood hazard for the immediate upstream lowlands. Such measures have been employed to some extent. Detention reservoirs aid greatly in flood control but are structures requiring a knowledge of engineering and a heavy financial outlay.

Despite the usually moderate rainfall, there are seasons when the precipitation is not enough for growing crops. In some localities irrigation is practicable for high-value crops. In places ample water for irrigation is available. Many farmers have constructed small ponds that serve as a source of water for livestock and for some irrigation of truck crops.

PRODUCTIVITY

Crop yields are a good measure of soil productivity. Estimated average acre yields of principal crops on the soils of Buncombe County are listed in table 11 under two levels of management. In columns A are yields to be expected under the prevailing (common) management; in columns B, yields to be expected under good management. These estimates are based on information obtained from individual farmers throughout the county and from the agricultural agent and other farm leaders. Some of the yields indicated in columns B are those obtained by the agricultural experiment station on the same or closely related soils in Buncombe County and in adjoining or nearby counties. Specific crop yields extending over a period of several years were obtained for some of the soils. Information concerning the carrying capacity of pastures on soils commonly grazed could be obtained from only a few farmers.

TABLE 11.—*Estimated average acre yields of principal crops that may be expected over a period of years on soils of Buncombe County, N. C.*

[Yields in columns A are those to be expected under common practices of management; those in columns B, under good practices of management. Blank spaces indicate crop is not commonly grown and soil is not well suited to it under management specified.]

	Corn		Wheat		Lespedeza hay		Alfalfa		Potatoes		Tobacco (burley)		Permanent pasture		Workability [1]	Conservability [2]	Land class [3]
	A	B	A	B	A	B	A	B	A	B	A	B	A	B			
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Cow-acre-days* [4]	*Cow-acre-days* [4]			
Altavista loam:																	
Eroded rolling phase	25	50	12	20	0.7	1.5	2.4	3.2	120	180	1,200	1,500	70	150	Good	Good	2
Undulating phase	32	65	14	22	1.0	1.7	2.7	3.4	130	200	1,500	1,800	85	200	Excellent	Very good	1
Ashe loam:																	
Eroded hilly phase	16	32	9	17	.5	1.1	----	3.0	65	135	800	1,000	50	110	Fair	Fair	3
Steep phase	12	26	8	14	.4	.8	----	----	----	----	----	----	40	80	Poor	Poor	4
Ashe stony loam:																	
Eroded hilly phase	----	----	----	----	.4	1.0	----	2.4	----	----	----	----	40	80	do	Fair	4
Eroded steep phase	----	----	----	----	----	----	----	----	----	----	----	----	20	55	Very poor	Poor	5
Rolling phase	18	36	10	18	.7	1.2	----	3.0	70	140	900	1,100	60	120	Fair	Good	3
Steep phase	----	----	----	----	----	----	----	----	----	----	----	----	25	60	Very poor	Poor	5
Balfour clay loam, severely eroded rolling phase	10	30	6	14	.3	1.0	1.0	2.0	----	----	----	----	15	70	Fair	Fair	4
Balfour fine sandy loam, rolling phase	28	53	13	20	.6	1.4	2.4	3.3	120	180	1,300	1,600	60	150	Good	Good	2
Balfour loam:																	
Eroded rolling phase	27	50	12	20	.7	1.5	2.4	3.2	120	180	1,200	1,500	60	170	Very good	do	2
Rolling phase	30	55	14	22	.8	1.6	2.5	3.3	120	180	1,300	1,600	70	180	do	Very good	2
Buncombe gravelly loamy fine sand [5 6]	12	28	4	8	.4	.7	1.5	2.0	60	110	----	----	12	35	Good	Fair	3
Buncombe loamy fine sand [5 6]	15	33	5	10	.6	.8	1.8	2.2	70	120	----	----	15	40	Very good	do	3
Burton stony loam	----	----	----	----	----	----	----	----	----	----	----	----	75	90	Poor	do	4
Chewacla fine sandy loam [5 6]	30	60	----	16	1.3	1.7	----	----	80	160	----	----	80	200	Very good	Excellent	2
Chewacla silt loam [5 6]	32	65	----	18	1.4	1.8	----	----	75	150	----	----	90	210	do	do	2
Congaree fine sandy loam [5 6]	38	60	10	18	1.2	1.6	2.6	3.3	120	200	1,400	1,800	65	190	Excellent	do	1
Congaree silt loam [5 6]	45	75	14	20	1.3	1.8	2.8	3.5	140	220	1,500	1,900	95	200	do	do	1
Congaree-Tate loams [5 6]	40	70	12	20	1.2	1.8	2.7	3.5	125	220	1,400	1,900	90	200	do	do	1
Edneyville fine sandy loam	22	43	11	17	.5	1.2	2.2	3.1	110	170	1,200	1,500	35	150	Good	Good	2
Fletcher silt loam:																	
Eroded hilly phase	18	38	10	16	.5	1.1	1.9	2.9	65	125	900	1,100	40	110	Fair	Poor	4
Eroded rolling phase	25	47	10	18	.6	1.3	2.1	3.0	100	160	1,100	1,400	50	130	Good	Fair	2
Hilly phase	20	40	11	17	.5	1.2	2.0	3.0	75	130	900	1,100	45	120	Fair	do	4
Rolling phase	28	50	12	20	.6	1.5	2.2	3.2	110	170	1,200	1,500	50	150	Good	Good	2
Fletcher silty clay loam, severely eroded hilly phase.	----	----	5	12	.2	.9	----	1.8	----	----	----	----	12	45	Fair	Poor	4
Fletcher slaty silt loam:																	
Eroded hilly phase	16	36	9	15	.4	1.0	1.8	2.8	60	120	800	1,000	35	90	do	do	4
Eroded rolling phase	20	42	9	16	.5	1.2	2.0	2.9	90	150	900	1,100	40	110	Good	Fair	3
Hilly phase	16	36	9	15	.4	1.0	1.8	2.8	60	120	800	1,000	35	100	Fair	Poor	4
Severely eroded hilly phase	----	----	----	----	----	----	----	----	----	----	----	----	12	40	Poor	Very poor	5
Hulewood clay loam:																	
Severely eroded hilly phase	----	----	5	12	.2	.9	----	1.8	----	----	----	----	12	45	do	do	5
Severely eroded steep phase	----	----	----	----	----	----	----	----	----	----	----	----	10	40	Very poor	do	5

See footnotes at end of table.

TABLE 11.—*Estimated average acre yields of principal crops that may be expected over a period of years on soils of Buncombe County, N.C.*—Con.

	Corn		Wheat		Lespedeza hay		Alfalfa		Potatoes		Tobacco (burley)		Permanent pasture		Workability [1]	Conservability [2]	Land class [3]
	A	B	A	B	A	B	A	B	A	B	A	B	A	B			
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Cow-acre-days* [4]	*Cow-acre-days* [4]			
Halewood loam:																	
Eroded hilly phase	18	38	10	16	.5	1.1	1.9	2.9	65	125	900	1,200	40	130	Fair	Fair	4
Eroded steep phase													35	100	Poor	Poor	4
Hilly phase	20	40	10	18	.6	1.3	2.3	3.0	75	140	1,000	1,200	45	150	Fair	Fair	3
Steep phase													40	110	Poor	Poor	4
Halewood stony loam:																	
Eroded hilly phase													35	100	do	Fair	4
Eroded steep phase													15	80	Very poor	Poor	4
Hilly phase													40	120	Poor	Fair	4
Steep phase													20	90	do	Poor	4
Hayesville clay loam:																	
Eroded hilly phase	18	38	10	16	.5	1.1	1.9	2.9	65	125	900	1,200	40	120	do	do	4
Eroded rolling phase	25	45	11	18	.6	1.4	2.3	3.0	105	170	1,200	1,500	50	140	Good	Fair	2
Eroded steep phase													35	85	Poor	Poor	4
Severely eroded hilly phase			5	12	.2	.9		1.8					12	45	do	do	5
Severely eroded rolling phase	10	30	6	14	.3	1.0	1.0	2.0					15	50	Fair	do	4
Severely eroded steep phase													10	40	Very poor	Very poor	5
Hayesville loam:																	
Hilly phase	20	40	10	18	.6	1.3	2.3	3.0	75	140	1,000	1,200	45	140	Fair	Fair	3
Rolling phase	28	50	12	20	.7	1.5	2.4	3.2	110	170	1,300	1,600	45	170	Good	Good	2
Steep phase													40	90	Poor	Poor	4
Undulating phase	30	60	12	20	.8	1.6	2.6	3.3	120	185	1,400	1,700	55	190	Excellent	Very good	1
Hayesville stony clay loam:																	
Eroded hilly phase													35	90	Poor	Fair	4
Eroded rolling phase	20	40	10	18	.7	1.2	2.1	3.0	75	145	900	1,100	40	120	Fair	Good	3
Hayesville stony loam:																	
Hilly phase													40	110	Poor	Fair	4
Rolling phase	22	42	10	18	.7	1.2	2.1	3.0	80	150	900	1,100	45	140	Fair	Good	3
Hiwassee clay loam:																	
Eroded hilly phase	20	40	11	18	.6	1.2	2.0	3.0					40	140	do	Poor	4
Eroded rolling phase	25	50	14	22	.6	1.4	2.3	3.1	115	175	1,300	1,600	50	160	Good	Good	2
Eroded undulating phase	32	60	16	24	.9	1.5	2.6	3.2	120	185	1,400	1,700	65	180	do	Very good	1
Iredell-Halewood stony loams, hilly phases													20	40	Poor	Fair	4
Made land																	5
Masada gravelly loam:																	
Eroded rolling phase	23	48	12	18	.5	1.2	2.1	2.9	100	160	1,100	1,500	35	110	Good	Good	3
Rolling phase	23	48	12	20	.5	1.2	2.1	2.9	100	160	1,200	1,500	40	120	do	do	3
Masada loam:																	
Eroded hilly phase	18	38	10	16	.5	1.1	1.9	2.9	65	125	900	1,200	40	140	Fair	Fair	4
Eroded rolling phase	25	48	13	20	.6	1.3	2.2	3.0	105	165	1,200	1,500	45	160	Good	Good	2
Rolling phase	25	50	13	20	.6	1.3	2.2	3.0	105	165	1,200	1,500	45	150	do	do	2
Undulating phase	30	55	14	22	.8	1.5	2.5	3.1	110	175	1,300	1,600	60	180	Very good	Very good	1

Porters loam:																	
Eroded hilly phase	20	40	10	16	.6	1.2	1.9	2.9	70	130	900	1,200	40	130	Fair	Fair	4
Eroded steep phase	14	28	8	12	.4	.8							25	90	Poor	Poor	4
Steep phase	15	30	9	15	.5	.9							35	100	do	do	4
Porters stony loam:																	
Eroded hilly phase	16	32	8	16	.5	1.1	1.8	2.7	60	110	800	1,100	35	100	do	Fair	4
Eroded steep phase													20	40	Very poor	Poor	4
Steep phase													20	45	do	do	4
Very steep phase															do	Very poor	5
Rabun clay loam, eroded hilly phase	20	40	11	18	.6	1.2	2.0	3.0					40	150	Fair	Fair	3
Ramsey shaly silt loam:																	
Eroded hilly phase	7	18	4	10	.3	.6							15	45	Poor	Poor	5
Eroded steep phase															do	Very poor	5
Hilly phase	7	20	4	12	.3	.7							20	45	do	Poor	5
Steep phase															do	do	5
Rock outcrop															Very poor	Very poor	5
Rough gullied land (Hayesville and Halewood soil materials)															do	do	5
State gravelly loam	30	60	12	20	1.0	1.5	2.3	3.2	115	200	1,400	1,700	70	180	Very good	Excellent	2
State loam	40	75	15	25	1.2	1.8	2.5	3.5	130	220	1,600	2,000	90	200	Excellent	do	1
Stony colluvium (Tusquitee soil material)													30	60	Very poor	Very good	4
Stony rough land (Porters soil material)															do	Very poor	5
Tate silt loam:																	
Rolling phase	30	55	13	20	.7	1.4	2.3	3.1	110	175	1,300	1,600	60	180	Good	Very good	1
Undulating phase	35	60	14	22	.9	1.5	2.4	3.2	115	190	1,400	1,800	70	200	Very good	do	1
Toxaway silt loam [5 6]	20	75		16	.6	1.9				220			50	220	Fair [7]	Excellent	2
Tusquitee loam:																	
Eroded rolling phase	30	65	14	22	.8	1.6	2.3	3.2	115	180	1,300	1,600	65	160	Very good	Good	1
Rolling phase	35	65	14	22	1.0	1.7	2.4	3.3	120	195	1,400	1,800	75	180	Good	Very good	1
Undulating phase	40	70	15	25	1.2	1.8	2.5	3.5	130	220	1,600	2,000	90	200	Excellent	Excellent	1
Tusquitee stony loam:																	
Eroded hilly phase	20	40	10	18	.5	1.3	2.0	2.9	80	140	1,000	1,300	45	140	Fair	Poor	3
Eroded rolling phase	23	48	12	20	.6	1.4	2.2	3.0	105	170	1,200	1,600	55	160	do	Good	2
Hilly phase	23	45	11	20	.6	1.4	2.1	3.0	90	150	1,100	1,400	55	140	Poor	Fair	3
Rolling phase	25	50	12	20	.7	1.5	2.3	3.2	110	180	1,300	1,600	65	170	Fair	Good	2
Undulating phase	33	60	14	23	1.0	1.7	2.4	3.3	120	200	1,400	1,800	80	180	Good	Excellent	2
Warne silt loam [5]	18	30		16	.5	1.5							30	160	Fair	Very good	3
Wehadkee silt loam [5 6]		50				1.7							30	180	Poor [7]	Excellent	4
Wilkes gravelly loam:																	
Eroded steep phase													15	35	Very poor	Very poor	5
Severely eroded steep phase															do	do	5
Steep phase		22				.9							20	40	do	do	5

[1] Workability refers to ease of tillage, harvesting, and other field operations.

[2] Conservability refers to the ease with which productivity and workability can be maintained. It includes as major considerations ease of conservation of soil material, of conservation of plant nutrients, and of maintenance of good tilth.

[3] Classification of soils according to relative suitability for general agriculture.

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

[5] Yields in columns A are those to be expected without the benefit of artificial drainage; those in columns B, with adequate drainage.

[6] High water causes damage to crops every third to fifth year. This hazard is not taken into consideration in arriving at the productivity.

[7] Workability is good to very good when soil is adequately drained.

Prevailing management is not the same on all soils nor in all parts of the county. To learn the management prevailingly practiced on a given soil, turn to the section on Soil Descriptions, find the description of the soil in question, and read under the subheading, Use and Management.

Good management—that defined as necessary to obtain yields listed in columns B of table 11—generally involves selection of suitable crops and rotations; correct use of commercial fertilizer, lime, and manure; return of organic matter to the soil; proper tillage; and engineering measures for the control of water on the land where necessary. All these practices are used as needed to maintain or increase soil productivity within practical limits.

It is not known exactly what are good management practices for all soils; complete information is lacking. However, the management practices listed in the subsection on Land Classes and Management Groups are of proved value and are recommended on the basis of known deficiencies of the soils. They are therefore used to define the management necessary to achieve the yields listed in columns B of table 11. For example, table 11 lists Altavista loam, undulating phase, as having an estimated yield of 65 bushels an acre of corn under good management. What practices are necessary to obtain this yield? Refer to the last column, Land Class, of table 11 and note that Altavista loam, undulating phase, is a First-class soil. With this information as a guide, turn to the subsection on Land Classes and Management Groups and refer to table 4, which lists all First-class soils by management groups. Note that Altavista loam, undulating phase, is in management group 1–B and then read in the text for a description of this management group and the management practices required. What is said about management of group 1–B soils applies to Altavista loam, undulating phase. Refer also to tables 9 and 10 for a summary of information on suitable crops, crop rotations and fertilization of this soil.

Yields in columns B of table 11 may be considered production goals; they are based on yields actually obtained by some of the more progressive farmers. The advisability of reaching the production goals repsented by yields in columns B will depend on the farm business as a whole. On one farm it may be practical to manage a soil so as to exceed yields in columns B of table 11; on another it may be practical not to reach them. The best feasible management for a farm unit may give yields in excess of those in column B for one crop and soil, and yields below for another crop on the same soil. It should be borne in mind that the yields in columns B can be reached by one or several different combinations of management practices. The practices recommended in the section on Land Classes and Management Groups should be used as guides; they are not the only practices by which good management can be achieved.

THE AGRICULTURE OF BUNCOMBE COUNTY

EARLY AGRICULTURE

Buncombe County was originally occupied by Cherokee Indians, who lived mainly by hunting but did grow some corn, barley, tobacco, and pumpkins on the bottom lands. The first white settlers located

along rivers and creeks and grew wheat, rye, oats, corn, buckwheat, flax, indigo, apples, berries, peaches, and pears. As the population increased, land in the valley uplands and mountain coves was cleared for farms. Grazing land on the smoother mountain slopes and ridges was cleared later, and raising cattle and sheep became a leading enterprise.

Lack of roads and railroads limited early agriculture to growing subsistence crops and raising livestock. Livestock could be driven to market over poor roads or trails. Production of marketable crops increased when roads were built that allowed hauling farm products to markets. Before the Civil War, oats and wheat were the principal crops; just after the war, tobacco became important as a cash crop. Production of bright, or flue-cured, tobacco increased for a time but was later discontinued. By 1880, agriculture consisted mainly of the growing of corn, wheat, rye, oats, hay, and minor crops of potatoes and sweetpotatoes. Some livestock was raised.

PRESENT AGRICULTURE

In the present agriculture, corn, wheat, rye, oats, hay, and forage are grown as subsistence crops, and cabbage, snap beans, potatoes, and tobacco as principal cash crops. Some forest products also are marketed. Many cattle are raised for both beef and dairy purposes. Practically every farm produces garden vegetables, potatoes, and sweetpotatoes for home use. There are several commercial orchards, and practically every farm in the county has a few apple and other fruit trees.

No one crop dominates in the present agriculture. Truck crops are grown largely in the valley section. Corn, wheat, and hay are grown in all agricultural areas, but their distribution is determined by the character of the soil, chiefly its slope. Soils and relief are favorable to agriculture in part of the mountain section, but areas are small and widely separated by rough mountains. Much of the mountainous area is now owned by the Federal government.

In general, crops requiring tillage are suited to and grown on only the smoother or less steep soils. Accordingly, the agriculture of the county depends largely on a few soils. Potatoes and truck crops are produced mostly on Halewood, Balfour, Edneyville, State, and Tusquitee soils and on the Chewacla and Congaree soils of the bottom lands; corn and wheat dominantly on the Hayesville, Halewood, Balfour, Tusquitee, Fletcher, Tate, State, Chewacla, and Congaree soils; and pasture and forage principally on the Porters, Halewood, Wilkes, Hayesville, Balfour, Tusquitee, Tate, Fletcher, and Ashe soils. The shorter and cooler growing season somewhat limits the crop suitabilities of Ashe and Burton soils.

On farms having both steep and relatively smooth soils, the general practice is to crop the less steep areas and pasture the steeper ones. Many farms, however, have only hilly or steep land, and on them very careful management is required in crop production; otherwise, the soils cannot be maintained in a relatively productive state.

CROPS

The acreages of principal crops and number of fruit trees and grapevines in Buncombe County are listed in table 12 for stated years.

TABLE 12.—*Acreage of principal crops and number of fruit trees and grapevines in Buncombe County, N. C., in stated years*

Crop	1919	1929	1939	1949
	Acres	*Acres*	*Acres*	*Acres*
Corn	34, 783	19, 509	20, 575	12, 761
For grain	28, 830	17, 447	18, 322	10, 674
Wheat, threshed	14, 333	2, 871	3, 209	924
Oats:				
Threshed	2, 604	617	461	268
Unthreshed	(1)	1, 962	835	847
Rye, threshed	1, 004	788	687	145
Barley, threshed	(1)	10	205	224
All hay	9, 135	6, 825	7, 911	13, 082
Timothy and clover, alone or mixed	7, 026	3, 641	2, 800	4, 419
Other legumes	174	1, 203	2, 956	2, 426
Alfalfa	52	104	413	2, 404
Grains cut green	412	757	882	1, 360
All other tame hay	1, 053	1, 003	730	2, 473
Wild hay	418	117	130	(1)
Potatoes	963	1, 176	1, 107	350
Sweetpotatoes	131	244	199	21
Tobacco	123	698	1, 136	1, 649
Sorghum for all purposes	984	813	1, 308	450
Strawberries	44	163	81	10
	Number	*Number*	*Number*	*Number* [2]
Apple trees	164, 172	132, 883	113, 693	68, 296
Cherry do	5, 758	9, 800	10, 586	7, 115
Peach do	37, 022	17, 341	2, 565	1, 997
Pear do	1, 480	1, 577	1, 772	1, 356
Grapevines	21, 551	29, 255	35, 896	18, 285

[1] Not reported.
[2] Number bearing trees in 1950.

Corn is grown on almost every soil at all suited to it. Yields are frequently low because many of the soils are relatively low in content of plant nutrients and organic matter, do not hold enough moisture available to plants, and receive too little fertilizer. An appreciable acreage of corn is on soils not well suited, and on these yields are very low and productivity generally is not being maintained. The best yields are usually obtained on Tusquitee, Congaree, and State soils, for they are relatively high in content of plant nutrients and organic matter and normally have favorable moisture relations and tilth. In 1949, the average yield of corn for the county was 34.1 bushels an acre. Tests at the Mountain Branch Experiment Station show that corn yields can be increased about 20 percent by using hybrid varieties.

Practically all the corn is fed to work animals and cattle and to hogs being fattened for market. A small quantity is ground into meal for domestic use. Corn produced in excess of what the individual farms require can be readily sold at local markets.

Wheat produces low yields, chiefly because poor seed is used, poor seeding practices are followed, insufficient fertilizer is applied, and the crop is subject to winterkilling. The average yield in 1949 was 12.6 bushels an acre. Fine-textured soils are used for wheat. Gen-

erally about 200 pounds an acre of superphosphate or low-grade complete fertilizer is applied or wheat is grown following crops that have been heavily fertilized.

Oats are grown mainly for hay, but a small acreage is harvested for grain. Most of the rye harvested is used locally for sowing winter cover crops. The rye is sown in fall, provides cover for the soil through the winter, is grazed in spring, and then turned under as a green-manure crop. Rye is usually sown in the corn, with little seedbed preparation and no fertilization. Little of the crop is sold outside the county. Some barley is also grown for hay.

Mixed clover and grass hay, lespedeza, timothy, soybeans, other grass hays grown alone, and wild hay are produced on most of the soils suited to crops. Hay occupies the largest crop acreage in the county and is fed locally to work animals and to cattle in winter. Most farmers produce enough hay for their own needs, but only a few produce any for sale. Hay yields and quality probably could be increased considerably by more adequate fertilization and liming, proper harvesting and curing, and use of better grasses and legumes.

Truck crops are grown mainly on the most productive soils, chiefly the Congaree, State, Altavista, Tusquitee, Tate, Hayesville, Halewood and Balfour. They usually receive generous applications of 8–8–8, 5–10–5, 6–8–6, or 4–10–6. They are marketed mostly in Asheville and other conveniently located smaller towns and usually bring top prices because they are of high quality. Sweetpotatoes are grown chiefly for home consumption, but a few are sold on local markets.

Tobacco is the most important cash crop and generally occupies the most productive soils on the farm. The soils most used for this crop are the State, Tusquitee, Tate, Hayesville, Halewood, Balfour, and Fletcher. The tobacco first grown in the county was the flue-cured (or bright) variety, but the better suited burley variety was introduced between 1909 and 1919 and quickly replaced the bright tobacco. Tobacco has priority over all other crops for fertilizer, manure, and labor. In large part the fertilizer used in this county is applied for tobacco; applications range from 400 to 1,500 pounds an acre, but are usually between 600 and 800 pounds. The predominant tobacco fertilizers are 6–8–6 and 5–10–5, although some farmers use the recommended 3–9–9 grade. Yields of tobacco range from 800 to 2,000 pounds or more an acre. The crop is marketed on warehouse floors in Asheville or in nearby towns in Tennessee.

Sorghum, grown chiefly for fodder, is planted mainly on Hayesville and Fletcher soils in the intermountain plateau section. Yields are fair but probably would increase if better fertilization and tillage were practiced and suitable rotations were followed. Most of the grain sorghum is fed to beef or dairy cattle on smaller farms. Some sweet sorghum is grown for sirup, mostly for home use.

The few commercial apple orchards in the county produce good quality fruit. Much of the crop is shipped by truck to markets outside the county. Orchards are mainly on Tusquitee, Halewood, and Porters soils. They receive good management, including proper fertilization, spraying, and pruning. Orchards consisting mostly of apple trees are on most farms, but there are some cherry, peach, and pear trees.

PERMANENT PASTURE

In 1949, permanent pasture and cropland used only for pasture occupied 60,468 acres on 3,688 farms reporting; in addition, 48,282 acres of woodland pasture was reported for 2,173 farms.

Pastures are on most soils of the county, but usually, on Porters, Halewood, Hayesville, and Ramsey soils. Porters soils produce the best pasture in the uplands, followed in order of desirability by the Ashe, Halewood, Balfour, Hayesville, and Fletcher soils. Nevertheless, pasture of the highest carrying capacity and probably better quality grows on the soils of the smoother colluvial slopes and the better drained soils of the low stream terraces and first bottoms.

If proper liming, fertilization, seeding, control of grazing and weeds, and other good management are followed, grazing vegetation is of good quality and moderate to high carrying capacity on all the soils suitable for pasture. The usual rate for pasture seeding is 25 pounds an acre. Pastures are fertilized with 200 to 400 pounds of superphosphate, or its equivalent, after seeding. Lime is applied at 4- to 6-year intervals, the application being 1½ tons of ground limestone an acre. Most of the lime is applied to more accessible areas; steeper slopes receive little or none.

LIVESTOCK AND LIVESTOCK PRODUCTS

A few hogs, one to three milk cows, and a small flock of chickens are kept on almost every well-established farm. Hogs are raised chiefly to provide lard and meat for home use, but a few are sold on local markets. Milk, poultry, and eggs are used mainly by the farm household, but some surplus is sold to outside markets.

In 1949, 2,873,897 gallons of whole fresh milk were sold. In addition, 5,324 pounds of butterfat (cream) were sold. A total of 335,714 dozen eggs was sold in 1949.

The number of livestock on farms is given in table 13 for stated census years.

TABLE 13.—*Number of livestock and bee hives on farms of Buncombe County, N. C., in stated years*

Livestock	1920	1930	1940	1950
	Number	*Number*	*Number*	*Number*
Horses	3, 570	1, 731	[1] 2, 174	2, 734
Mules	2, 305	1, 642	[1] 1, 329	823
Cattle	21, 210	20, 881	[1] 19, 625	22, 314
Hogs	10, 074	4, 943	[2] 5, 459	5, 657
Sheep	1, 333	2, 166	[3] 579	279
Goats	21	36	[3] 119	(4)
Chickens	118, 545	[1] 103, 458	[2] 121, 830	123, 272
Beehives	2, 653	3, 041	2, 254	(4)

[1] Over 3 months old, Apr. 1.
[2] Over 4 months old, Apr. 1.
[3] Over 6 months old, Apr. 1.
[4] Not reported.

TYPES AND SIZES OF FARMS

As classified in 1950 by types of farm, there were 817 field-crop farms other than vegetable and fruit and nut; 222, dairy; 133, livestock other than dairy or poultry; 77, general; 68, poultry; 10, vegetable; 10, fruit and nut; and 2,929 unclassified farms.

In 1950 there were 4,266 farms in the county, and the average size of all farms was 52.9 acres. Nearly half the cropland harvested and by far the greatest farm investment was on farms of less than 100 acres. The farms were grouped by size as follows:

Acres:	*Number of farms*
Under 10	949
10 to 29	1,379
30 to 49	718
50 to 69	400
70 to 99	319
100 to 139	202
140 to 179	90
180 to 219	66
220 to 259	38
260 to 499	71
500 to 999	29
1,000 and over	5

LAND USE AND FARM TENURE

Land in farms totaled 225,773 acres, or 54.6 percent of the county, in 1950. Of the land in farms, a total of 34,118 acres was cropland harvested; 16,098 acres, cropland not harvested and not pastured; 15,824 acres, cropland used only for pasture; 44,644 acres, other land pastured but not including woodland pastured; 105,718 acres, farm woodland (48,282 acres of which was pastured); and 9,371 acres, all other land in farms.

As the foregoing figures indicate, the total acreage of land suited to crops is relatively small. According to data prepared by the Forestry Relations Department of the Tennessee Valley Authority, only about 38 percent of the county is cleared of forest. Much of the land cleared is suitable for crops or pasture, but a considerable acreage is not suitable for crops, and some is suited to neither pasture nor crops and would be more useful if reforested. If forest industries did not supply some employment, a much smaller number of people would be able to gain a livelihood in the county.

In 1950, full owners operated 3,441 farms; part owners, 410; tenants, 400; and managers, 15.

FORESTS

The first white settlers found forest on most of the area now in Buncombe County. The native vegetation was chiefly deciduous hardwoods with some pine intermixed in places. The forest growth varied somewhat according to location.

On the extensive upland where Porters, Ramsey, Hayesville, Halewood, Fletcher, Wilkes, Edneyville, and Rabun soils predominate, the oak-chestnut, the northern hardwoods, and the southern hardwoods forest types were dominant. The chief species were white,

chestnut, red, and scarlet oaks, chestnut, hickory, maple, and yellow-poplar. Probably 50 percent of the trees were chestnut. On more sandy sites shortleaf or yellow pines were intermixed with these deciduous trees, and Virginia (scrub) pine was common on drier sites. Hemlock grew on steep slopes adjacent to streams and on other cool sites. Other common but less abundant species throughout the upland were white pine, cherry, beech, birch, locust, walnut, and butternut. The common undergrowth consisted of laurel, rhododendron, dogwood, serviceberry, gooseberry, huckleberry, blackberry, buckberry, and briers.

A small part of the upland—that on the highest mountains where Burton, Ashe, and Ramsey soils and Stony rough land (Porters soil material) are dominant—had a forest cover of red spruce and Southern balsam fir.

On colluvial slopes and better drained parts of the low terraces and bottom lands the forest consisted chiefly of basswood, tuliptree (yellow-poplar), ash, and buckeye. In these areas Tusquitee, Tate, State, Altavista, and Congaree soils are dominant. They are deep, fertile, permeable soils with moisture relations nearest optimum for growth of trees.

In more poorly drained areas occupied mainly by Chewacla, Toxaway, Wehadkee, and Warne soils the most important species were water and willow oaks, soft maple, sycamore, ash, sweetgum, and willow.

Today, the forest approximates the original in composition, but the balance among species has been altered by lumbering and by the blight that killed all the chestnut trees. Areas that have been cleared and abandoned are commonly reforested by pure stands of yellow pine. Shortleaf pine reestablishes readily and is valuable for timber and pulpwood (pl. 5, *B*).

FOREST RESOURCES AND PRODUCTS

According to the Forestry Relations Department of the Tennessee Valley Authority (*7*) there are approximately 243,000 acres of forest in the Tennessee River watershed part of Buncombe County. This watershed is about 95 percent of the county area. On this watershed a total of about 135,000 acres is of hardwood types in which oaks predominate, 18,000 acres of coniferous types (mostly yellow pine), and 90,000 acres of mixed coniferous and hardwood types.

The larger areas of forested land are in the northeastern, eastern, and southwestern parts of the county. To a great extent the larger forested areas are in Pisgah National Forest and in large private holdings. Other forested areas widely distributed throughout the county are mainly woodland on farms.

A total of about 53,000 acres of the county on the Tennessee River watershed is in public forest, 86,000 acres in private nonfarm forest, and 103,000 acres in farm woodland (*8*). The private nonfarm areas include land held for commercial forest, forested land held by individuals as long-term investments, and private recreational areas in forest. The public forest includes 31,000 acres in Pisgah National Forest and the Asheville municipal watershed.

In addition to natural reforestation, more than 3,800,000 trees have been planted on 3,000 acres in the Tennessee River watershed part of the county. The Tennessee Valley Authority cooperated in the 395 projects carried out in planting these trees. The planting was done mainly before 1942, and mostly on farms.

In 1940, there were approximately 99,000 acres of forest of saw-timber size and 116,000 acres of cordwood size in the Tennessee River watershed part of the county (7). The trees on the rest of the forested acreage in this area were smaller. The annual growth was about 12,500,000 board feet for the trees of saw-timber size and 67,000 cords for the trees of cordwood size.

Lumber, pulpwood, acid wood, tanbark, firewood, and some railroad ties are the chief forest products. According to a preliminary estimate prepared by the Southeastern Forest Experiment Station, production of sawed lumber in Buncombe County totaled 10,235,000 board feet in 1942, of which 2,710,000 board feet was softwoods and 7,525,000 board feet was hardwoods. The same station reported 51 active sawmills in 1942. In 1940, about 32,000 cords of wood were cut for pulp and 50,000 cords for firewood sold or used at home. The firewood consisted of trees cut for fuel and waste or refuse from logging operations and sawmills.

FIRE PROTECTION

Facilities for effective fire protection are maintained for the Pisgah National Forest by the Federal Government. Forested areas in the rest of the county are less well protected. One full-time and several part-time fire wardens are employed to protect forest lands not in the national forest. The laws of the State provide for conscripting any person needed for controlling forest fires. Fire fighters conscripted are paid a standard wage for time on duty. As a preventive measure, it is compulsory that a permit be obtained from the county fire warden before burning brush, pasture, or forest lands.

The Asheville watershed is protected by guards. The city furnishes men to put out fires in this area, and the laws of the State prohibit trespassing upon property from which municipal areas obtain water supplies.

MORPHOLOGY, GENESIS, AND CLASSIFICATION OF SOILS

FACTORS OF SOIL FORMATION

Soil is the product of the forces of weathering and soil development acting on the parent material deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and has existed since accumulation; (3) plant and animal life in and on the soil; (4) relief or lay of the land; and (5) the length of time the forces of development have acted on the material. The climate, and its influence on soil and plants, depends not only on temperature,

rainfall, and humidity, but also on the physical characteristics of the soil or soil material and on the relief, which, in turn, strongly influence drainage, aeration, runoff, erosion, and exposure to sun and wind.

PARENT MATERIALS

The parent materials of the soils of Buncombe County may be considered in two broad classes: (1) Materials residual from weathering of rocks in place and (2) materials transported by water or gravity and laid down as unconsolidated deposits of clay, silt, sand, and rock fragments. Materials of the first group are related directly to the underlying rocks from which they were derived; those of the second, to the soils or rocks from which they were transported.

The residual parent materials consist of weathered products of igneous and metamorphic rocks. These rocks differ greatly in chemical and mineralogical composition, and the soil parent materials derived from them differ correspondingly in composition and physical character. The rocks of this county have not been studied enough to permit determining differences in chemical and mineralogical composition and correlating such differences with differences among the soils developed from them. It is apparent, however, that differences among most soils developed from residual products of rock weathered in place are associated with differences among the rocks from which they were derived. Similar rocks underlie dissimilar soils in several places where differences in relief have been an important contributing factor.

Although some soil characteristics can be correlated with kinds of parent materials from which they were derived, other soil characteristics, especially those of regional significance to soil genesis, cannot be so correlated and must be attributed to other factors.

CLIMATE

The valley section, or intermountain plateau, has fairly long but moderately warm summers, relatively short and mild winters, and moderately high rainfall. As climate is relatively mild and the soils moist much of the time, chemical reactions are rapid. The high rainfall promotes complete leaching of soluble materials, as bases, from the soil and promotes downward translocation of less soluble materials and colloidal matter in the soil. Since the soil is frozen for only short periods and to shallow depths, weathering and translocation of materials is further intensified.

Temperatures are much lower in the mountainous sections than in the valleys, and therefore chemical reactions in mountain soils are appreciably slower. High rainfall tends to leach and translocate less soluble materials and colloidal matter downward in the mountain soils, but because these soils are frozen for a longer time and to greater depth than those in valleys, leaching is correspondingly retarded.

Within any one climatic zone certain outstanding characteristics are common to the well-drained, well-developed soils, but the soils differ in other characteristics that may be correlated with factors other than climate. The kinds of parent material appear to have been outstand-

ingly important in causing differences among soils. Climate over the larger part of the county has characteristics of the climate of both the Red-Yellow Podzolic and Gray-Brown Podzolic soil regions; consequently, Red-Yellow Podzolic and Gray-Brown Podzolic soils are intimately associated, and differences in such factors as parent materials, drainage, and age appear to have been important in determining the great soil group to which many of the soils belong. In general, the climatic conditions of the valleys are those that commonly give rise to soils of the Red-Yellow Podzolic great soil group; those of the mountains give rise to Gray-Brown Podzolic soils. All gradations between these two conditions of soil formation may be found.

PLANT AND ANIMAL LIFE

Higher plants, micro-organisms, earthworms, and other forms of life live on and in the soil and contribute to its morphology. The nature of the changes they bring about depends, among other things, on the kinds of life and the life processes peculiar to each. The kinds of plants and animals that exist are determined by the climate, parent material, relief, and by the age of the soil. Climate is most apparent but not always most important in determining the kinds of higher plants that grow on the well-developed, well-drained soils. Nonetheless, climate exerts a powerful indirect influence on the morphology of soils. Climate and vegetation together are the active factors of soil formation.

Buncombe County was originally covered by forest consisting principally of deciduous trees. Chestnut, Northern red oak, sugar maple, hemlock, spruce, yellow birch, black cherry, cucumber, and beech trees were dominant in the mountains; white ash, yellow-poplar, basswood (linden), white and other oaks, chestnut, white pine, hickory, and walnut predominated in the valleys. The undergrowth of the mountain forest included many plants as galax, huckleberry, rhododendron, and laurel, which were largely absent in the valley forests. These differences appear to have resulted partly from differences in climate.

Many of the trees and shrubs are moderately deep feeders that shed their leaves annually. The content of the various plant nutrients in the leaves ranges considerably, but in general the quantities of bases and phosphorus returned to the soil by leaves of deciduous trees are high as compared with those returned by leaves of coniferous trees. Leaves falling on the ground contain plant nutrients that tree roots have carried up from the lower part of the soil and they therefore replace nutrients leached out by percolating waters. Probably trees transfer more nutrients in soils of the valleys than in soils of the mountains and thus somewhat offset the more rapid weathering of rocks and leaching of soils occurring at lower elevations.

Decaying leaves, twigs, roots, and entire plants add much organic matter to soil—most of it to the topmost part where it is acted on by micro-organisms, earthworms, and other forms of life, and by direct chemical reactions. Plant remains probably decay more rapidly in valleys than on mountains, and partly as a result of this, some well-drained soils of the higher mountains contain considerably more organic matter than do well-drained soils of the valleys.

Decaying organic material releases organic acids that speed the dissolving of slowly soluble constituents and increase the rate of leaching and translocation of inorganic materials. The effect of organic acids is conditioned by climate, for climate affects the kinds of vegetation and micro-organisms, the rates of reaction, and leaching.

RELIEF

In relief the soils of this county range from almost level to very steep. Relief modifies the effects of climate and vegetation. On some steep areas much water runs off, and consequently geologic erosion keeps almost even pace with rock weathering and soil formation. In such steep areas soil materials are constantly removed or mixed by creeping, by rolling, or by minute to moderate slides; they do not remain in place long enough for a profile of genetically related horizons to form. A small quantity of water percolates through soil on steep slopes, and leaching and translocation of materials are correspondingly small. The vegetation is commonly less dense on steep soils than on those with more favorable moisture conditions. It has been noted that steeply sloping soils are better developed where the slope is concave than where it is convex. On concave slopes moisture conditions favor a dense growth of vegetation, and geologic erosion is slow. In fact, on many concave slopes soil material is accumulating.

In some nearly level areas where internal and external drainage are slow, soils developed from materials that have been in place for a long time show characteristics that well-drained soils do not. These slowly drained soils commonly have a subsoil mottled with yellow and gray. Geologic erosion is slow in poorly drained areas and the soils so located may develop a highly leached surface layer and a very compact subsoil. Also, their vegetation is different from that on well-drained soils. The micropopulation also is different, and conditions are less favorable for the rapid decomposition of organic matter.

TIME

Some materials have been in place for such a short time that the influences of climate and vegetation have not had opportunity to develop well-defined and genetically related profile horizons. Most soils of the first bottoms are composed of such materials, as are also the steeply sloping soils. The first bottom soils receive new alluvial deposits; the steeply sloping soils have their materials constantly renewed or removed by geologic erosion. These two broad groups comprise the young soils of the county.

Soils that have been in place for a long time and have approached equilibrium with their environment are considered to be mature. In the county some almost level well-drained soils that have been little affected by geological erosion have developed more intense profile characteristics than have well-drained well-developed soils on the gently rolling uplands. Such level soils are very old. The soils of this county range from very young to very old, but they are mostly young to very young.

CLASSIFICATION OF SOIL SERIES

The soil series of Buncombe County are classified by soil orders and great soil groups as follows:

Order, great soil group, and series:	*Parent rock*
Zonal soils:	
Red-Yellow Podzolic:	
Red members:	
Hayesville	Light-colored granite, gneiss, and schist.
Rabun	Dark basic igneous and metamorphic rocks.
Fletcher	Brevard schist.
Hiwassee	Old alluvium.
Yellow members:	
Edneyville	Light-colored granite, gneiss, and schist.
Altavista	Moderately young alluvium.
Masada	Old alluvium.
Gray-Brown Podzolic:	
Members with relatively thick B horizons:	
Halewood	Light-colored granite, gneiss, and schist.
Balfour	Do.
Tusquitee	Alluvium and colluvium.
Tate	Colluvium.
Members with relatively thin B horizons:	
Porters	Granite, gneiss, and schist.
Ashe	Do.
Intrazonal soils:	
Brown Forest (locally may include some Humic Gley):	
Burton	Granite, gneiss, and schist.
Planosols (modified):	
Iredell	Dark basic igneous and metamorphic rock.
Warne	Moderately young alluvium.
Azonal soils:	
Lithosols:	
Ramsey	Shale, slate, sandstone, and quartzite.
Wilkes	Granite, gneiss, and schist.
Alluvial soils:	
Congaree	Young alluvium.
Chewacla	Do.
Wehadkee (transitional to Low Humic Gley)	Do.
Toxaway (transitional to Humic Gley)	Do.
Buncombe	Do.
State (transitional to Gray-Brown Podzolic)	Moderately young alluvium.

ZONAL SOILS

Zonal soils are any one of the great groups of soils having well-developed soil characteristics that reflect the influence of the active forces of soil genesis—climate, living organisms, and vegetation (*9*). In this county the zonal soils are members of the Red-Yellow Podzolic and the Gray-Brown Podzolic great soil groups.

RED-YELLOW PODZOLIC SOILS

The Red-Yellow Podzolic great soil group consists of red and yellow zonal soils. The red soils of this great soil group are first discussed.

The red soils of the Red-Yellow Podzolic group—the Hayesville, Rabun, Fletcher, and Hiwassee—occur mainly in lower lying parts of the county where temperatures are highest. They are on uplands of the intermountain valleys, on lower mountain slopes, or on terraces along streams. They may occur at about the same elevation as the Gray-Brown Podzolic soils but are derived from materials generally higher in bases or that have been in place longer. Internal drainage is slightly better than in the associated yellow members of the Red-Yellow Podzolic great soil group.

The Hayesville soils show the characteristics of Red Podzolic soils as well as any series in the county. They have developed from light-colored granite, gneiss, and schist rocks on undulating to steep relief in the intermountain and, to some extent, mountain uplands. They are characterized by a gray to yellowish-brown surface soil over a moderately compact brownish-red to red clay subsoil. Development took place under the warm moist climate and deciduous forest characteristic of areas marginal between Gray-Brown Podzolic and Red-Yellow Podzolic soil regions. The parent rocks of Hayesville soils apparently contain less silica and more clay-forming minerals than do rocks underlying Halewood soils. Also, these rocks weather to a darker residuum under the conditions of climate and vegetation existing. The residuum appears to be fairly low in bases.

Profile description of Hayesville loam, hilly phase, taken about three-fourths mile east of Venable School:

A_1. 0 to ½ inch, brown leafmold layer of organic matter; contains many fine roots and root hairs.

A_2. ½ to 6 inches, yellowish-brown friable loam containing many fine tree and grass roots and little organic matter; moderately developed crumb structure.

B_1. 6 to 12 inches, brown friable clay loam with a moderately developed nuciform structure; breaks into irregularly shaped lumps; contains some quartz gravel, a few finely divided mica flakes, and many large and small tree roots.

B_2. 12 to 32 inches, reddish-brown brittle heavy clay with moderately developed nuciform structure; contains a few quartz gravelstones, some mica flakes, and only an occasional root; breaks into irregularly shaped lumps.

C. 32 to 40 inches +, reddish-brown very friable rotten granitic rock mottled with yellow and gray and speckled with black; contains many mica flakes but no gravel or roots; shows some constructional form of the original rock.

Other red soils of the Red-Yellow Podzolic great soil group are the Rabun, Fletcher, and Hiwassee. Like the Hayesville, these soils have the common characteristics of Red Podzolic soils. All the red soils of the county apparently developed under relatively similar conditions of climate and vegetation. They are well drained, and though they vary somewhat in degree of maturity, all have at least a moderately well developed Red Podzolic soil profile. Relief ranges from undulating to hilly, but differences among these soils do not appear to result primarily from differences in slope. Rather outstanding differences in kinds of parent materials appear to be directly or indirectly the major cause of differences among the soils.

The yellow soils of the Red-Yellow Podzolic group belong to the Edneyville, Altavista, and Masada series. They have thin organic and organic-mineral layers over a grayish-yellow leached layer that rests on a yellow horizon; they have developed under mixed forest in a warm-temperate moist climate (*9*).

Edneyville soil developed from light-colored granite, gneiss, and schist ridges in the valley section. It is characterized by a pale-yellow friable fine sandy loam surface soil that grades to a yellow friable fine sandy clay lower subsoil. Surface runoff is medium, and internal drainage is moderate.

Profile of Edneyville fine sandy loam in a cultivated area:

A. 0 to 13 inches, pale-yellow friable fine sandy loam with many grass roots and a few small mica flakes.

B_1. 13 to 23 inches, yellow friable fine sandy clay loam with a few gray mottlings; contains no mica flakes or gravel; breaks into soft irregularly shaped lumps; has moderately developed nuciform structure.

B_2. 23 to 37 inches, yellow friable fine sandy clay containing little mica and no quartz gravel; moderately developed nuciform structure; breaks into irregularly shaped lumps that are friable and easily reduced to a friable mass; no roots in layer.

C. 37 inches +, reddish-brown, yellow, and gray mottled friable rotten granitic rock.

A few angular gravelstones are on the surface and in the soil.

Altavista soils are developed on low stream terraces from alluvium washed or transported from soils underlain by igneous or metamorphic rocks. They are characterized by brownish-gray surface soil and friable pale-yellow subsoil. Internal drainage may be somewhat restricted but is adequate for most farm crops.

The Masada soils are developed on old alluvium on old high terraces along the larger streams of the intermountain valleys. They are characterized by brownish-gray to light-brown friable surface soil and yellowish-brown firm clay subsoil and are transitional between the yellow and red members.

GRAY-BROWN PODZOLIC SOILS

The Gray-Brown Podzolic soils are a zonal group of soils having a comparatively thin organic covering and an organic-mineral layer over a grayish-brown leached layer that rests upon an illuvial brown horizon. They have developed under deciduous forest in a temperate moist climate. Podzolization is the dominant soil-forming process (*9*).

In this county, Gray-Brown Podzolic soils generally are at higher altitudes than red members of the Red-Yellow Podzolic great soil group, although in places soils of both groups occur side by side. In such areas of association the red members of the Red-Yellow Podzolic group are derived from materials higher in bases or are older than the Gray-Brown Podzolic soils, but soils of both groups apparently developed under similar vegetation and on like relief. Soils of both groups are well drained.

The Gray-Brown Podzolic soils are members of the Halewood, Balfour, Tusquitee, Tate, Porters, and Ashe series. The Halewood, Balfour, Tusquitee, and Tate soils have a relatively thick B horizon; the Porters and Ashe, a relatively thin B horizon. Differences among

this group of soils appear to result mainly from differences in parent materials or relief.

The Halewood soils have formed from acid crystalline rocks on steeper slopes in the intermountain areas and on lower slopes of some mountains or mountain ridges. Relief ranges from hilly to steep, and the profile is generally not so well developed as that of the Hayesville soils or of other Red Podzolic soils.

The characteristics of Gray-Brown Podzolic soils are shown in the following profile description of Halewood loam, hilly phase, taken in a virgin area 2¼ miles east of Venable School:

A. 0 to 6 inches, yellowish-gray friable porous loam containing many large and small roots, some small schist fragments, and a few finely divided mica flakes; very thin layer of leafmold and woodland litter on surface; moderately developed crumb structure.

B. 6 to 24 inches, reddish-yellow or yellowish-brown friable porous clay that breaks into irregularly shaped lumps; contains some light-colored finely divided mica flakes, a few large and small roots, and some quartz gravelstones and schist fragments; moderately developed nuciform structure.

C. 24 inches +, mottled brown and yellow friable rotten rock that retains the constructional form of the original rock; slightly more mica flakes than in B horizon.

The Balfour soils differ from the Halewood in having smoother relief, a slightly heavier subsoil, and a more uniform color. Surface runoff is not so rapid as in the Halewood, and internal drainage is good but not so rapid. Both Halewood and Balfour soils are derived from light-colored granite, gneiss, and schist.

The undulating to hilly Tusquitee soils have a brown friable surface soil that is underlain by a yellowish-brown friable subsoil. They have developed from alluvium and colluvium.

Soils of the Tate series are undulating to rolling. They have a gray to pale-brown friable surface soil and a brownish-yellow to yellowish-brown moderately friable subsoil. They are derived from colluvium.

The Porters and Ashe soils are characterized by a relatively thin B horizon and are sometimes referred to as Lithosolic Gray-Brown Podzolic soils. Soils of both of these series show some profile development, but it is less well defined than in the Halewood, Balfour, Tusquitee, and Tate soils.

Soils of the Porters series developed from dark-colored granite, gneiss, and schist rock on hilly to very steep relief in mountainous areas. Most areas have a weakly formed Gray-Brown Podzolic profile, but this profile is not sufficiently developed to justify considering Porters soils as typical members of the Gray-Brown Podzolic group. Porters soils are characterized by a friable brown to dark-brown surface soil and a brown to yellowish-brown friable and very permeable subsoil. The depth to bedrock is usually less than 32 inches, and outcrops of bedrock are common. The lack of profile development appears to be related to the steepness of slope and the consequent lack of stability.

Profile description of Porters loam, steep phase, taken 2 miles northeast of Riceville:

A_1. 0 to 9 inches, brown friable porous loam covered with a very thin layer of organic matter composed of woodland litter; breaks into irregularly shaped lumps and readily crumbles to a friable mass showing a moderately developed crumb structure.

B. 9 to 22 inches, moderate-brown friable porous loam containing root and worm holes coated with organic matter, a few mica flakes, many large and small roots, and some schist fragments up to a few inches in diameter; breaks into irregularly shaped lumps that crumble easily to a friable mass showing moderately developed nuciform structure.

C. 22 inches +, moderate-brown rotten rock and hard schist fragments; some mica flakes.

Ashe soils developed under a climate similar to that of the Porters, but from parent materials apparently higher in content of silica and lower in content of clay-forming minerals. They are lighter colored than Porters soils and apparently lower in content of plant nutrients.

INTRAZONAL SOILS

Intrazonal soils are any of the great soil groups having more or less well-developed soil characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of climate and vegetation (*9*). In this county intrazonal soils are members of the Brown Forest and the Planosols (modified) great soil groups. The soils of these two great soil groups may be associated with members of any of the other great soil groups.

BROWN FOREST SOILS

Brown Forest soils are an intrazonal group of soils. They have very dark-brown surface material relatively rich in humus (mull) that grades through lighter colored soil into the parent material. They are characterized by medium acid reaction, little or no illuviation of iron and alumina, and a very slight content of calcium in the soil colloids. They are developed under deciduous forest in temperate humid regions from parent materials moderately rich in bases (*9*). Burton stony loam is the only member of this great soil group in the county. It developed on the tops of mountains and in high mountain coves, largely from formations of hornblende gneiss and schist that usually lie at a shallow depth. It is characterized by a very dark gray to almost black highly organic surface layer that lies upon yellowish-brown friable clay loam. Bedrock frequently crops out on the surface. The soil developed under a cool moist climate. The original vegetation probably was deciduous trees, but some areas were covered by grasses, sedges, and shrubs when the county was first settled.

The cool climate favors slow decay of organic matter, and this factor probably contributed greatly to the accumulation of organic material. Trees and grasses that contribute organic material high in bases also may have been a factor in formation of the thick upper layer. It is reasonably certain that the parent materials of this soil are relatively high in bases, though the soil itself is strongly acid.

Profile description of Burton stony loam at Beetree Gap:

A. 0 to 12 inches, very dark-gray or almost black friable porous loam rich in organic matter; contains many grass roots and many large schist fragments; breaks into irregularly shaped lumps that crumble to a mass showing a moderately developed nuciform structure.

B. 12 to 22 inches, yellowish-brown porous friable loam or clay loam containing many large schist fragments and a few finely divided mica flakes; breaks into irregularly shaped lumps that crumble readily to a friable mass showing a moderately coarse crumb structure.

C. 22 inches +, rotten rock with light yellowish-brown loam intermixed; contains many mica flakes and some small hard rock fragments.

Angular rock fragments up to 12 inches in diameter are on the surface and in the soil. Some boulders are also on the surface, and outcrops of bedrock are common. In sheltered coves and on north-facing slopes the soil profile resembles that of the Humic Gley soils. These areas have a mucklike surface soil and a gray loam or friable clay loam subsoil.

PLANOSOLS (MODIFIED)

Typical Planosols are an intrazonal group of soils with eluviated surface horizons underlain by B horizons more strongly illuviated, cemented, or compacted than those of associated normal soils. They have developed on nearly level land under grass or forest vegetation in a humid or subhumid climate (*9*). Warne and Iredell soils are classified in the Planosols great soil group.

Warne silt loam, although not a typical Planosol, developed in nearly level areas on stream terraces from moderately young alluvium composed of materials washed from uplands underlain by igneous and metamorphic rocks. It is closely associated with Altavista and State soils and is characterized by a light-colored friable surface layer and by a stiff, plastic, compact yellowish-gray mottled silty clay or clay. Surface runoff is low and internal drainage is slow to very slow, but in places where slopes are stronger, surface runoff is higher. It is not known whether slow internal drainage contributed to the development of its dense B layer or resulted from that layer. The relief is generally such that normal erosion is slow. This slow erosion may have contributed to the formation of the dense B horizon. Also, it is possible that relatively dense layers in the original alluvial deposits may have impeded internal drainage, and that impeded internal drainage combined with low surface runoff have caused abnormal compaction of the illuviated layer.

Profile description of Warne silt loam in an oak-covered area about 1 mile northeast of Swannanoa:

A. 0 to 3 inches, brownish-gray silt loam with moss covering the surface; contains many small roots; slightly sticky when moist; breaks into irregularly shaped lumps that crush to a mass having a moderately developed crumb structure.

B_1. 3 to 20 inches, light yellowish-brown or yellowish-gray, mottled with moderate yellowish brown, slightly sticky and plastic silt loam; breaks into irregularly shaped lumps that crush to a moderately developed nuciform structure.

B_2. 20 inches +, yellowish-gray sticky and plastic stiff silty clay loam mottled with strong yellowish brown; breaks into irregularly shaped lumps and looks slightly flaky; has sandy clay texture in places.

The Iredell soil is developed from basic igneous material. Its surface soil—brownish gray with a greenish cast—is underlain at a depth of about 6 inches by yellowish-brown firm clay or clay loam. Below about 20 inches the subsoil is mottled olive, yellow, and gray plastic clay.

AZONAL SOILS

Azonal soils are any group of soils that lack well-developed profile characteristics because of their youth or because of parent material or relief such that development of normal soil-profile characteristics is prevented (*9*). In this county azonal soils are members of the Lithosols and Alluvial great soil groups.

LITHOSOLS

Lithosols are an azonal group of soils having no clearly expressed soil morphology. They consist of a freshly and imperfectly weathered mass of rock fragments, largely confined to steeply sloping land (*9*). In this county the soils very shallow over bedrock and some that show little development of genetic profile are classified as Lithosols. They are soils and land types generally steep and broken or severely eroded. Geologic erosion almost keeps pace with the weathering of rocks, or the soil materials slough or roll down slopes so rapidly that little true soil can develop. Some small areas of zonal soils are included in mapping because they are intricately associated with the Lithosols. Soils of the Ramsey and Wilkes series are the only Lithosols in the county other than the land types—Stony rough land (Porters soil material), Stony colluvium (Tusquitee soil material), and Rough gullied land (Hayesville and Halewood soil materials).

Ramsey soils are characterized by yellowish-gray to dark yellowish-brown shaly silt loam underlain by brownish-yellow to brown friable shaly silt loam. The soils are developed from highly siliceous rocks on hilly to steep relief. They are generally much less than 25 inches deep to bedrock.

Profile of Ramsey shaly silt loam, eroded steep phase, in a forested area one-eighth mile south of Lakey Gap:

A. 0 to 6 inches, dark yellowish-brown friable and porous shaly silt loam; contains many schist fragments up to 2 inches in diameter, a few very finely divided mica flakes, and many small roots.

C. 6 inches + (bedrock at 15 to 20 inches), moderate yellowish-brown friable porous shaly silt loam; consists mostly of shale fragments up to about 6 inches long; shale fragments permit penetration of only a few roots; a few finely divided mica flakes occur.

The Wilkes soils developed on steep slopes and have a grayish-brown to brownish-gray surface layer. The underlying material is lighter colored than the surface layer and contains many schist fragments. The parent material is mixed acidic and basic granitic or metamorphic rock.

Stony rough land (Porters soil material) is a very shallow Lithosol. Nearly all of it has steep to precipitous slopes, and there are many loose fragments of rock up to boulder size, as well as numerous out crops of bedrock.

Stony colluvium (Tusquitee soil material) consists of soil and rock fragments washed from steep slopes and accumulated on lower slopes or, in many places, in channels of former streams. Enough soil material is generally intermixed with the rock fragments to support some grass or trees.

Rough gullied land (Hayesville and Halewood soil materials) represents areas in which soils have been truncated by erosion and retain little of the material that once formed their solum. Most areas have an intricate pattern of gullies.

ALLUVIAL SOILS

Alluvial soils are an azonal group of soils developed from transported and relatively recently deposited material (alluvium); they are characterized by weak modification (or none) of the original

material by soil-forming processes (*9*). Soils of the Congaree, Chewacla, Wehadkee, Toxaway, Buncombe, and State series belong to the Alluvial great soil group.

The Congaree soils of the first bottoms are derived from alluvial materials washed mainly from soils underlain by crystalline rocks. They are subject to overflow, and new materials are deposited periodically. Because the soil material is constantly renewed by deposits, it remains young or very young and it has developed little or nothing in the way of genetically related horizons. The soil varies in kind and arrangement of layers. The color ranges from grayish brown or brown in the topmost layers to brown or yellowish brown in the lower layers. Textures range from fine sandy loam to silt loam.

Profile description of Congaree silt loam taken in an open field one-fourth mile south of Black Mountain:

A. 0 to 16 inches, light-brown friable silt loam of uniform color; contains many fine roots and a few mica flakes.

B. 16 to 36 inches +, moderate yellowish-brown friable porous silt loam of uniform color; contains many finely divided mica flakes and a few small roots.

The Congaree and Buncombe are well drained, the Toxaway and Wehadkee are poorly drained, and the Chewacla is imperfectly drained, being intermediate between Congaree and Wehadkee soils in drainage. State soils are similar to the Congaree but occur at elevations slightly higher above normal overflow and are transitional to the Gray-Brown Podzolic soils. Much of the Toxaway soil has characteristics of the Humic Gley soils. Its 8– to 26–inch surface layer is almost black and high in organic matter. It is underlain by bluish-gray more or less mottled silt loam.

SOIL SURVEY METHODS AND DEFINITIONS

Soil surveying consists of examining, classifying, and mapping of soils in the field. The soil scientist walks over the area, at intervals of one-eighth mile or less except in the mountainous sections, and bores into the soil with an auger or digs holes with a spade. Each boring or hole shows the soil to consist of several distinctly different layers, called horizons, which collectively are known as the soil profile. Each of these layers is studied carefully for the things about it that affect plant growth.

The color of each layer is noted. The darkness of the topmost layer is usually related to its content of organic matter. Streaks and spots of gray, yellow, and brown in lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay in each layer, is determined by the feel and is checked by mechanical analyses in the laboratory. Texture determines to a considerable extent the quantity of moisture the soil will hold available to plants, whether plant nutrients or fertilizers will be held by the soil in forms available to plants or will be leached out, and how hard the soil may be to cultivate.

Soil structure, or granulation, and the number of pores or open spaces between particles indicate how easily plant roots can penetrate the soil and how easily water enters it.

Consistence, or the tendency of the soil to crumble, or to stick together, indicates how difficult it is to keep the soil open and porous under cultivation. Consistence covers such soil characteristics as hardness, friability, plasticity, stickiness, compactness, toughness, and cementation.

The kind of rocks and the parent material from which the soil has been developed affect the quantity and kind of plant nutrients the soil may have naturally. Simple chemical tests show how acid the soil may be. The depth to bedrock or to compact layers is determined. The quantity of gravel or rocks that may interfere with cultivation, the steepness and kind of slope, the quantity of soil lost by erosion, and other external features are observed.

On the basis of all these characteristics, soil areas much alike in kind, thickness, and arrangement of layers are mapped as one soil type. Some soil types are separated into two or more phases. For example, if a soil type has slopes that range from 2 to 15 percent, the type may be mapped in two phases, an undulating phase (2- to 7-percent slopes) and a rolling phase (7- to 15-percent slopes); or a soil that has been eroded in places may be mapped in two or more phases, an uneroded (or normal) phase, an eroded phase, and perhaps a severely eroded phase. A soil type will be broken into phases primarily because of differences in the soil other than those of kind, thickness, and arrangement of layers. The slope of a soil, the frequency of outcropping bedrock, the extent of erosion, or artificial drainage are examples of characteristics that might cause a soil type to be divided into phases.

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

The name of a place near where a soil series was first found is chosen as the name of the series. Thus, Halewood is the name of a soil series first mapped in Madison County, N. C. Three types of this series are found in Buncombe County—Halewood loam, Halewood clay loam, and Halewood stony loam. These types differ in the texture of the surface soil, as their names show. These types are divided into ten phases because of differences in slope and erosion. Some of these phases are Halewood loam, hilly phase; Halewood stony loam, eroded hilly phase; and Halewood clay loam, severely eroded steep phase.

When very small areas of two or more kinds of soil are so intricately mixed that they cannot be shown separately on a map of the scale used, they are mapped together, and the areas of the mixture are called a soil complex. Congaree-Tate loams is a complex of Congaree loam and Tate loam.

Areas such as very stony land and bare rocky mountainsides that have little true soil are not designated with series and type names. They are considered to be land types and are given descriptive names,

such as Stony colluvium (Tusquitee soil material) and Stony rough land (Porters soil material).

The soil type, or where the soil type is subdivided, the soil phase, is the unit of mapping in soil surveys. It is the unit or the kind of soil that is most nearly uniform and has the narrowest range of characteristics. For this reason land use and soil management practices can be more definitely specified for a soil type or phase than for broader groups of soil that contain more variation. One can say, for example, that soils of the Hayesville series need lime for alfalfa; but for Hayesville loam, undulating phase, it can be said that it has mild slopes and, in addition to needing lime, is suited to row crops in a rotation with small grain and hay. For Hayesville loam, steep phase, it can be stated that it has slopes that fall more than 30 feet in 100, is hard to work with heavy machinery, erodes easily, and should be used principally for long-term hay or pasture. Both phases are included in the Hayesville series.

LITERATURE CITED

(1) ALLEY, F. E.
1941. RANDOM THOUGHTS AND MUSINGS OF A MOUNTAINEER. 539 pp., illus. Salisbury, N. C.

(2) ARTHUR, J. P.
1914. WESTERN NORTH CAROLINA; A HISTORY (FROM 1730 TO 1913). 710 pp., illus. Raleigh, N. C.

(3) FEDERAL WRITERS PROJECT, NORTH CAROLINA.
1939. NORTH CAROLINA, A GUIDE TO THE OLD NORTH STATE. Amer. Guide Ser., 601 pp., illus. Chapel Hill, N. C.

(4) FENNEMAN, N. M.
1938. PHYSIOGRAPHY OF EASTERN UNITED STATES. 714 pp., illus. New York and London.

(5) NORTH CAROLINA DEPARTMENT OF CONSERVATION AND DEVELOPMENT.
1929. NORTH CAROLINA: RESOURCES AND INDUSTRIES. 287 pp., illus.

(6) SHANTZ, H. L., and ZON, R.
1924. NATURAL VEGETATION. U. S. Dept. Agr. Atlas of American Agriculture, pt. 1, sec. E, adv. sheets No. 6, 29 pp., illus.

(7) TENNESSEE VALLEY AUTHORITY.
1941. FORESTRY DATA FOR THE TENNESSEE VALLEY. Dept. of Forestry Relations Bul. 3, pt. 1, 155 pp., illus.

(8) ———
1942. FORESTRY DATA FOR THE TENNESSEE VALLEY. Dept. of Forestry Relations Bul. 5, pt. 3, 25 pp., illus.

(9) UNITED STATES DEPARTMENT OF AGRICULTURE.
1938. SOILS AND MEN. U. S. Dept. Agr. Yearbook 1938, 1232 pp., illus.

(10) UNITED STATES GEOLOGICAL SURVEY.
1904. GEOLOGIC ATLAS OF THE UNITED STATES, ASHEVILLE FOLIO, NORTH CAROLINA-TENNESSEE. U. S. Geol. Survey Folio 116, 10 [1] pp., illus.

(11) ———
1905 GEOLOGIC ATLAS OF THE UNITED STATES, MOUNT MITCHELL FOLIO, NORTH CAROLINA-TENNESSEE. U. S. Geol. Survey Folio 124, 10 pp., illus.

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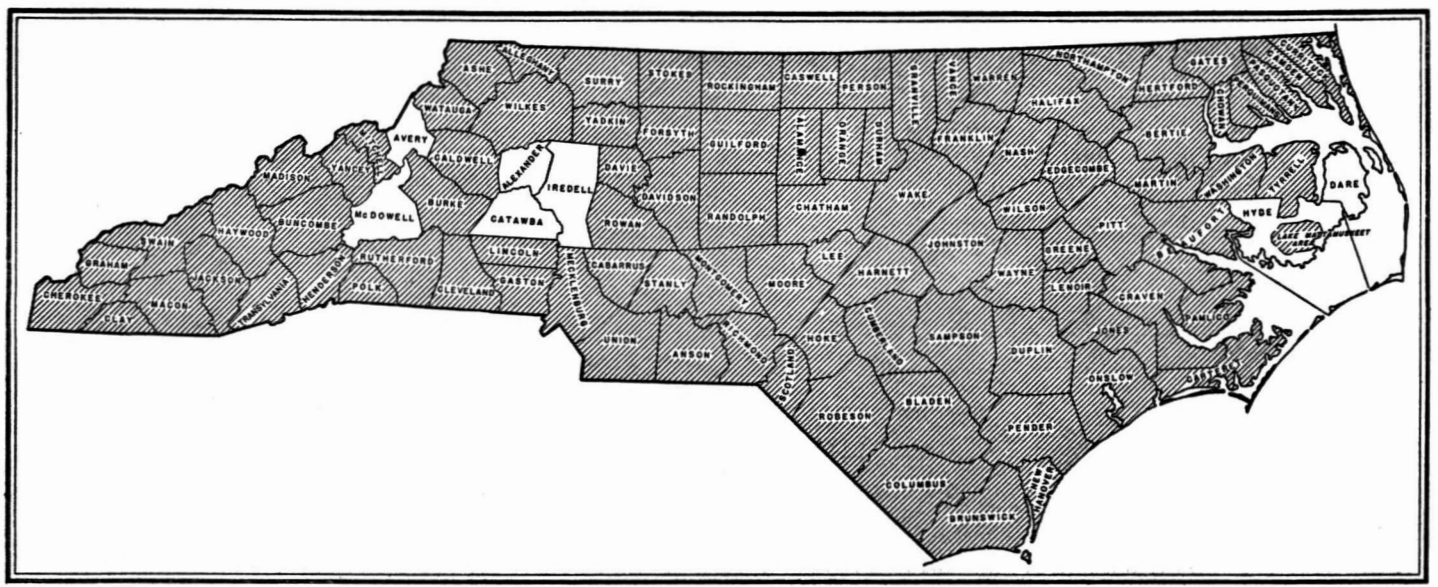

Areas surveyed in North Carolina shown by shading.

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