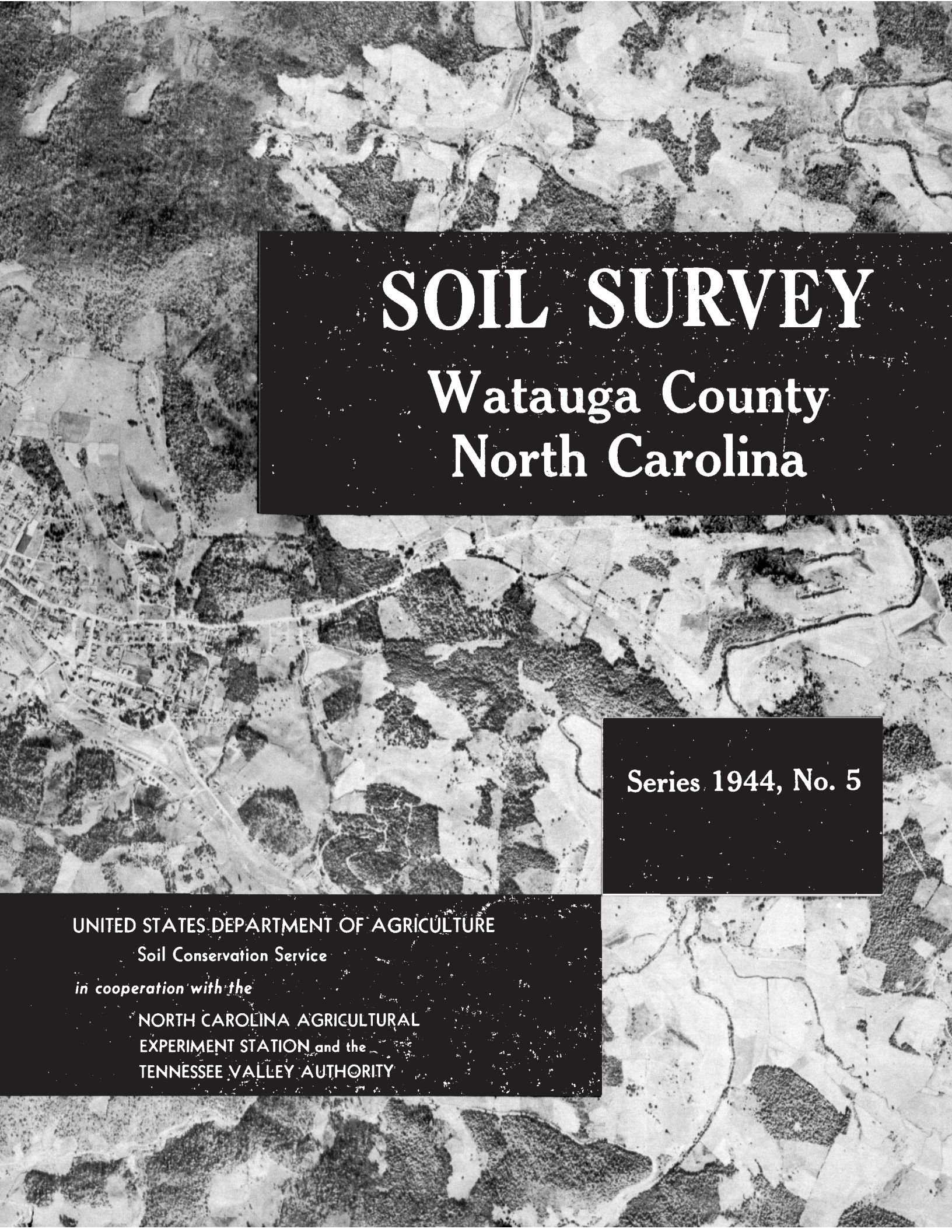

# SOIL SURVEY

## Watauga County North Carolina

Series 1944, No. 5

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

THE SOIL SURVEY of Watauga County was made to find out the nature and extent of each kind of soil. Soil scientists walked across the fields and through the woodlands. Wherever each one went, he examined the surface soils and subsoils; measured slopes with a hand level; looked closely at the lay of the land; and watched for differences in the crops, weeds, brush, and trees that were growing on the different soils. He carried a photograph made from an airplane that flew directly overhead, and on it he plotted boundaries of the soils. He placed a symbol in each area to tell what kind of soil he saw there.

This report contains a description of each soil and statements about what that soil will do under different kinds of use and treatment. Soil maps of the entire county have been printed on the aerial photographs, which were pieced together to make a mosaic. Roads, houses, streams, and other important landmarks and places have been marked on the aerial mosaic. You can also see the woodlands, the open fields, and something about how the fields are arranged. Remember, however, that the photographs were made in 1940, and that if woodlands have been cleared or if fields have been rearranged since, the map will not show them.

### *Find your farm on the map*

Look at the Index to Map Sheets for the county. It shows the main roads and streams and several place names. Look at the part of the county where your farm is located and notice the big number in the rectangle. That number tells you the map sheet on which you will find your farm. If your farm is near the edge of a sheet, you will have to check its exact location on the large-scale maps.

On the aerial photograph you can see the woodlands, some individual trees, and many of the field boundaries that are marked by hedgerows. Streams and roads have been marked, and place names are shown. Take a little time to become acquainted with the photograph. See if you can pick out your farm and locate its boundaries. Your county agent or soil conservation representative will help you.

Look at the red lines that are boundaries of the different kinds of soil. Each kind of soil is marked by a letter symbol, also printed in red. Usually the letter symbol is inside the area it identifies, but if the area is too small, the symbol is outside and connected to the area by a straight red line.

Make a list of the different symbols on your farm and then turn to the map legend, where each symbol is followed by the name of the soil it identifies. You are now ready to learn about the strong points and shortcomings of your soils and what you can do to take care of your soils and get best returns year after year.

Suppose you have found soil Pc, Perkinsville loam, rolling phase, on your farm. How does this soil look in the field? What does it need to control runoff and erosion? How is it used? How much will it produce? These are questions answered in the report.

Perkinsville loam, rolling phase, and all the other soils mapped in Watauga County are described in the section, Soil Types, Phases, and Miscellaneous Land Types. After you have read about the Perkinsville soil, you will want to know how much it can produce. For this information, turn to table 9 in the section, Management Practices and Estimated Yields. This table gives expected yields under two levels of management—the management commonly practiced, and suggested management. You will notice that yields of most crops increase on this soil if improved management is used.

What should be done to take care of the soil and to get the better yields given in table 9? The answer to this is found by first noting that Perkinsville loam, rolling phase, is in management group 2–B (see second column in table 9), and by then turning to Management Group 2–B in the section on soil use and management.

Management group 2–B consists of Perkinsville loam, rolling phase, and several other soils, all of which need about the same kind of management. Read about the ordinary management needed to get the yields given in columns A of table 9, and about the better management needed to get the higher yields given under columns B.

### *Make a farm plan*

Study your soils to see whether you have been cultivating any that would make better pasture or woodland. Compare the yields you have been getting with those you could expect under different management. Then decide whether or not you should change your methods of farming. The choice, of course, must be yours. You will probably need help in making your own farm plan if you decide to change your methods. This report will help you in planning but it is not a plan of management for your farm or any other single farm in the county.

For help in farm planning, consult the Soil Conservation Service or the county agricultural agent. Members of your State experiment station staff and others familiar with farming in your county will also be glad to help.

### *Soils of the county as a whole*

Many users of this report will want to know something about the kinds of soils that occur in each part of the county. The section, General Soil Associations (p. 51), will be useful to them. Information about the principal rock formations, climate, agriculture, and several other subjects appears in the section, Additional Facts. A technical discussion of the soils and factors influencing their formation is given in the section, Soil Series and Their Relations.

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# Contents



Series 1944, No. 5

Issued June 1958

# SOIL SURVEY OF WATAUGA COUNTY, NORTH CAROLINA[1]

Field work by W. J. LEIGHTY, in Charge, and S. O. PERKINS, Division of Soil Survey,[2] United States Department of Agriculture; and C. W. CROOM and W. A. DAVIS, North Carolina Agricultural Experiment Station

Area inspected by J. W. MOON, Soil Scientist, Division of Soil Survey

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

WATAUGA COUNTY covers nearly 205,000 acres in the Blue Ridge section of North Carolina (fig. 1).

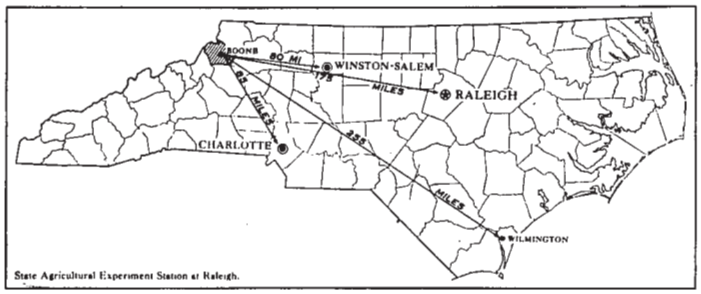


*Figure 1.*—**Location of Watauga County in North Carolina.**

Almost half of it is in second- or third-growth forest. Nevertheless, farming, not forestry, is the principal enterprise. The average farm covers about 68 acres, has 34 acres of cropland, and produces mainly for the farm household. The farmers grow corn, small grains, and hay for use on the farm, and tobacco, potatoes, cabbage, green beans, and other truck crops for sale. Nearly every farm has a few cattle and hogs, work animals, and a flock of chickens.

Productivity of the soils has gradually declined because of continued cropping and erosion. The soils most affected are those up on hillsides that have been cleared and farmed without enough regard for control of runoff and erosion. Some of these strongly sloping soils should be seeded to permanent pasture, and others restored to forest. The less sloping soils can be improved by crop rotation, application of fertilizer, and other good management described in this report.

Field work for this soil survey was completed in 1944, and, unless otherwise indicated, all statements in the report refer to conditions in the county at that time. As new and improved ways of managing soils and crops are discovered, some of the suggestions in this report will become out of date. Keep in touch with your county agricultural agent, soil conservation technician, and other farm advisors for the latest information on management of your soils and crops.

[1] The report was revised by R. C. Jurney, Division of Soil Survey, U. S. Department of Agriculture.

[2] Field work for this survey was done while the Division of Soil Survey was a part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service Nov. 15, 1952.

## *Soils and Their Interpretation*

### General Nature of the Soils

The soils of Watauga County are somewhat similar to those of the mountain districts in the surrounding counties of North Carolina, northwestern Tennessee, and southwestern Virginia. Most of the soils have either a loam or stony loam surface soil, and a friable more or less permeable subsoil.

Differences in parent material, relief, drainage, as well as some differences in the climate and native vegetation, and the age or stage of development of the soils, have caused the soils of the county to vary a great deal.

Some of the more important differences among soils are in nature of the parent material; degree of stoniness; content of organic matter and plant nutrients; relief; drainage; erodibility and present state of erosion; depth to bedrock; color, consistence, texture, and structure of the various profile layers; and susceptibility to overflow by streams.

All the foregoing are important in determining the suitability of soils for agriculture. These and other characteristics were recognized in classifying the soils in series (see tables 10 and 11) and in mapping them as types and phases of the series or as miscellaneous land types.

The parent material of the soils is of especial importance because of its effect on the recent, young, and immature soils that occupy a large proportion of the area. This material consists mainly of weathered products from metamorphic, igneous, and noncalcareous (or only very slightly calcareous) sedimentary rocks and recent and older alluvium from these materials. The kind of parent material influences natural fertility, stone content, profile depth, and many other aspects of the soils.

Stoniness of the soils also affects their use and management. About 32 percent of the soil area of the county is nonstony, that is, the surface soil does not contain enough stones to interfere with tillage. About 50 percent is stony or cobbly; the surface soil contains rock fragments that interfere with but do not prevent tillage. About 18 percent of the area has stones or bedrock outcrops that prevent tillage. About 0.1 percent of the total area consists essentially of rock outcrops with very little or no soil.

The soils of this county have formed in a temperate climate. Rainfall is moderately high and well distributed. The winters are not extremely cold, nor the summers

extremely hot. This climate allows leaching by water during much of the year. This water percolates through the soil, removes soluble plant nutrients, and leaves the soils mainly strongly or very strongly acid. This leaching is more active than in semiarid or arid climates, but it is not so rapid or so continuous as it is in the warmer Piedmont or Coastal Plain regions of the State, or in the warmer, more humid climate farther south. Principally because the soils developed in a cooler climate, they differ somewhat from those of the Piedmont region of the State. Generally, they are somewhat less leached, are higher in organic matter and natural fertility, and have more friable and permeable subsoils.

Practically all the soils have formed under a forest vegetation, principally hardwoods. They do not have as much organic matter as those formed under a grass vegetation. Most of the soils have a relatively low to medium content of organic matter. They are relatively light colored, except for a dark-colored surface layer, usually an inch or less thick, found in undisturbed areas of forest where organic matter has accumulated. The original thin, dark-colored surface layer of organic matter laid down over a long period of time soon disappears when it is mixed with the rest of the soil to plow depth under cultivation. A few of the soils remain darker, however, because their organic-matter content was greater because of the effect of a colder climate at higher elevation, grass vegetation on the natural balds, poor drainage, or other causes which in time have produced greater organic-matter content.

Relief, or lay of the land, is one of the most important features. It affects tillage, drainage and moisture relations, erosion and erosion hazard. The soils of the county are classified by slope ranges as follows:

| Slope description: | *Grade of slope (percent)* | *Area of county (percent)* |
|---|---|---|
| Level to undulating | 0 to 2 | 4 |
| Undulating to rolling | 2 to 7 | 2 |
| Rolling to hilly | 7 to 15 | 7 |
| Hilly to steep | 15 to 30 | 21 |
| Steep | 30 to 60 | 54 |
| Very steep | 60+ | 12 |

The use of heavy machinery for tillage becomes increasingly difficult and uneconomical as the slope increases beyond 15 percent, or from hilly to steep or very steep slopes.

Soil drainage, internal and external, is closely related to relief. In this county, the drainage ranges from very poor to excessive. Drainage is of particular importance to the bottom lands, terrace lands, and local alluvial and colluvial accumulations that together constitute a large proportion of the soils having good or very good relief for tillage. About 2.5 percent of the county has imperfect, poor, or very poor drainage.

Present erosion and tendency to further erosion are important problems because of the strong relief throughout most of the county. Fortunately, however, most of the soils have texture and permeability that do not make them highly erodible. Approximately 56 percent of the county is virtually uneroded, 16 percent slightly eroded, 27 percent moderately eroded, 0.8 percent severely eroded, and 0.2 percent very severely eroded and gullied.

## Soil Types, Phases, and Land Types

In the following pages, the types and phases of the 21 series classified in the county and the miscellaneous land types are described in detail, and their agricultural relations are discussed. Their acreage and proportionate extent are given in table 1. Their use suitability, present management and management requirements, crop adaptations, fertilizer requirements, and expectable average yields are discussed in the section Soil Use and Management where suitable crops, rotation of crops, water-control practices, fertilization, and estimated yields are discussed.

TABLE 1.—*Approximate area and percent of soils in Watauga County, N. C.*

| Soil | Acres | Percent [1] |
|---|---|---|
| Ashe loam: | | |
| Steep phase | 2,577 | 1.3 |
| Eroded steep phase | 7,796 | 3.8 |
| Ashe stony loam: | | |
| Hilly phase | 2,609 | 1.3 |
| Eroded hilly phase | 2,278 | 1.1 |
| Steep phase | 23,643 | 11.6 |
| Eroded steep phase | 12,845 | 6.3 |
| Very steep phase | 2,952 | 1.5 |
| Augusta loam | 234 | .1 |
| Buncombe loamy fine sand | 146 | .1 |
| Burton stony loam, hilly phase | 540 | .3 |
| Chandler loam: | | |
| Steep phase | 3,764 | 1.9 |
| Eroded steep phase | 4,383 | 2.1 |
| Chandler stony loam: | | |
| Steep phase | 4,936 | 2.4 |
| Eroded steep phase | 2,667 | 1.3 |
| Severely eroded steep phase | 450 | .2 |
| Very steep phase | 838 | .4 |
| Chewacla cobbly loam | 705 | .3 |
| Chewacla loam | 1,866 | .9 |
| Clifton clay loam: | | |
| Eroded hilly phase | 559 | .3 |
| Eroded steep phase | 375 | .2 |
| Clifton stony clay loam: | | |
| Eroded hilly phase | 1,129 | .6 |
| Eroded steep phase | 2,348 | 1.1 |
| Clifton stony loam: | | |
| Rolling phase | 463 | .2 |
| Hilly phase | 692 | .3 |
| Steep phase | 2,571 | 1.3 |
| Congaree cobbly fine sandy loam | 501 | .2 |
| Congaree fine sandy loam | 952 | .5 |
| Congaree loam | 1,040 | .5 |
| Gullied land (Chandler and Clifton soil materials) | 412 | .2 |
| Halewood clay loam: | | |
| Eroded hilly phase | 2,464 | 1.2 |
| Eroded steep phase | 2,507 | 1.2 |
| Halewood loam: | | |
| Rolling phase | 698 | .3 |
| Hilly phase | 362 | .2 |
| Steep phase | 1,390 | .7 |
| Halewood stony clay loam: | | |
| Eroded hilly phase | 915 | .4 |
| Eroded steep phase | 2,203 | 1.1 |
| Halewood stony loam: | | |
| Hilly phase | 444 | .2 |
| Steep phase | 2,475 | 1.2 |
| Hayesville clay loam: | | |
| Eroded hilly phase | 292 | .1 |
| Eroded steep phase | 247 | .1 |
| Hayesville loam, hilly phase | 215 | .1 |
| Hayesville stony loam, steep phase | 330 | .2 |

See footnotes at end of table.

TABLE 1.—*Approximate area and percent of soils in Watauga County, N. C.*—Continued

| Soil | Acres | Percent [1] |
|---|---|---|
| Matney loam: | | |
| Rolling phase | 203 | 0. 1 |
| Hilly phase | 133 | . 1 |
| Eroded hilly phase | 260 | . 1 |
| Matney stony loam: | | |
| Hilly phase | 431 | . 2 |
| Eroded hilly phase | 514 | . 3 |
| Perkinsville loam: | | |
| Undulating phase | 356 | . 2 |
| Rolling phase | 2, 380 | 1. 2 |
| Hilly phase | 2, 316 | 1. 1 |
| Eroded hilly phase | 4, 598 | 2. 3 |
| Perkinsville stony loam: | | |
| Rolling phase | 801 | . 4 |
| Eroded hilly phase | 857 | . 4 |
| Porters loam: | | |
| Hilly phase | 489 | . 2 |
| Eroded hilly phase | 769 | . 4 |
| Steep phase | 1, 232 | . 6 |
| Eroded steep phase | 4, 915 | 2. 4 |
| Porters stony loam: | | |
| Hilly phase | 437 | . 2 |
| Eroded hilly phase | 939 | . 5 |
| Steep phase | 5, 423 | 2. 7 |
| Eroded steep phase | 5, 988 | 2. 9 |
| Very steep phase | 1, 206 | . 6 |
| Eroded very steep phase | 628 | . 3 |
| Ramsey stony loam: | | |
| Steep phase | 5, 909 | 2. 8 |
| Eroded steep phase | 1, 746 | . 9 |
| Very steep phase | 654 | . 3 |
| Riverwash | 622 | . 3 |
| Rock outcrop | 197 | . 1 |
| State loam, undulating phase | 349 | . 2 |
| Stony colluvium (Tusquitee and Tate soil materials). | 6, 109 | 3. 0 |
| Stony hilly land (Ashe and Porters soil materials) | 1, 669 | . 8 |
| Stony rough land (Ashe and Porters soil materials). | 27, 850 | 13. 5 |
| Tate loam: | | |
| Undulating phase | 553 | . 3 |
| Rolling phase | 1, 498 | . 7 |
| Hilly phase | 407 | . 2 |
| Tate stony loam: | | |
| Rolling phase | 1, 275 | . 6 |
| Hilly phase | 883 | . 4 |
| Toxaway loam | 83 | (2) |
| Tusquitee loam: | | |
| Undulating phase | 489 | . 2 |
| Rolling phase | 1, 091 | . 5 |
| Hilly phase | 431 | . 2 |
| Tusquitee stony loam: | | |
| Undulating phase | 317 | . 2 |
| Rolling phase | 2, 513 | 1. 2 |
| Hilly phase | 2, 552 | 1. 2 |
| Eroded hilly phase | 343 | . 2 |
| Watauga loam: | | |
| Undulating phase | 107 | . 1 |
| Rolling phase | 1, 314 | . 6 |
| Eroded rolling phase | 407 | . 2 |
| Hilly phase | 1, 333 | . 7 |
| Eroded hilly phase | 3, 631 | 1. 8 |
| Watauga stony loam: | | |
| Rolling phase | 381 | . 2 |
| Hilly phase | 585 | . 3 |
| Eroded hilly phase | 1, 517 | . 7 |
| Wehadkee loam | 1, 320 | . 6 |
| Peaty phase | 311 | . 2 |
| Worsham loam | 666 | . 3 |
| Total | 204, 800 | 100. 0 |

[1] Rounded to nearest 0.1 percent. [2] Less than 0.1 percent.

**Ashe loam, steep phase** (30- to 60-percent slopes) (Ab).—This light-colored soil of the mountain uplands is derived mainly from residuum that weathered from granite, acidic gneiss, and schist. In some areas, metarhyolite is also present. The rocks are low in mica content. The soil occupies hillsides and mountainsides at elevations of about 1,500 to 5,500 feet. It occurs particularly in the northwestern and south-central parts of the county. Only a few acres are in the eastern and northeastern parts.

This soil differs from Porters loam, steep phase, in being more yellowish; from Chandler loam, steep phase, in being less micaceous; and from Perkinsville loam, rolling phase, in having a lighter textured subsoil and stronger relief.

Surface runoff is high, and internal drainage is moderate. The natural vegetation was mainly hardwood forest, principally black, white, Northern red, and chestnut oaks, yellow-poplar, basswood, hickory, and red maple. Some areas had a great number of hemlocks or white pines, or both; and many had an undergrowth of rhododendron, mountain-laurel, wild azalea, dogwood, and galax.

Virgin profile in a forested area:

0 to 1 inch, dusky-brown to weak-brown friable loam; weak fine crumb structure; cover of decaying leaves, twigs, and bark mainly from deciduous trees.

1 to 6 inches, dark yellowish-brown very porous friable loam; upper part slightly darker than lower; weak fine crumb structure.

6 to 33 inches, strong yellowish-brown to moderate yellowish-brown very porous friable somewhat gritty loam or heavy loam; structure ranges from weak medium or fine crumb to weak fine nut; contains small to moderate number of soft partly weathered rock fragments measuring up to 3 inches across.

33 inches +, brownish-gray to dark-gray, weak-yellow, or light yellowish-brown soft partly disintegrated rock; light-brown to strong yellowish-brown loam fills openings in the rock; bedrock at variable depths.

In most places rock fragments up to 6 inches across are on and in the soil, but generally they are not numerous enough to interfere with tillage. A few small outcrops of bedrock occur in some areas. In most areas a very small quantity of fine mica flakes is present, mainly in the lower part of the soil. The profile contains some coarse or medium sand in most areas.

The soil generally is strongly to very strongly acid throughout; but in places it is slightly to medium acid to a depth of 1 or 2 inches. Its organic-matter content is relatively low in some areas but it may be moderate to a depth of 2 or 3 inches in small moist coves on north or northeast slopes or under a thick growth of rhododendron. Fertility is relatively low to medium. The surface soil, subsoil, and parent material are moderately to rapidly permeable to water, roots, and air.

*Use and management.*—Nearly all of this phase is in forest, most of which has been culled or cut over. It is suited to permanent pasture but varies from poor to very poor for crops, mainly because of its steep slopes. If cleared, it should be seeded to a pasture mixture before erosion begins, as it is moderately erodible when not properly protected by vegetation. Application of lime and phosphate would benefit pastures.

**Ashe loam, eroded steep phase** (30- to 60-percent slopes) (Aa).—Represented by this phase are areas of Ashe loam, steep phase, that have been cleared of forest, cropped in

most places, and subsequently moderately eroded. The soil occurs in the same general area as Ashe loam, steep phase, and is associated with the other Ashe soils and the Perkinsville soils.

The original surface soil has been lost through accelerated erosion to such an extent that the subsoil is now within plow depth in more than half of the area. The plow layer is moderate to dark yellowish-brown friable loam. In places there are a few short shallow gullies that can be filled by tillage. Areas where sheet or gully erosion is greater than the normal range for this phase are indicated on the soil map by symbols. A few included areas have been only slightly eroded, particularly where the forest cover has only recently been removed or a good permanent pasture has covered the soil since it was cleared. Landslides occur infrequently during periods of heavy rainfall, but occasionally one is disastrous. Surface runoff is high to very high; internal drainage, moderate; and hazard of erosion, moderate. Organic-matter content is low.

*Use and management.*—All of this phase has been cleared. About 70 percent is in open pasture, 15 percent in crops, and 15 percent is idle. Black locust, white pine, mixed hardwoods, and field brush have begun to take over a few acres, especially where erosion has been severe. The principal crops are corn and potatoes. Smaller acreages are planted to cabbage, oats, buckwheat, wheat, rye, snap beans, and occasionally other crops. A few areas near Blowing Rock are in apple orchards.

Lime is used to some extent but on the majority of farms it is not applied, mainly because of the difficulty of getting it up to and spreading it over the steep slopes. About half the farmers having this soil have treated some of it with superphosphate but it is doubtful that half the pastured area has been so treated. Fertilizer is generally used for all crops.

This soil is poorly or very poorly suited to crops, largely because it is steep and erodible. The relief prevents satisfactory use of grain binders, mowers, wagons, and all but the simplest of farm implements, such as hoes, grain cradles, sleds, and hillside plows. Erosion is active under intertilled crops, even though the rows are customarily planted approximately on the contour. Nevertheless, because of its good permeability, the soil is not so erodible as the slope would indicate. Stripcropping is not a common practice. Under most conditions the soil is best suited to permanent pasture. If it is properly limed, phosphated, seeded, and receives other needed management, it produces good mixed grass and legume pasture.

**Ashe stony loam, steep phase** (30- to 60-percent slopes) (Af).—This phase resembles Ashe loam, steep phase except it has enough stones on the surface or in the plow layer to interfere with but not prevent tillage. In most places it is also shallower to disintegrated rock or bedrock. The stones vary greatly in size and shape. A few small outcrops of bedrock occur in some areas, and in other areas surface relief is not favorable to tillage. This soil covers a comparatively large area; it occurs in many parts of the county, but not extensively in the northeastern part.

A few areas are included that have a somewhat finer textured and better developed subsoil layer than normal. The soil of these areas approaches Perkinsville stony loam, rolling phase, in profile characteristics but has stronger relief. Other areas, especially those near Beech Mountain, have somewhat more grit or coarse sand in the profile than elsewhere.

*Use and management.*—The use, suitability, and management requirements of this phase are similar to those of Ashe loam, steep phase, but because of its stoniness this soil would be less suitable for pasture if cleared of forest.

**Ashe stony loam, eroded steep phase** (30- to 60-percent slopes) (Ad).—This phase consists of areas of Ashe stony loam, steep phase, that have been cleared of forest, cropped in most places, and moderately eroded. Except for stoniness and eroded surface soil, it is similar to Ashe loam, eroded steep phase. The areas occur in many parts of the county. Some are relatively large.

Surface runoff is high to very high, and internal drainage and erosion hazard are moderate. The original low content of organic matter has been further lowered by erosion and cropping. Several included areas are only slightly eroded, particularly those where the forest cover has been recently removed or where a good permanent pasture has remained on the soil since it was cleared. More than 100 acres are included that have been severely eroded.

The steep relief prevents satisfactory use of grain binders, mowers, wagons, and almost all except the simplest farm implements such as hoes, grain cradles, sleds, and hillside plows. Enough stones are present in most places to interfere somewhat with tillage, but they do not prevent cultivation where relief is favorable. There are scattered small areas of rock outcrop.

*Use and management.*—About 75 percent of this phase is in open pasture, 5 percent is in crops, and 20 percent is idle. Corn and potatoes are the main crops. A small part is used for cabbage, oats, buckwheat, wheat, rye, and snap beans. Productivity is a little lower than for Ashe loam, eroded steep phase.

Under most conditions the soil is best suited to permanent pasture. It produces fairly good mixed grass and legume pasture if it receives good management, including the proper use of lime and phosphate and proper seeding. The soil is poor to very poor for crops, largely because it is steep and erodible.

**Ashe stony loam, very steep phase** (60 +percent slopes) (Ag).—This soil resembles Ashe stony loam, steep phase, but is steeper, more stony, and somewhat shallower to bedrock. It occurs on hillsides and mountainsides at elevations of about 1,350 to 5,500 feet. Some of the areas are relatively large.

Surface runoff is high to very high; internal drainage, moderate; and erosion hazard, moderate to great.

In most places the stones are not numerous enough to prevent tillage but the very steep slopes are not favorable to cultivation. The stones vary greatly in size. In some areas there are a few outcrops of bedrock. Included with this soil is about 192 acres of soil that is nearly stone-free.

*Use and management.*—About 82 percent of Ashe stony loam, very steep phase, is in forest and 15 percent in open pasture. The rest is in crops or left idle. Most of the cleared land has been moderately eroded. The crops grown are chiefly corn and potatoes. Because of its very steep slopes, this soil is very poorly suited to crops. This soil will produce fair permanent pasture if it receives lime and phosphate and other management practices are good. The best use for the soil, however, is forest.

**Ashe stony loam, hilly phase** (15- to 30-percent slopes) (Ae).—This phase differs from Ashe loam, steep phase, in having milder relief and in being more stony and shallower to disintegrated rock or bedrock. It occurs on rounded tops of ridges or mountains, on mountainsides, or in hilly parts of intermountain country. It occurs at altitudes of 2,000 to 5,500 feet. The areas are associated with the other Ashe soils and to some extent with the Perkinsville. They are chiefly in the western and south-central parts of the county.

There are enough stones on the surface and in the soil to interfere with tillage but in most places not enough to prevent cultivation. These stones range greatly in size and shape, and small outcrops of bedrock occur here and there. Included are a few areas of soil having a subsoil layer that contains more clay than normal. This included soil approaches Perkinsville stony loam, rolling phase, in profile characteristics.

Ashe stony loam, hilly phase, has medium surface runoff and moderate internal drainage; its erosion hazard is slight to moderate.

*Use and management.*—Approximately 95 percent of this phase is in forest and the rest in open pasture. Mainly because of its stoniness and hilly relief, the soil is poor to fair for crops. After a few years of cultivation it would closely resemble Ashe stony loam, eroded hilly phase.

**Ashe stony loam, eroded hilly phase** (15- to 30-percent slopes) (Ac).—This soil represents areas of Ashe stony loam, hilly phase, that have become moderately eroded after clearing and cultivation. It is associated with other Ashe soils and to some extent with Perkinsville soils. Enough of the original surface soil has been lost by accelerated erosion to bring the subsoil within plow depth. Tillage has mixed the surface soil with subsoil material and formed a plow layer of moderate to dark yellowish-brown friable stony loam.

Surface runoff is medium; internal drainage, moderate. The entire soil is moderately to rapidly permeable to water, roots, and air. This soil is less erodible than some other soils of the county with similar slope; erosion hazard is slight to medium. Areas where sheet or gully erosion is greater than the normal range for this soil are indicated on the soil map by symbols. Many included areas have been only slightly eroded because the land has not been cleared long enough or because it has been kept under a good close-growing plant cover since it was cleared.

*Use and management.*—Almost all of this phase has been cleared and cultivated. White pine, black locust, and other trees have begun to take over a few areas. About 45 percent of the total acreage is now in open pasture, 35 percent in crops, 5 percent in forest, and 15 percent is idle. The principal crops are red clover and timothy grown for hay, corn, potatoes, and cabbage. Buckwheat, rye, wheat, and snap beans are grown to some extent. Liming this soil is a common practice on most farms, and it is usually fertilized for all crops except possibly hay. Superphosphate is used for pasture on the majority of farms. Most areas are tilled approximately on the contour, but only a few fields are stripcropped.

This soil is fair to poor cropland mainly because it is hilly and stony. Most farm machinery can be used, but it is difficult to operate the heavier types on the steeper slopes.

The climate, as influenced by the altitude and topography, affects the suitability of this soil for the various crops. At high elevations it is well suited to late cabbage, late potatoes, grasses, onions, and snap beans but poorly suited to corn, tobacco, peaches, crimson clover, wheat, and rye. At low elevations the opposite tends to be true. Wheat and rye apparently heave more on this soil at all elevations than on some of the other soils. Buckwheat tends to produce well at high elevations, but it leaves the soil loose and subject to erosion. Soybeans also leave the soil loose and erodible. Apples do fairly well if the site is favorable in respect to slope and climate and needed management is practiced.

**Augusta loam** (0- to 2-percent slopes) (Ah).—This light-colored, poorly to somewhat poorly drained soil has formed on low stream terraces from moderately old or less recent alluvium. This alluvium was deposited by streams when they flowed at a higher elevation and probably originated from granite, gneiss, and schist and to some extent from other igneous and metamorphic rocks and from sedimentary rocks. In profile characteristics the soil is somewhat like Worsham loam.

The areas of this soil occur chiefly along the Watauga River near Foscoe, in the broad valley southeast of Boone, and along Meat Camp and Howard Creeks. The total extent is relatively small. The terraces that the soil occupies are 1 to 4 feet above the first bottoms and have nearly level, level, or slightly depressed surface relief. Although the slopes are normally 2 percent or less, they range up to 5 percent in places.

Surface runoff is low to very low; erosion hazard is none to very little. Internal drainage is slow because it is restricted by a moderately high water table. If the water table were lowered sufficiently, internal drainage would be fairly good. The soil may be inundated by exceptionally high floods. The natural vegetation probably was hemlock and mixed hardwoods containing some white pine and much undergrowth of rhododendron and mountain-laurel.

Profile in a cultivated field:

0 to 8 inches, brownish-gray to dark olive-brown very porous friable mellow loam or silt loam; weak fine crumb structure.
8 to 33 inches, weak-yellow and pale-olive moderately porous friable to firm heavy clay loam or light gritty clay mottled with moderate yellowish brown; weak medium nut structure.
33 inches +, when wet, pale-olive and weak-yellow to yellowish-gray gravelly clay loam or clayey gravelly loam with yellowish-brown mottlings; generally grades into stratified gravelly or sandy material.

In most places the surface soil and subsoil contain a few to a moderate number of rounded pebbles and angular quartz fragments up to about 1 inch across. A slight to moderate quantity of small mica flakes is present. Crawfish holes are numerous in most areas.

The soil is naturally strongly to very strongly acid, and the surface soil contains a moderate quantity of organic matter. Fertility is low. Where not restricted by a high water table, subsoil permeability is moderately slow for water, roots, and air.

Included in this phase is an area of about 25 acres lying just southeast of Boone that has a finer textured surface soil and subsoil than areas elsewhere. Also included are areas totaling about 70 acres that are moderate to light yellowish-brown in the upper part of the subsoil and have a little faster drainage than is normal for Augusta loam.

*Use and management.*—All of Augusta loam has been cleared of forest, and about 75 percent is now used for crops. The rest is in open pasture. The chief crops are corn, and red clover and timothy for hay. Oats, rye, buckwheat, potatoes, and cabbage are grown to some extent.

Most of the soil has been limed and much of it has been artificially drained to some extent by open ditches or closed wooden or stone drains; drainage nearly everywhere is inadequate. Chiefly because of poor natural drainage, the soil is only fair for crops. Burley tobacco, wheat, snap beans, alfalfa, and apple and other fruit trees are poorly adapted to areas not sufficiently drained; but corn, buckwheat, soybeans, and grass for hay are fairly well adapted.

One of the first essentials in improving this soil is adequate drainage. Although open ditches or closed wooden or stone drains can be used for obtaining needed drainage, properly installed tile probably would be the most satisfactory. Liming is an important management requirement.

**Buncombe loamy fine sand** (0- to 2-percent slopes) (Ba).—This loose, loamy fine sand occurs in first bottoms. It has developed in young alluvium derived mainly from gneiss, schist, and granite. In places, however, material from sandstone, conglomerate, and shale has been admixed. In nearly all places the soil lies adjacent to the streams and is subject to overflow. The areas are scattered in many of the bottom lands and most of them are small.

Surface runoff is very low; internal drainage, very rapid. The soil is not subject to ordinary erosion, but there may be some stream erosion at times. The natural vegetation probably was mixed hardwoods and hemlock and a thick undergrowth of rhododendron and mountain-laurel. Practically all the soil is cleared.

Profile in a cultivated area:

0 to 8 inches, dark yellowish-brown to weak-brown loose loamy fine sand.

8 to 43 inches +, moderate, dark, or strong, yellowish-brown loose loamy fine sand, fine sand, or fine sandy loam; light olive-gray or pale-olive mottlings below 36 to 50 inches in places.

A slight to moderate quantity of small mica flakes occurs throughout the profile. The texture varies somewhat from place to place. The subsoil typically is stratified with coarse-textured sandy material ranging from fine sandy loam to fine gravel.

The soil is naturally medium or strongly acid, but much of it has been limed. The organic-matter content is low. Because of its coarse texture, the soil has low water-holding capacity, and many crops are soon injured by drought.

*Use and management.*—Buncombe loamy fine sand is used principally for corn, clover-and-grass hay, oats, early potatoes, and pasture. The soil is not so productive or so well suited to many of the crops commonly grown as Congaree loam, for it is coarse-textured and has relatively low water-holding capacity, organic-matter content, and fertility. It is best used for early maturing crops such as early potatoes, garden vegetables, and rye.

**Burton stony loam, hilly phase** (15- to 30-percent slopes) (Bb).—This soil has the darkest color and highest organic-matter content of any of the soils of uplands in the county. It occurs on rounded tops of some of the highest mountains and in some high mountain gaps at altitudes of 4,000 and 5,500 feet. Most areas are on or in the vicinity of Big Bald, Rich, Snake, Stone, and Grandfather Mountains and Hanging Rock Ridge. The parent rock is mainly gneiss and schist, but on Stone and Grandfather Mountains it is sandstone or metamorphosed sedimentary rock. Although the relief is mainly hilly, about a fourth of the area has rolling slopes ranging between 7 and 15 percent.

Surface runoff is medium; internal drainage, moderate. The hazard of erosion is slight. Limited erosion—not enough to affect soil productivity—has occurred in places.

It is somewhat questionable as to what was the natural vegetation, for practically all the soil is now open pasture. Some of the older local residents say that the areas on Big Bald Mountain, Rich Mountain near Tater Hill, and Rich Mountain Bald were largely treeless. Probably their original vegetation when the county was first settled consisted of grasses, sedges, ferns, strawberry, cinquefoil, azalea, hazelnut, and low buckeye bushes. This is assumed because areas that have not been cultivated now support these plants. A few small southern balsam firs grow on Big Bald Mountain. Possibly some areas, especially those in the lower mountain gaps, at one time had a more or less open forest consisting mainly of chestnut and Northern red oaks, chestnut, yellow birch, buckeye, azalea, and hazelnut. The trees probably were stunted and small because of the wind, ice, and cold of high altitudes. A considerable growth of grasses and sedges probably covered the open spaces in the forest.

Profile description:

0 to 8 inches, black to brownish-black loose mellow very porous stony loam; weak fine crumb structure; large quantity of well-decomposed organic matter; moderate number of stones 3 to 12 inches or more across found on the surface and in the layer.

8 to 16 inches, brownish-black to dusky-brown friable heavy loam to light clay loam; weakly to moderately developed fine to medium crumb or weakly developed fine granular structure; large quantity of well-decomposed organic matter; moderate to large number of angular rock fragments ½ to 3 inches across.

16 to 19 inches, dark yellowish-brown friable light clay loam, heavy loam, or clayey fine sandy loam; weak fine crumb structure; moderate quantity of organic matter; many angular rock fragments ¼ to 6 inches across, some partly weathered.

19 to 26 inches, yellowish-brown or light yellowish-brown friable heavy loam, loam, or fine sandy loam; weak fine crumb structure to structureless (single-grain); organic matter low; numerous rock fragments varying in size and degree of weathering.

26 to 45 inches, yellowish-brown to light yellowish-brown soft disintegrated rock, loam, and fine sandy loam; a great many rock fragments of various sizes and degrees of weathering.

45 inches +, bedrock.

Throughout the profile there is a slight to moderate quantity of mica flakes. The number of stones on the surface varies; some of the areas lying northeast of Zionville have few surface stones. In some areas there are a few small bedrock outcrops (fig. 2).

Except for the first inch or two of soil, which is slightly to medium acid, this soil is strongly acid. Fertility is high. Permeability to roots, water, and air is moderately rapid.

*Use and management.*—About 98 percent of Burton stony loam, hilly phase, is in open pasture of grass and sedge. The rest is used mainly for timothy or orchard grass hay, and for buckwheat. Cabbage, potatoes, and

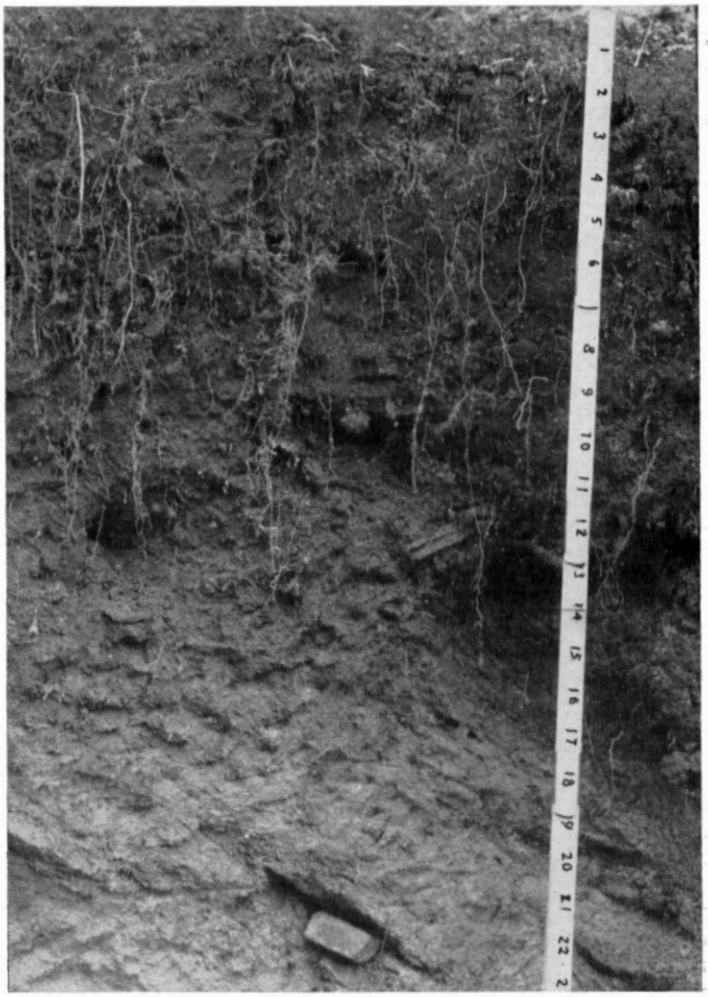

*Figure 2.*—**Profile of Burton stony loam, hilly phase, showing about 10 inches of dark-colored surface soil and the lighter colored subsoil.**

corn are grown infrequently. Little lime is applied, but most farmers use phosphate for grass pastures and meadows. The crops are fertilized and otherwise managed in about the same way as crops on Porters loam, hilly phase.

This soil is one of the most fertile in the county; but its use for crops is limited by the cool climate, short average frost-free season, and the difficulty of moving farming equipment to and from most of the areas. Adapted crops are those that tolerate cool weather and require a comparatively short growing season. Buckwheat, late cabbage, and late potatoes generally do well. When corn is grown, the earliest maturing variety should be selected, as there is much risk of frosts or freezes before it can mature. The soil is one of the best in the county for pasture, and several grasses grow well without the use of amendments. Nevertheless, applications of lime and phosphate will encourage plant growth, especially the growth of white clover and bluegrass. Wherever possible, some orchardgrass and fescue should be seeded in the pasture.

**Chandler loam, steep phase** (30- to 60-percent slopes) (Cb).—This light-colored soil occurs on steep hills and mountains; it has formed in material weathered mainly from a formation of mica schist interbedded with mica gneiss and granitoid. Beds or veins of pegmatite occur locally. This phase is found at elevations of about 2,000 to 4,500 feet in the central part of the county. Its area of occurrence could roughly be approximated by drawing a line from Todd through Meat Camp, Rich Mountain School, Boone, Bamboo, Triplett, and Elk Creek, and on to the eastern county line. Small areas occur in the northeastern part.

Surface runoff is high to very high; internal drainage, moderate. Practically the total area is in forest. There is virtually no erosion under this natural cover but the erosion hazard is very great when the soil is cleared. Landslides of varying sizes sometimes occur during periods of heavy rainfall.

The original forest was mainly deciduous, but the present growth has been cut over and consists principally of chestnut, black, and Northern red oaks, with some white oak, yellow-poplar, dead chestnut trees, and pignut hickory, dogwood, sourwood, sassafras, and red maple. Many areas have an undergrowth of rhododendron, mountain-laurel, and wild azalea. In some areas in the southeastern part, varying numbers of eastern white pine are mixed with the usual hardwoods, and in areas south of the Blue Ridge some Virginia pine occurs with the hardwoods.

Profile in a forested area:

0 to 1 inch, dusky-brown to brownish-black loose mellow loam; weak fine crumb structure; large quantity of small mica flakes gives material a slick greasy feel; contains a few fragments of quartz, mica schist, and gneiss, most of them less than ½ inch across; decaying leaves, twigs, and bark cover this layer.

1 to 6 inches, dark yellowish-brown friable mellow slightly gritty loam of weak fine crumb structure; large quantity of small mica flakes cause a slick greasy feel; contains a few fragments of quartz, mica schist, and gneiss, most of them less than ½ inch across.

6 to 23 inches, moderate yellowish-brown very porous friable mellow slightly gritty loam or heavy loam; mainly structureless but has some weak fine crumb aggregates; large to very large content of small mica flakes impart a slick, greasy feel; contains many weathered fragments of mica schist and gneiss, generally less than 2 inches across, and some small angular quartz fragments.

23 inches +, light yellowish-brown, moderate yellowish-brown, dark-gray, and black soft weathered mica schist or mica gneiss; contains a few pockets or lenses of moderate yellowish-brown loam or heavy loam; mica schist and mica gneiss bedrock at variable depths.

A few quartz, gneiss, or schist stones ranging up to about 1 foot across occur on or in the surface soil in some places, but they generally do not interfere with tillage. Symbols on the soil map indicate areas where these stones do interfere with cultivation.

The soil is strongly or very strongly acid throughout. The supply of organic matter is low to very low except in the topmost inch or so, which has a moderate to large content. Fertility is low. The surface soil and subsoil are rapidly permeable to roots, water, and air. Water-holding capacity is moderately low to low, largely because the subsoil is moderately light textured and the profile is shallow to disintegrated rock.

Included with this Chandler loam, steep phase, is about 256 acres having a somewhat better developed and thicker subsoil of friable clay loam. This inclusion approaches Watauga loam, rolling phase, in profile characteristics but has steeper relief. Also included because of small extent are areas of Talladega loam, steep phase, that together total about 32 acres. This Talladega soil

*Figure 3.*—**Severe rill erosion caused by planting buckwheat on a 46-percent slope of Chandler loam, steep phase. This soil is not suitable for intertilled crops.**

has a thin dark-colored humus layer, then about 3 inches of dark yellowish-brown or yellowish-brown friable loam, and below that about 2 inches of brown friable loam. The subsoil is strong-brown to light-brown to pale or moderate reddish-brown friable loam or heavy loam. The subsoil grades to similarly colored parent material, which in turn, grades into bedrock. This Talladega soil is highly micaceous and very similar to Chandler loam, steep phase, in most features except color (fig. 3).

*Use and management.*—Only about 2 percent of Chandler loam, steep phase, is used for crops and pasture; the rest is in forest. The soil is poorly suited to crops chiefly because it is low in fertility, steep, and erodible. After clearing and use for intertilled crops, buckwheat, or soybeans, it soon becomes like Chandler loam, eroded steep phase. Under most conditions the soil should remain in forest, but if needed for pasture it should be treated with lime and phosphate and seeded to a grass-legume mixture immediately after clearing.

**Chandler loam, eroded steep phase** (30- to 60-percent slopes) (Ca).—This phase is similar to Chandler loam, steep phase, but differs in having been cleared, cropped in most areas, and then moderately eroded. The subsoil is within plow depth in more than half of the area. The 4- to 6-inch plow layer—a mixture of surface soil and subsoil—is moderate yellowish-brown friable slightly gritty loam or heavy loam containing many mica flakes. This phase occurs in the same general area as Chandler loam, steep phase.

Surface runoff is high to very high, and the soil is subject to much erosion when not protected by vegetation or other practices for controlling water on the land. Landslides may occur during periods of heavy rainfall. A few short shallow gullies have formed in places. Areas where there is significantly more sheet or gully erosion than usual for this soil are shown on the soil map by symbols.

Some areas included with this soil are only slightly eroded because of having been recently cleared or protected by close-growing vegetation. In a total of about 512 included acres, the subsoil layer is better developed and thicker than usual. It is a friable light clay loam. This included soil approaches Watauga loam, eroded hilly phase, in profile characteristics but has stronger surface relief. A total of about 6 acres of Talladega loam, eroded steep phase also is included because of small extent. This soil differs from Chandler loam, eroded steep phase, chiefly in having a strong-brown or moderate reddish-brown color.

*Use and management.*—About 50 percent of Chandler loam, eroded steep phase, is in open pasture, 25 percent in land left idle, 13 percent in crops, and 12 percent in forest. The principal crops are corn, potatoes, oats, cabbage, and buckwheat.

Lime has been applied to only a small acreage, partly because of difficulty of transporting it to the steep slopes, but the practice of liming is increasing. Probably a somewhat higher proportion of the crop acreage has been limed than the pasture acreage. Superphosphate is used on more than half of the pasture. In areas not treated with lime and phosphate, pasture is generally poor. Some pasture areas are mainly in lespedeza.

Much of the idle land has a cover of wild blackberry, strawberry, cinquefoil, broomsedge, and a variable growth of bushes. Many areas in the southeastern part of the county have a growth of white pines ranging from seedlings to trees 30 years old or older. These areas have reforested naturally in most places; some of the trees are now large enough to cut for timber.

The soil is poorly suited to intertilled crops, buckwheat, and most other crops, mainly because it is steep, highly erodible, low in fertility, and shallow. If it is properly limed, phosphated, seeded, and other necessary management is followed, this soil produces a fairly good growth of mixed grass and legume pasture. Under most conditions pasture is the best use for this soil.

**Chandler stony loam, steep phase** (30- to 60-percent slopes (Ce).—This light-colored highly micaceous soil differs from Chandler loam, steep phase, chiefly in stoniness. It is associated with the other Chandler soils and with Watauga and Tate soils.

Enough stones are on the surface and in the plow layer to hinder cultivation to some extent but not enough to prevent tillage, provided other features are favorable. The stones are principally fragments of mica schist, mica gneiss, and quartz, most of them less than 12 inches across. In most areas the subsoil contains a moderate number of rock fragments. There are scattered small outcrops or ledges of bedrock. The depth of this soil to disintegrated bedrock material or bedrock averages somewhat less than for Chandler loam, steep phase.

Included with this soil is a total of about 448 acres in which the soil has a friable light clay loam subsoil layer that is somewhat better developed and thicker than usual for this phase. This inclusion approaches Watauga stony loam, hilly phase, in profile characteristics but has stronger surface relief. Also included because of the small aggregate area is a total of about 45 acres of Talladega stony loam, steep phase. This Talladega soil differs from Chandler stony loam, steep phase, in having a browner surface soil and a strong-brown or moderate reddish-brown subsoil.

*Use and management.*—Present use and management requirements of Chandler stony loam, steep phase, are similar to those for Chandler loam, steep phase, but the soil is a little less suitable for crops and pasture, chiefly because of its stoniness. Under most conditions the soil is best suited to forest.

**Chandler stony loam, eroded steep phase** (30- to 60-percent slopes) (Cc).—This phase is similar to Chandler stony loam, steep phase, in all respects except for its eroded surface soil. After it was cleared and cropped, it lost part of the original surface soil through accelerated erosion. The subsoil is within plow depth on more than half of the area. The soil, to plow depth, is moderate yellowish-brown slightly gritty friable stony loam or heavy loam. There are a few short, shallow gullies in places. Surface runoff is high to very high, and hazard of further erosion is very great unless the soil is protected by vegetation or other means. There may be landslides during periods of heavy rainfall.

This phase occurs in the same general area as Chandler loam, steep phase, and has about the same range of altitude. It is associated with other Chandler soils and the Watauga and Tate soils. Stones on the surface and in the subsoil interfere with but do not prevent tillage if the relief is favorable. The original low organic-matter content of the surface soil has been reduced by cultivation and erosion.

Included is a total of about 672 acres in which the subsoil layer is thicker and better developed than elsewhere and is a friable light clay loam. In these areas the profile approaches that of Watauga stony loam, eroded hilly phase, in characteristics, but surface relief is stronger.

Also included because of small aggregate extent is about 12 acres of Talladega stony loam, eroded steep phase. This soil differs in having a strong-brown or moderate reddish-brown color.

*Use and management.*—Use and prevailing management of Chandler stony loam, eroded steep phase, are similar to those of Chandler loam, eroded steep phase. A somewhat larger proportion of this stony phase is idle, however, and a smaller proportion is in crops and pasture. This phase is less suited to crops or pasture because of its stoniness. If it is properly limed, phosphated, and seeded, and receives other needed management, some less steep and eroded areas of this soil will produce fair pasture. Under most conditions, however, the soil can be used best for forest. White pine and black locust are suitable for planting, but the young trees should be protected from grazing animals.

**Chandler stony loam, severely eroded steep phase** (30- to 60-percent slopes) (Cd).—This phase represents areas of Chandler stony loam, steep phase, that have been cleared, cropped, and severely eroded. It occurs in the general area of Chandler loam, steep phase.

Practically all the original surface soil, which was 6 inches or more thick, has been lost through accelerated erosion, and in places part of the subsoil has also been eroded. Tillage takes place almost wholly in the subsoil. Small gullies vary from few to many in most areas. Land that is more gullied than the normal range for this phase is indicated on the soil map by symbols. Landslides sometimes occur during periods of heavy rainfall.

Surface runoff is very high, and the hazard of further erosion is very great. Organic matter is very low; fertility is low. Erosion has considerably reduced soil depth to disintegrated rock, and water-holding capacity of the soil has consequently been lowered. About half of the total area of this phase is not stony enough to interfere with tillage, provided other conditions are favorable.

Included is a total area of 83 acres in which the subsoil is somewhat better developed and thicker than usual and is friable light clay loam. This inclusion approaches Watauga stony loam, eroded hilly phase, in profile characteristics but has stronger relief and more erosion. Also included because of its small extent is a total area of about 32 acres of Talladega loam, severely eroded steep phase. This soil differs mainly in having a strong-brown or moderate reddish-brown color.

*Use and management.*—Very little of Chandler stony loam, severely eroded steep phase, is used for crops. Some is in very poor pasture and forest, but most of it is idle land partly in brush, or is being forested to white pine. Steep relief, severe erosion, low fertility, and shallow depth make this soil very poorly or poorly suited to crops and pasture. It can be used best for forest.

**Chandler stony loam, very steep phase** (60-percent+ slopes) (Cf).—This phase resembles Chandler stony loam, steep phase, but has steeper slopes. It occurs on very steep to precipitous mountain slopes or hillsides at elevations of about 1,350 to 5,500 feet. It also resembles Chandler loam, steep phase, but is more stony and somewhat shallower to bedrock. This phase is associated with the other Chandler soils, the Watauga and Tate soils, and Stony rough land (Ashe and Porters soil materials).

Surface runoff is high to very high, and the soil is very erodible when not protected by vegetation. An inclusion of about 128 acres has less stony soil than surrounding areas.

*Use and management.*—About 80 percent of Chandler stony loam, very steep phase, is in forest and 5 percent in open pasture; about 15 percent is idle. The cleared land has been moderately eroded in most places, and the erosion is indicated on the soil map by symbols. Under most conditions, this soil is best used for forest because of its very steep relief. The forested land should remain in forest, and the cleared land should be planted to white pine or black locust.

**Chewacla loam** (0- to 2-percent slopes) (Ch).—This soil has a light-colored profile, a mottled subsoil, and imperfect drainage. It occurs on first bottoms, and consists of a mixture of materials originating chiefly from gneiss, schist, and granite. In places material from sandstone, shale, and other sedimentary rocks is intermixed. The soil is flooded by adjacent streams about once every 2 or 3 years. Part of the soil may be removed or sediments may be deposited during these floods. Very occasionally one of the floods is disastrous; all or most of the soil and vegetation are washed away, leaving sand and gravel. This soil is less well drained then the Congaree soils but better drained than the Wehadkee. It is not so dark as the Toxaway.

Surface runoff is very slow. Internal drainage is slow and restricted by a relatively high and fluctuating water table. The soil occurs on nearly level, very gently undulating, or slightly depressed alluvial flood plains. There are shallow swales or abandoned stream channels in places. The natural vegetation probably was mixed hardwoods, hemlock, and a thick undergrowth of rhododendron and mountain-laurel.

Profile in a field:

0 to 18 inches, dark yellowish-brown friable mellow loam; weak fine crumb structure.
18 to 42 inches, mottled light olive-gray, pale olive, and moderate yellowish-brown very friable loam; structureless, or weak fine crumb structure.

42 inches +, (wet) mottled dusky-yellow, light yellowish-brown, light olive-gray, pale-yellow, medium-gray, and strong yellowish-brown loose stratified medium sand, coarse sand, and loamy sand; some fine gravel.

The subsoil varies considerably from place to place in degree and color of mottlings. In places the surface soil overlies black, dusky-brown, or dark-gray loam, which grades with increasing depth into mottled lighter gray material. Here and there, stratified layers of various light textures are present in the profile. The deeper substratum may consist of sand, gravel, or cobbles. The surface soil and subsoil contain some gravel or small cobbles. A slight to moderate quantity of small mica flakes is mixed through the profile in the greater part of this phase.

The soil is medium to strongly acid. Organic-matter content is moderate. Fertility is high. Soil permeability is moderate to moderately rapid in all places except where a high water table interferes.

Included in the mapping of this soil are a few very small areas that have a brownish-gray surface soil.

*Use and management.*—About 75 percent of Chewacla loam is in crops, 20 percent is in open pasture, and 5 percent is idle. The principal crops are red clover and timothy hay and corn; but oats, buckwheat, and sorghum cane are also grown (fig. 4). Unless adequately drained, the soil is poorly suited to tobacco, alfalfa, wheat, rye, snap beans, and fruit trees. One of the essentials in improving productivity is adequate drainage. Many areas have been more or less drained by open ditches or closed wooden or stone drains, and a few areas, by tile. Most of the soil is still inadequately drained. Tile would probably be most satisfactory. Some areas may require the deepening and enlarging of stream channels to obtain satisfactory outlets for drainage.

**Chewacla cobbly loam** (0- to 2-percent slopes) (Cg).—This soil differs from Chewacla loam principally in having enough cobbles and gravel to interfere with but not prevent tillage. The cobbles are as much as 6 inches across. In places they are most numerous; in others gravel predominates. In most places the cobbles and gravel occur on the surface and are also mixed through the soil. The texture of the surface soil and subsoil varies from place to place. The areas of this soil are scattered in various alluvial flood plains of the county.

*Figure 4.*—**Plowing under crimson clover after corn on Chewacla loam bottom land along Meat Camp Creek about a mile south of Green Valley School. The wooded slope is Chandler loam, steep phase.**

The soil is medium to strongly acid, contains a moderate quantity of organic matter, and has medium fertility. It has moderate to moderately rapid permeability, which in places is retarded by a high water table.

*Use and management.*—About 60 percent of Chewacla cobbly loam is in crops, 30 percent is in open pasture, and 10 percent is idle. Crops are about the same as for Chewacla loam, but the soil is less suited to their growth because of its cobble and gravel content. For the same reason, use of tillage machinery is more difficult. An important management requirement for improvement in productivity is adequate drainage. Some of the soil has been partly drained by open or enclosed ditches, but in most places better drainage is needed. Removing some of the stones would improve tillage.

**Clifton clay loam, eroded hilly phase** (15- to 30-percent slopes) (Ck).—Before it was cleared of forest and cultivated, this soil was Clifton loam, hilly phase. After it was cleared, it lost 25 to 75 percent of its original surface soil through accelerated erosion. To plow depth, the surface soil is light-brown, or strong-brown to moderate-brown, friable clay loam, light clay loam, or heavy clay loam. The subsoil is strong-brown or dark-orange friable to firm gritty clay loam or heavy clay loam 14 to 20 inches thick. The soil occurs on rounded tops of mountain ridges and knobs, mountain slopes, and hillsides, where it has formed from material weathered mainly from hornblende schist, hornblende gneiss, and diorite. It is associated with other Clifton soils. Included are a few areas that are only slighted eroded, as well as a very few that are severely eroded and have lost 75 percent or more of the surface soil. The severely eroded areas are indicated on the soil map by symbols.

Surface runoff is medium to high; internal drainage, moderate. The soil is moderately erodible when not protected by a vegetative cover or other methods. It is strongly acid and moderately low in organic matter. Fertility is medium; permeability and water-holding capacity, moderate. The surface soil tends to become hard when dry and to clod when plowed too wet. Most farm machinery can be used, but the heavier types are somewhat difficult to move over the strong slopes.

*Use and management.*—Approximately 65 percent of this phase is used for crops and 30 percent for open pasture. The rest is idle. Corn, red clover and timothy for hay, oats, potatoes, cabbage, and buckwheat are the principal crops; minor crops are snap beans, wheat, rye, sorghum cane, and tobacco. The soil is poor to fair for crops, largely because of strong relief, eroded condition, and erodibility. It is poorly suited to intertilled crops, buckwheat, and soybeans. In general, hay crops and pasture are best.

**Clifton clay loam, eroded steep phase** (30- to 60-percent slopes) (Cl).—This phase is steeper than the eroded hilly phase. It consists of areas of Clifton loam, steep phase, that were subject to moderate erosion when cleared of forest and cultivated. The plow layer is 4 to 6 inches of light-brown, or strong- to moderate-brown, friable clay loam, light clay loam, or heavy clay loam. There are a few stones on the surface and in the surface

soil, but they do not interfere with cultivation. In a few small areas erosion is only slight. Areas of this soil are associated with other Clifton soils.

This phase has high to very high surface runoff and, if not properly protected by vegetation or other means, is subject to further accelerated erosion. Workability is poor. Hoes, grain cradles, sleds, and hillside plows are the main implements used on the steep slopes.

*Use and management.*—About 65 percent of this phase is cleared land used for open pasture. About 20 percent is used for crops and about 15 percent is idle. The principal crops are corn, potatoes, oats, buckwheat, wheat, rye, and cabbage. The soil is poorly or very poorly suited to these or other crops, chiefly because of steep slopes and erosion hazard. Erosion is active where intertilled crops are grown, despite the fact that the rows are run approximately on the contour. Stripcropping would control erosion to a considerable extent, but very little is practiced. This phase generally is best suited to pasture. With proper use of lime, phosphate, proper seeding, and other needed management, it produces a good pasture of mixed grass and legumes.

**Clifton stony loam, hilly phase** (15- to 30-percent slopes) (Co).—This soil differs from Porters soils in having a more reddish subsoil that is distinctly finer in texture. It is associated with other Clifton soils, Porters soils, and to some extent Halewood and Tusquitee soils.

This Clifton soil has medium to high surface runoff and moderate internal drainage. It is moderately erodible when cleared of forest, and water control is not practiced. The natural vegetation was deciduous forest. The present cutover forest is principally oaks—chestnut, black, white, and Northern red—with some red and sugar maples, hickory, yellow-poplar, basswood, and dogwood. In many areas there is an undergrowth of rhododendron, mountain-laurel, and wild azalea.

Profile in a forested area:

0 to 1 inch, dusky-brown, weak-brown, or dark-brown friable mellow stony loam; weak fine crumb structure; covering of decaying leaves, twigs and bark, mainly from deciduous trees.

1 to 4 inches, moderate-brown friable mellow stony loam; weak fine to medium crumb structure.

4 to 7 inches, moderate-brown to light-brown friable stony loam or heavy loam; structure ranges from weak to moderate medium or coarse crumb to fine nut.

7 to 24 inches, strong-brown or dark-orange porous friable to firm stony clay loam or heavy clay loam; plastic and sticky when wet; structure ranges from weak to moderate fine to medium nut.

24 to 45 inches, brown, orange, yellowish-brown, dark-gray, and black weathered fragments of hornblende schist, hornblende gneiss, diorite, or other dark-colored rocks; strong-brown or dark-orange stony clay loam or heavy clay loam soil material around the rock fragments; less soil material and more rock fragments with increase in depth; bedrock at variable depths extending as much as 60 inches below the surface.

In most areas angular fragments of hornblende schist, hornblende gneiss, diorite, and other dark-colored rocks ranging up to about 12 inches across, and quartz less than 2 inches across, occur in the surface soil and subsoil, but are not numerous enough to prevent tillage. Very few mica flakes are present in most areas.

The soil is strongly acid except in the dark-colored surface layer, which may be only medium or slightly acid in places. Organic matter is relatively low except in the thin surface layer. Fertility is medium. The subsoil has moderate to moderately slow permeability to water and allows good penetration of roots and circulation of air. Water-holding capacity is moderate.

*Use and management.*—This phase is almost entirely in forest. About 3 percent is in open pasture, and 2 percent in crops. It is poor to fair for crops and fair for pasture. If it were cleared and cropped for a few years in the customary manner, it would resemble Clifton stony clay loam, eroded hilly phase, in all respects and would have the same use suitability and management requirements.

**Clifton stony loam, steep phase** (30- to 60-percent slopes) (Cr).—This phase differs from the hilly phase principally in having stronger relief resulting in higher surface runoff, shallower depths to bedrock, and, in many places, a slightly coarser textured subsoil. In some places the soil approaches Porters stony loam, steep phase, in characteristics. It occurs on hillsides and mountain slopes.

Surface runoff is high to very high. The soil is very erodible if cleared of forest and not protected by vegetation. If it were cleared and cropped for a few years, this phase would be similar to Clifton stony clay loam, eroded steep phase, in all respects.

*Use and management.*—Clifton stony loam, steep phase, is in cutover forest; only a small percentage is in open pasture. The soil is poor to very poor for crops, chiefly because of its relief, erodibility, and stoniness. Although it can be used for pasture, most of it should remain in forest. If needed for pasture, it should be treated with lime and phosphate, seeded, and not overgrazed. To control erosion this soil should be seeded to a pasture mixture immediately after it is cleared of forest.

**Clifton stony loam, rolling phase** (7- to 15-percent slopes) (Cp).—This phase differs from other Clifton soils principally in having gentler relief and consequently less surface runoff and erosion. A few very small areas are undulating and have slopes of 2 to 7 percent. It occurs on relatively broad ridgetops and mountaintops, and most of the areas are fairly small.

Surface runoff is medium. Erosion hazard is slight to moderate, and loss of soil material through accelerated erosion can be largely controlled by relatively simple management practices. A small part of the surface soil in most unprotected places has been lost through erosion.

Included is a total of about 140 acres where the surface soil has eroded away to the extent that the subsoil is within plow depth in most places. This moderately eroded inclusion is indicated on the soil map by symbols. It has a finer texture and more reddish color than is normal for this phase. Although most of this Clifton stony loam, rolling phase, contains sufficient stones to interfere with tillage, about 180 acres are included in which stones do not hinder cultivation.

This is one of the better soils of the uplands for crops and pasture. It has medium fertility and responds well to good management. Its relief permits use of all kinds of farm machinery, although moving heavy machinery to areas located on tops of high ridges or mountains is somewhat difficult. In the eroded areas the soil tends to become hard when dry and sticky when wet. It is more difficult to cultivate than the included less stony areas and is not so productive.

*Use and management.*—About 70 percent of this phase is in crops, 15 percent in open pasture, and 10 percent in forest. About 5 percent is idle. The cropped land is used rather intensively for crops commonly grown, especially

corn, potatoes, and cabbage. Lime has been applied to most areas of the soil, and fertilizer is used for crops and pasture. Cabbage, snap beans, small grains, and buckwheat are fairly well adapted to most areas. Burley tobacco does well where the altitude is not too high. Although alfalfa is grown to very small extent, it should do well with liming and other good management. Apples should do well on most areas.

**Clifton stony clay loam, eroded hilly phase** (15- to 30-percent slopes) (Cm).—This phase is similar to the uneroded phase of Clifton stony clay loam in all profile characteristics except those of the surface soil, and it occurs in the same general area.

The medium to high surface runoff has removed 25 to 75 percent of the original surface soil and left the subsoil within plow depth. Consequently, tillage has mixed original surface soil with subsoil material and produced a light-brown or strong-brown to moderate-brown friable stony clay loam plow layer 4 to 6 inches deep. There are a few short shallow gullies. Areas where there is more sheet or gully erosion than the normal range for this soil are indicated on the soil map by symbols. Included are a few slightly eroded areas.

Cultivation and erosion have reduced the original low to moderate content of organic matter. The soil has medium fertility. Its clay loam surface soil tends to become hard when dry and to clod when plowed too wet. Although most farm machinery can be used, some of the heavier types can be used only with considerable difficulty because of hilly relief and stoniness.

*Use and management.*—All of this phase was cleared of its original forest and probably cultivated, but black locust and other hardwoods have grown back on a small part. About 50 percent of the cleared land is in crops, 35 percent is in open pasture, and 12 percent is idle. Corn, red clover and timothy for hay, oats, potatoes, cabbage, and buckwheat are the principal crops. Snap beans, wheat, rye, sorghum cane, and tobacco are grown to a limited extent.

In some areas, some of the stones have been placed in piles in the field; in others, all of them have been removed from the field; and in still others the stones have been made into fences around fields.

This soil is only poor to fair for crops because of its hilly relief, stoniness, moderate erodibility, eroded condition, and medium to high surface runoff. It is relatively poorly suited to intertilled crops, buckwheat, and soybeans, largely because of stony surface and erosion hazard. In many areas hilly relief makes use of grain binders difficult. The soil is best used for hay crops and pasture.

**Clifton stony clay loam, eroded steep phase** (30- to 60-percent slopes) (Cn).—The eroded steep phase consists of former areas of Clifton stony loam, steep phase, that were cleared, cropped, and moderately eroded. In the present condition of erosion, depth, color, texture, and tilth, the surface soil resembles that of Clifton stony clay loam, eroded hilly phase. But parent material, stoniness, and significant profile characteristics, except for the eroded surface soil, resemble those of Clifton stony loam, hilly phase, but in places the subsoil is slightly coarser and somewhat shallower to bedrock.

The soil occurs on hillsides and mountain slopes. Most of the areas are in the north-central and northwestern parts of the county. They are associated with areas of other Clifton soils, Porters soils, and to some extent Halewood, Watauga, Chandler, and Tusquitee soils. Surface runoff is high to very high, and the soil is very erodible if not protected by vegetation.

Severely eroded areas totaling about 200 acres are included and are indicated on the soil map by symbols. These areas have lost 75 percent, or more, of their original surface soil through accelerated erosion, and tillage is almost entirely in subsoil material. There are a few included areas that have been relatively recently cleared of forest and are only slightly eroded. In about 50 included acres, the soil is not stony enough to hinder tillage very much. In some areas, some of the stones on the surface have been piled up in the field, removed from it, or made into fences around it.

*Use and management.*—Approximately 65 percent of Clifton stony clay loam, eroded steep phase, is in open pasture, 20 percent is idle, 10 percent is in crops, and 5 percent is in forest of black locust or other hardwoods. The principal crops are corn, potatoes, oats, buckwheat, rye, wheat, and cabbage.

Steep relief and erodibility make the soil poorly or very poorly suited to crops. The steep relief also prevents satisfactory use of grain binders, mowers, wagons, and almost all except the simplest farm machinery, such as hoes, grain cradles, sleds, and hillside plows. Erosion is active under intertilled crops, even though the rows are usually run approximately on the contour. Stripcropping is not common, but where practiced it has reduced erosion considerably. Under most conditions, the soil is best used for pasture. If the soil is properly limed, phosphated, and seeded, and receives other needed management, it produces good mixed grass-legume pasture. The severely eroded areas are best for forest.

**Congaree loam** (0- to 2-percent slopes) (Cu).—This is one of the best soils in the county for corn and hay. It is relatively light colored and occurs on first bottoms along streams in various parts of the county. It has formed from recent alluvium derived from the drainage basins. The alluvium originally came from material weathered from gneiss, schist, and granite or other igneous and metamorphic rocks; but in some areas it is mixed with material weathered from sandstone, conglomerate, and other sedimentary rocks.

This soil is not extensive. Some is found along the Watauga River near Valle Crucis and along Cove Creek in the neighborhood of Sugar Grove. It is associated with the other Congaree soils, Chewacla soils, soils of stream terraces, and with local alluvial and colluvial accumulations. Where associated with Chewacla soils, it usually lies adjacent to the streams.

This soil occurs on nearly level, very gently undulating, or very gently sloping alluvial flood plains. Many areas have shallow swales or old abandoned stream channels. Surface runoff is very low, and internal drainage is moderate, although in some local spots it may be slow. Because of its low-lying position near streams, the soil is subject to overflow about once every 10 years, and part of it may be removed or sediments may be deposited by the floodwater. Occasionally, a flood washes away nearly all the soil, leaving loose sandy, gravelly, cobbly, or stony material.

Practically all of this soil has been cleared of forest. The natural vegetation probably was mixed hardwoods

and hemlock with a thick undergrowth of rhododendron and mountain-laurel.

Profile in a field:

0 to 10 inches, dark yellowish-brown very porous mellow loam; weak fine crumb structure.
10 to 30 inches, dark yellowish-brown very porous, very friable loam; weak fine crumb structure; layer usually very similar to overlying layer.
30 to 53 inches, dark yellowish-brown friable mellow fine sandy loam or loamy fine sand.
53 inches +, mottled dark yellowish-brown, light olive-gray, pale-olive, strong-brown, or moderate-brown friable mellow sandy loam, loamy sand, or other light-textured alluvial material.

In some areas the surface soil is silt loam and in others it is fine sandy loam. The texture of the lower subsoil varies from loam to sand or gravel. In most areas there are stratified layers or lenses of various light-textured materials at some place in the profile. The subsoil is lighter colored or more yellowish in many places. The profile contains a slight to moderate quantity of small mica flakes.

The soil naturally is medium to strongly acid. Much of it, however, has been limed. Organic-matter content is low to moderate, and fertility is medium. All the layers of the profile have moderate to moderately rapid permeability for roots, water, and air. Tilth conditions are excellent (fig. 5).

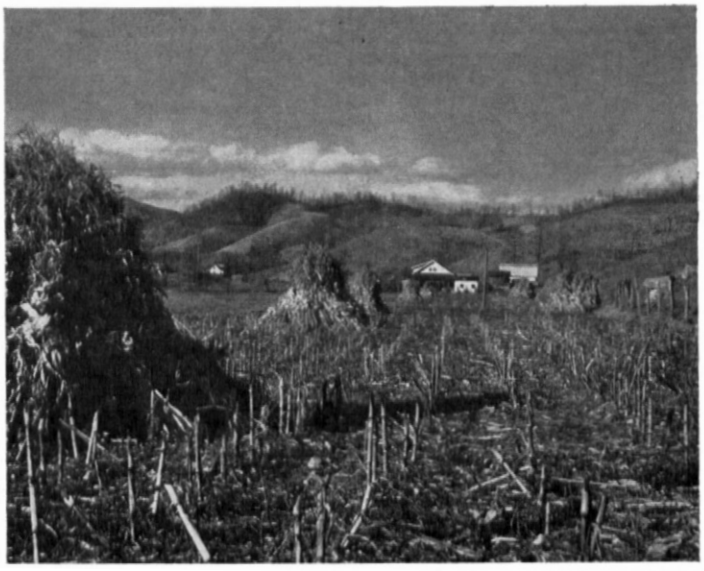

*Figure 5.*—**Good corn on Congaree loam along Brushy Fork near Vilas.**

Included with this soil are small local areas, swales, or old drainage channels too small to separate on the map in which the soil is imperfectly drained and to some extent resembles Chewacla loam. Included also is a total of about 40 acres that would have been separated on the map as Transylvania loam had the total been greater. This Transylvania soil has a darker surface soil (dusky brown to weak brown) and a slightly finer textured, better developed subsoil layer. In most areas it occupies high bottoms or low stream terraces and is less subject to overflow than Congaree loam. The areas are mainly in the broad bottom southeast of Boone and in other places along the South Fork New River.

*Use and management.*—Practically all of Congaree loam has been cleared and about 90 percent is now used for crops. The rest is nearly all in open pasture. Corn, and red clover and timothy for hay are the principal crops. Various other crops, especially oats, potatoes, cabbage, snap beans, and tobacco, are grown on smaller acreages. Most farmers use fertilizer for all crops. Under good management this soil is probably the best in the county for intensive cropping.

**Congaree fine sandy loam** (0- to 2-percent slopes) (Ct).—This soil differs from Congaree loam principally in its texture—a fine sandy loam. Where the soil is associated with Congaree loam, it usually lies nearer the streams. It covers relatively small areas; and these are scattered over much of the bottom land.

Profile in a field:

0 to 7 inches, dark yellowish-brown to weak-brown friable mellow fine sandy loam; weak fine crumb structure to structureless (single-grain).
7 to 20 inches, moderate yellowish-brown to dark yellowish-brown friable mellow fine sandy loam, heavy fine sandy loam, or loam; weak fine crumb structure to structureless.
20 to 43 inches, moderate yellowish-brown to dark yellowish-brown friable mellow loamy. fine-sand or light fine sandy loam.
43 inches +, moderate yellowish-brown to dark yellowish-brown friable mellow sandy loam or loamy fine sand mottled to some degree with light olive gray or pale olive.

A very limited to moderate quantity of small mica flakes is mixed through the profile. Texture varies to some extent, and in places the surface soil is loamy fine sand or loam. The subsoil usually is stratified with coarse-textured material ranging from loam to fine gravel.

The soil is naturally medium to strongly acid, but a large part of its acreage has been limed. It has a low to moderate supply of organic matter and is medium in fertility. Permeability to water, roots, and air is moderate to moderately rapid, and the soil has excellent tilth.

*Use and management.*—About 85 percent of Congaree fine sandy loam is in crops; the rest is almost entirely in open pasture. The principal crops are corn and red clover and timothy for hay; minor crops are oats, potatoes, cabbage, snap beans, and tobacco. Crops usually receive fertilizer. This soil is well suited to intensive cropping if properly managed. Its productivity generally is lower than for Congaree loam.

**Congaree cobbly fine sandy loam** (0- to 2-percent slopes) (Cs).—This soil is distinguished by the presence of many cobblestones on the surface and in the profile. In most profile characteristics except texture, it is similar to Congaree loam.

Profile in a field:

0 to 8 inches, dark yellowish-brown to weak-brown friable mellow cobbly fine sandy loam.
8 to 43 inches +, moderate dark or strong yellowish-brown very friable cobbly fine sandy loam, loam, or loamy fine sand; in places light olive-gray or pale-olive mottling below depths of 36 to 50 inches.

Texture varies somewhat from place to place. Here and there the surface soil is a gravelly loam or loamy sand. The subsoil generally is stratified with coarse-textured material. The number of cobblestones on and in the soil varies from place to place, but there are enough in most places to interfere with tillage. These cobblestones are waterworn, mostly fairly well rounded, and as much as 6 inches in diameter. In most places there is also rounded waterworn gravel ⅛ to 2 inches in diameter;

and in some places the gravel is more abundant than the cobblestones. Small mica flakes are present in the profile in small to moderate quantity.

The soil is medium to strongly acid and low in organic matter and fertility. Permeability is moderate to moderately rapid, and water-holding capacity is moderately low.

Included is an area of about 100 acres of soil somewhat resembling State loam but more cobbly and slightly finer textured in the subsoil. Most of this soil lies 1 to 3 feet higher than the first bottom along streams and is less subject to overflow.

*Use and management.*—Congaree cobbly fine sandy loam is used largely for crops and pasture. About 70 percent is in crops, and 24 percent is in open pasture. For the most part the rest is idle land. The crops are mainly corn, clover and grass for hay, oats, and potatoes. Cobblestones, moderately low water-holding capacity, and low plant-nutrient content make this soil less well suited to many crops than the other Congaree soils.

**Gullied land (Chandler and Clifton soil materials)** (7- to 60 +percent slopes) (Ga).—Very severely sheet eroded and gullied areas of Chandler and Clifton soils comprise most of this land type. Gullies as deep as 5 feet occupy half or more of each area. Although much of this land is eroded to bedrock, there are small areas between gullies that still retain part of the original surface soil and support a scant pasture growth.

Although most of the areas were Chandler and Clifton soil before accelerated erosion began, some were Halewood, Ashe, Porters, Watauga, or Ramsey soil. The areas are small, and scattered in various parts of the county. They range in relief from rolling to very steep.

Surface runoff is medium to high; internal drainage, moderate. The hazard of further erosion is great to extremely great.

*Use and management.*—About 80 percent of Gullied land (Chandler and Clifton soil materials) is lying idle, and the rest is in forest. There has been natural reforestation on some areas, especially to white pine or black locust, and forest plantings have been made in a few areas. This land is almost worthless for crops or pasture, and reclaiming it for these purposes is impractical. It should be planted to suitable trees, such as white pine or black locust, and then kept in forest.

**Halewood loam, hilly phase** (15- to 30-percent slopes) (Hc).—This light-colored soil occurs at elevations ranging up to 4,000 feet. It is found on tops of rounded and hilly mountain peaks and ridges, mountainsides, and hillsides where it formed from weathered granite and low-micaceous acid schist and gneiss. In places some metarhyolite and metadiabase are present. The areas are small and scattered throughout the county; they are associated with Porters soils and less extensively with Hayesville, Clifton, Perkinsville, and Watauga soils.

The soil resembles Porters soil in color and parent material but differs principally in having a finer textured subsoil. It differs from the Perkinsville soil principally because it is less yellowish and more brownish, from the Hayesville soil because it is less reddish, and from the Watauga soil because it has less mica and is more brownish.

Surface runoff is medium to high; internal drainage, moderate. Erosion hazard is moderate where the soil is not protected by vegetation and other means. The natural cover was mixed hardwoods, white and Virginia pines, and an undergrowth of rhododendron, mountain-laurel, wild azalea, and galax.

Profile in a forested area:

0 to 1 inch, weak-brown to dusky-brown or dark-brown friable mellow loam; weak fine crumb structure; has a covering layer about ¼ inch thick of decaying leaves, twigs, and bark derived mainly from deciduous trees.
1 to 3 inches, moderate-brown to weak-brown friable mellow loam; weak fine crumb structure.
3 to 6 inches, moderate-brown friable heavy loam; weak to moderate fine nut structure.
6 to 23 inches, moderate-brown to moderate yellowish-brown moderately porous friable to firm clay loam or heavy clay loam; moderate fine nut to medium nut structure.
23 to 28 inches, moderate yellowish-brown moderately porous very friable loam.
28 inches +, mixed strong, moderate, and light yellowish-brown, black to brownish-black, and brownish-gray soft disintegrated rock; contains fragments or strata of hard only slightly weathered rock; underlain by bedrock at varying depths.

Stones as much as 12 inches across occur on the surface or in the surface soil but in most places are not numerous enough to interfere with tillage. A few partly weathered rock fragments about 1 inch across are scattered through the profile, and a small quantity of fine mica flakes is present in most areas.

The soil is naturally very strongly acid. Organic-matter content is moderate to relatively low, and fertility is medium. The subsoil is moderately permeable to water, roots, and air.

*Use and management.*—This phase is nearly all in forest; small parts are used for crops and open pasture. In most areas the forest has been culled or cut over. The soil is suited to pasture but is only poor to fair for crops, even under proper management. After it has been cleared and cultivated for a few years in the customary manner, it closely resembles Halewood clay loam, eroded steep phase.

**Halewood loam, steep phase** (30- to 60-percent slopes) (He).—This phase differs from the hilly phase of Halewood loam principally in having stronger surface relief, shallower depth to disintegrated or solid bedrock, and in many places a slightly coarser textured subsoil. In places the profile approaches Porters loam, steep phase, in characteristics. The soil occupies steep hillsides or mountain slopes at altitudes of 1,500 to 4,000 feet. The areas are widely scattered.

Surface runoff is high to very high, and the soil is very erodible when cleared and not properly protected. Internal drainage is moderate.

*Use and management.*—All of this phase is in forest except a few acres that have been cleared for crops and pasture. Most of the forest has been culled or cut over. This soil is poorly or very poorly suited to crops, mainly because it is steep and erodible. After it is cleared and cropped for a few years in the usual manner, it becomes eroded and resembles Halewood clay loam, eroded steep phase. This soil should remain in forest. If needed for pasture, cleared areas would produce fairly well if limed, phosphated, properly seeded, and not overgrazed. To prevent erosion, the soil should be seeded to a pasture mixture immediately after it is cleared.

**Halewood loam, rolling phase** (7- to 15-percent slopes) (Hd).—This phase differs from the hilly phase of Halewood loam principally in having rolling relief and consequent differences in surface runoff and erodibility. A few small areas are undulating and have slopes less than 7

percent. The soil occurs mainly on broad tops of ridges and mountains, but some is in other smoother parts of the county. Many of the area are comparatively small.

Surface runoff is medium; internal drainage, moderate. In most cleared areas, erosion has removed a part of the original surface soil, but enough remains to form the plow layer normal for this phase. In a total of about 115 acres, the subsoil is within plow depth, and the plowed soil is finer in texture and lighter in color than in less eroded areas. Symbols are used on the soil map to indicate this condition. Some stones are on and in the surface soil, but they do not interfere with cultivation. In a total of about 150 acres, however, stones are numerous enough to hinder tillage somewhat, and their location is shown on the soil map by symbols.

*Use and management.*—A large part of this phase is intensively used for corn, potatoes, cabbage, snap beans, and burley tobacco. Lime has been applied to most of the land, and fertilizer is used for all the crops.

This is one of the better soils of the uplands for crops and pasture. It has medium fertility and responds well to good management. The relatively gentle relief allows use of all kinds of farm machinery, but it is difficult to move heavy machinery up to the areas located on tops of high ridges and mountains. The soil is somewhat erodible when not protected by vegetation and other means, but erosion can be controlled by relatively simple practices. In the moderately eroded areas, the soil tends to become hard when dry and is difficult to cultivate and is not so productive as the less eroded soil.

Cabbage, snap beans, small grains, apples, potatoes, and buckwheat are fairly well adapted to most of this soil. Burley tobacco does well in areas where the altitude is not too high. Alfalfa should make good growth on land that is properly limed and managed. The soil is well suited to pasture, but only about 15 percent of its area is used for that purpose.

**Halewood clay loam, eroded hilly phase** (15- to 30-percent slopes) (Ha).—This soil has lost a moderate amount of the original surface soil. The subsoil is within plow depth in most places. The plow layer—a mixture of surface soil and subsoil material—is a moderate-brown friable heavy loam, light clay loam, or clay loam. Areas of this soil are scattered in various parts of the county.

The relatively heavy textured surface soil of this phase is less permeable to moisture and is more erodible than the surface soil of Halewood loam, hilly phase. Surface runoff is medium to high, and the hazard of erosion is moderate in areas not protected by vegetation and other means. A few short shallow gullies have formed in places. Areas where there is more sheet or gully erosion than the normal range for this soil are indicated on the map by symbols.

Cultivation and erosion have reduced the relatively low to moderate organic-matter content that was originally present. Fertility is medium. Tillage is difficult because the surface soil tends to become hard when dry and to clod when plowed too wet. Although most farm machinery can be used, the hilly relief makes use of some of the heavier types difficult.

*Use and management.*—All of this phase probably has been cultivated at some time. Black locust, white pine, mixed hardwoods, and field brush have become established on a few acres. By rough estimate, 55 percent of the total area is used for crops and 35 percent for open pasture. The rest is largely idle. Corn, and red clover and timothy for hay are the principal crops. Less important crops are potatoes, cabbage, oats, buckwheat, snap beans, wheat, rye, burley tobacco, apples, and sorghum cane. Lime is applied to most of the soil, and all crops are fertilized.

The soil is poor to fair for crops, largely because of its hilly relief, eroded condition, surface runoff, and erodibility. Intertilled crops, buckwheat, and soybeans are poorly suited to this soil; close-growing crops are somewhat better, although the relief makes use of grain binders difficult in many areas. The soil is fair for pasture. Under proper management, productivity is medium for crops and pasture.

One of the first essentials for improving the soil is an application of 2 tons an acre of ground limestone. A good crop rotation should include a cultivated crop only once every 5 years and a legume and grass mixture about 3 out of every 5 years. Buckwheat and soybeans are not recommended because they induce further erosion. It is important to conserve and return all available manure and crop residues and to turn under green-manure crops whenever possible. Fertilizer is necessary for all crops.

Special precautions should be taken to reduce or check surface runoff to control erosion. Stripcropping and contour tillage can be used for such control (fig. 6). Another method of erosion control is to keep a cover of vegetation on the land as much of the time as possible. A good growth of grass-legume hay or pasture is one of the most effective plant covers.

**Halewood clay loam, eroded steep phase** (30- to 60-percent slopes) (Hb).—Except for its eroded condition this phase is similar to Halewood loam, steep phase. As a result of accelerated erosion under cultivation, a considerable part of the surface soil has been lost. The scattered areas of this soil occur on hillsides or mountain slopes. Surface runoff is high to very high, and the soil is very erodible when not protected by vegetation or other means.

*Use and management.*—Practically all of this phase has been cleared of forest, and most of it has been cultivated.

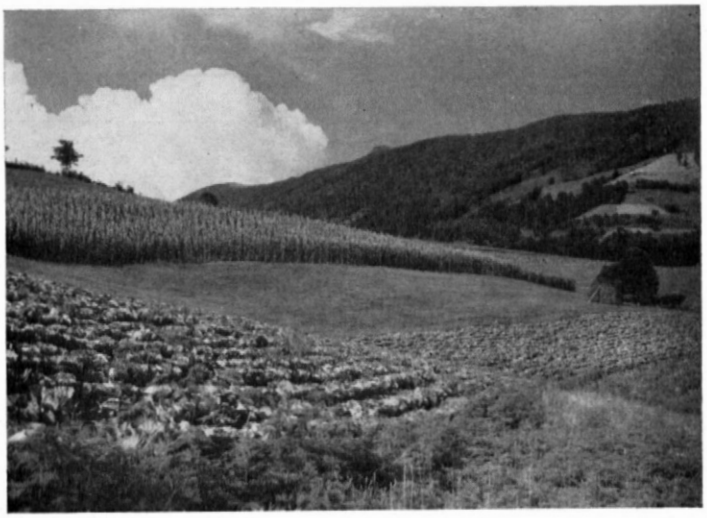

*Figure 6.*—**Stripcropping on Halewood clay loam, eroded hilly phase, near Silverstone. From top to bottom the strips are red clover and timothy, corn, red clover and timothy, cabbage, and wheat. The rows of cabbage and corn are approximately on the contour.**

Black locust, white pine, mixed hardwoods, and field brush grow on a few acres. An estimated 15 percent of the soil is in crops, 70 percent is in pasture, and 12 percent is idle. The rest is in forest. The principal crops are corn, potatoes, and oats. Smaller acreages are planted to cabbage, buckwheat, rye, wheat, apples, snap beans, and occasionally to other crops.

Ground limestone is used to some extent, but only on a few farms, partly because it is difficult to transport it up the steep slopes and apply it to the land. Burned lime (calcium oxide) would reduce this difficulty to some extent, as its neutralizing value per pound is nearly twice that of ground limestone. It is estimated that pastures on slightly more than half the farms have received superphosphate.

The soil is poorly suited to crops, largely because it is steep and erodible. The steep relief prevents satisfactory use of grain binders, mowers, wagons, and almost all except the very simplest farm implements. Erosion is active where intertilled crops are grown, even though the rows are ordinarily planted approximately on the contour. Stripcropping is not common; its practice would control erosion to a considerable extent.

Under most conditions this soil is best suited to permanent pasture. If it then were properly limed, phosphated, seeded, and received other needed management, most areas would produce a good grass-legume pasture.

**Halewood stony loam, hilly phase** (15- to 30-percent slopes) (Hh).—This phase differs from Halewood loam, hilly phase, in having enough rock fragments scattered over the surface or embedded in the profile to interfere with but not prevent tillage. The rock fragments vary greatly in size. In some areas there are a few small outcrops of bedrock. The profile of this soil is slightly shallower to bedrock, or in many places to disintegrated bedrock, than that of Halewood loam, hilly phase.

*Use and management.*—This phase is nearly all in forest. For cleared areas the management requirements are similar to those of Halewood loam, hilly phase, but the soil is somewhat less suitable for crops because of its stoniness.

**Halewood stony loam, steep phase** (30- to 60-percent slopes) (Hk).—This phase differs from Halewood stony loam, hilly phase, principally in having stronger relief. It occurs on steep hillsides or mountain slopes at altitudes of 1,500 to 4,000 feet. Surface runoff is high to very high, and the soil is very erodible when cleared and not properly protected. Rock fragments on the surface or in the soil interfere with but do not prevent tillage. These fragments vary greatly in size. In some areas there are a few small outcrops of bedrock. In many places this soil is somewhat shallower to bedrock than Halewood loam, hilly phase, and has a subsoil of slightly lighter texture. Some of these areas approach Porters stony loam, steep phase, in characteristics.

*Use and management.*—This phase is in forest. If cleared, its suitability for use and its management requirements would be similar to those for Halewood loam, steep phase. If it were cropped for a few years in the customary manner, this soil would be similar to Halewood stony clay loam, eroded steep phase.

**Halewood stony clay loam, eroded hilly phase** (15- to 30-percent slopes) (Hf).—This phase represents areas that were Halewood stony loam, hilly phase, before they were cleared, cultivated, and moderately eroded. Rock fragments on the surface or in the profile interfere somewhat with tillage. Surface runoff is medium to high, and the soil is moderately erodible if not protected by vegetation or other means. Areas where there is more sheet or gully erosion than normal for this soil are indicated on the soil map by symbols. On some tracts, erosion is only slight. The areas of this soil are relatively small and are associated with other Halewood areas. Most farm machinery can be used, but, because of the relief, some of the heavier types can be used only with considerable difficulty.

*Use and management.*—This phase is used largely for crops (45 percent) and open pasture (40 percent), and the rest is idle. Suitability for use and requirements for management are practically the same as for Halewood clay loam, eroded hilly phase, but tillage is more difficult and productivity slightly less.

**Halewood stony clay loam, eroded steep phase** (30- to 60-percent) (Hg).—This soil is similar to Halewood clay loam, eroded hilly phase, but differs in having stronger relief and greater stoniness. There are enough rock fragments on or in the soil to interfere with tillage. This phase is associated with other Halewood soils in many parts of the county.

Surface runoff is high to very high. The soil is very erodible when not protected by vegetation. A total of about 80 severely eroded acres is included. A few areas have only slight erosion.

*Use and management.*—About 70 percent of this phase is in open pasture; the rest is largely idle land or cropland. Suitable use for the soil and its management requirements are similar to those for Halewood clay loam, eroded steep phase. This soil, however, is slightly less productive and more difficult to till. Under most conditions this soil is best used for pasture, provided it is properly limed, phosphated, seeded, and receives other needed management.

**Hayesville loam, hilly phase** (15- to 30-percent slopes) (Hn).—This light-colored soil of the uplands has a strong-brown or moderate reddish-brown, heavy-textured subsoil. It resembles Clifton soils in color but has developed from residuum of acidic rocks—granite and light-colored low-micaceous gneiss and schist. It is associated with Halewood soils and is distinguished from them by its strong-brown or moderate reddish-brown subsoil.

This soil occurs entirely in the southeastern part of the county—southeast of the crest of the Blue Ridge and mostly near Stony Fork School, Mountain View Church, and southeast of Triplett. It is found on rounded tops of ridges and on hillsides at altitudes below 2,500 feet. Surface runoff is medium to high; internal drainage, moderate.

The original vegetation was mainly deciduous forest mixed with white pine and possibly Virginia pine. There was an undergrowth of rhododendron, mountain-laurel, and wild azalea. The present cutover forest consists principally of black, white, and Northern red oaks, white pine, hickory, and a few sourwood, yellow-poplar, dogwood, sassafras, and Virginia pine.

Profile in a forest area:

0 to ½ inch, black or brownish-black friable loam; contains much partly decayed leaves and twigs; undecayed and partly decayed leaves and twigs on the surface.

½ to 3 inches, moderate to light yellowish-brown friable mellow loam or light loam; weak fine crumb structure.

3 to 6 inches, strong yellowish-brown to moderate-brown friable loam; weak fine crumb structure.
6 to 13 inches, strong-brown friable clay loam; weak to moderate fine nut structure.
13 to 53 inches, moderate reddish-brown to strong-brown slightly porous firm clay, light clay, or heavy clay loam; plastic and sticky when wet; moderate fine to medium nut structure; a few yellowish-brown decomposed rock fragments.
53 to 75 inches, moderate reddish-brown to strong-brown friable light clay loam or clay loam; a few decayed rock fragments.
75 inches +, strong-brown or moderate reddish-brown, mixed with moderate yellowish-brown, soft disintegrated rock.

In most areas the profile contains a small quantity of small mica flakes and some quartz or other rock fragments up to about an inch across. In places a few large stones are on or in the surface soil. The profile is strongly to very strongly acid. Organic matter is low except in the surface layer. Permeability of the subsoil to water, roots, and air is moderate to moderately slow.

Included with this soil are about 9 acres that have slopes ranging from 7 to 15 percent. These areas have generally slower surface runoff and are less erodible and more productive. An inclusion of about 15 acres has soil stony enough to interfere with tillage.

*Use and management.*—If cleared, Hayesville loam, hilly phase, would be poor to fair for crops and fair for pasture. Cleared and cultivated in the customary manner for a few years, this soil would closely resemble Hayesville clay loam, eroded hilly phase, and would require practically the same management.

**Hayesville clay loam, eroded hilly phase** (15- to 30-percent slopes) (Hl).—This soil occurs only in the southeastern part of the county, southeast of the crest of the Blue Ridge, in the vicinity of Stony Fork School, Mountain View Church, and Penley School, and southeast of Triplett.

Plowing and cultivating the virgin soil mixed the materials of the surface horizons together. Subsequently, most of the surface soil was eroded by medium to high surface runoff on land unprotected by adequate vegetative cover. This erosion reduced the surface soil to the extent that the subsoil is now within plow depth in most places. Tillage has mixed remnants of the original surface soil with the reddish fine-textured subsoil and has formed a 4- to 6-inch plow layer of light-brown, moderate-brown, or weak-orange friable clay loam, light clay loam, or heavy loam. The rest of the profile is similar to that of Hayesville loam, hilly phase.

The present surface layer is less permeable to water than that of Hayesville loam, hilly phase, and is moderately to very erodible when not protected by grass or other close-growing plants. There are a number of short shallow gullies in places. Areas significantly more gullied or sheet-eroded than normal are indicated on the soil map by symbols.

Organic-matter content and soil fertility are low. The relatively fine textured surface soil tends to become hard, clod, and to be somewhat difficult to till when dry. Although most farm machinery can be employed, the heavier types are not used because of the hilly surface.

Included is a total of about 25 acres with rolling relief. These areas have less rapid surface runoff, are less erodible, and are more productive than is the hilly phase. An inclusion of about 60 acres has stones on or in the surface soil that interfere somewhat with tillage.

*Use and management.*—An estimated 40 percent of Hayesville clay loam, eroded hilly phase, is in crops, 35 percent is in open pasture, 22 percent is idle, and 3 percent is in forest. The principal crops are corn, red clover and timothy for hay, wheat, rye, oats, and potatoes. A few acres are planted to soybeans.

This phase is only poor to fair for crops, mainly because of its hilly relief, rapid surface runoff, erodibility, eroded condition, and relatively low fertility. It is fair for pasture. Controlling erosion and improving fertility are among the major management requirements.

**Hayesville clay loam, eroded steep phase** (30- to 60-percent slopes) (Hm).—This phase resembles Hayesville stony loam, steep phase, except for stoniness. Areas of this soil occur in proximity to Hayesville loam, hilly phase.

This phase is very erodible. When it was cultivated it was protected by vegetation only part of the time. Consequently, the high to very high surface runoff removed part of the surface soil and in most places brought the subsoil to within plow depth. This soil is similar to Hayesville clay loam, eroded hilly phase, in eroded condition, organic-matter content, and color, texture, and tilth of the plow layer.

Generally, the stones on and in the surface soil do not interfere much with tillage; but in an inclusion of about 40 acres stones do hinder tillage considerably.

*Use and management.*—About 55 percent of Hayesville clay loam, eroded steep phase, is in open pasture and about 27 percent is idle. The rest is in crops and second-growth white pine or mixed hardwoods. Most of the pasture is poor to fair. The principal crops are corn, potatoes, wheat, rye, and oats.

Because of steep relief and high erodibility, this soil is poor or very poor for crops. Its steepness prevents use of grain binders, mowers, wagons, and almost all except the simplest farm implements. Erosion is active under intertilled crops, even though the rows are normally planted approximately on the contour. Stripcropping would reduce erosion to some extent.

Under most conditions this soil is best suited to pasture. If properly limed, phosphated, seeded, and otherwise well managed, this phase will produce fairly good grass-legume pasture.

**Hayesville stony loam, steep phase** (30- to 60-percent slopes) (Ho).—This phase differs from Hayesville loam, hilly phase, principally in stoniness and steeper relief; the subsoil is also slightly coarser in many places, and the profile is somewhat shallower to disintegrated bedrock. Stones on or in the surface soil hinder tillage to some extent. This phase occurs on steep hillsides or mountains, generally at altitudes below 2,500 feet.

Surface runoff is high to very high. There is no accelerated erosion under the original forest, but the soil would erode severely if it were cleared and not protected by close-growing vegetation. If cleared and then cropped for a few years, it would become similar to Hayesville clay loam, eroded steep phase, in all respects except stoniness and would be about equally suitable for use. Included is a total of about 109 acres in which stoniness does not interfere with tillage.

*Use and management.*—Hayesville stony loam, steep phase, is all in forest. The soil is poorly or very poorly suited to crops because it is steep and highly erodible. Probably, most of it should remain in forest. If needed

for pasture, it would produce fairly good grazing if properly limed, phosphated, seeded, and not overgrazed. After clearing, the land should be immediately seeded to a pasture mixture to control erosion.

**Matney loam, rolling phase** (7- to 15-percent slopes) (Mc).—This light-colored phase has a moderate to strong yellowish-brown friable subsoil. It formed from weathered material derived from noncalcareous sandstone, conglomerate, quartzite, or shale. It occurs on rounded tops of mountains, ridges, or hills at altitudes of 3,000 to 4,500 feet, in the southwestern part of the county, and on Stone Mountain in the northwestern part. It is associated with Ramsey soils, and resembles them in color and parent material but differs from them in having greater depth to bedrock, milder surface relief, and finer textured subsoil. It is like Perkinsville soils in many respects, but its parent material is more siliceous.

Surface runoff is medium; internal drainage, moderate. The original vegetation probably was mixed hardwood forest, with some white pine and hemlock. The principal deciduous trees probably were red, black, white, and chestnut oaks, red maple, yellow-poplar, and American chestnut. From observation of now existent similar forests, it is believed that many areas originally had an undergrowth of rhododendron and mountain-laurel.

Profile in a forested area:

0 to 1 inch, brownish-black to dusky-brown friable mellow loam; weak fine crumb structure; some decayed leaves and wood; undecayed and partly decayed leaves and twigs on the surface.
1 to 6 inches, dark yellowish-brown very friable loam; weak to moderate medium crumb structure; contains a few small decomposed rock fragments and a very little decayed wood.
6 to 20 inches, moderate to strong yellowish-brown porous friable clay loam or fine sandy clay loam; weak to moderate fine nut to weak fine crumb structure; contains a few partly weathered rock fragments.
20 to 27 inches, moderate to strong yellowish-brown, mixed with light yellowish-brown, very friable fine sandy loam or coarse loam; contains moderate number of partly weathered rock fragments.
27 inches +, light-colored noncalcareous disintegrated rock underlain at variable depths by sandstone, conglomerate, shale, quartzite, or other siliceous bedrock of sedimentary origin.

A small part of the surface soil has been lost through accelerated erosion but enough remains in most places to form the usual dark yellowish-brown plow layer. In most places a few stones of various size are on or in the surface soil, but generally they do not interfere with cultivation. Some areas have scattered small outcrops of bedrock, which are indicated on the soil map by symbols. In the areas underlain by shale or slate there are varying quantities of small rock fragments on the surface and throughout the profile. Some small areas have bedrock much closer to the surface than normal for this soil.

The soil is naturally strongly or very strongly acid and low in fertility. Its organic-matter content is relatively low except in the thin, dark surface horizon in virgin areas. The subsoil is moderately permeable to roots, water, and air.

An inclusion totaling about 80 acres has stones numerous enough to interfere with tillage. The location of these areas is shown on the soil map by symbols. Included areas totaling about 12 acres have undulating slopes of less than 12 percent. In these areas surface runoff is less and the soil is more productive than normal for this rolling phase.

*Use and management.*—About 65 percent of Matney loam, rolling phase, is in crops, 25 percent in open pasture and 10 percent in forest. Most of the common crops are grown, particularly potatoes, cabbage, red clover and timothy for hay, corn, oats, and snap beans. Tobacco is usually not grown. Lime has been applied to most of the soil, and fertilizer is used for all crops.

**Matney loam, hilly phase** (15- to 30-percent slopes) (Mb).—Except for relief and resultant differences in surface runoff and workability, this soil is like the rolling phase of Matney loam. It occurs on the rounded tops of mountains or ridges, mountain slopes, or hillsides in association with Ramsey soils and other soils of its own series. Surface runoff is medium to high, and the soil is moderately to very erodible when not protected by vegetation or other means. A few stones are present, but they do not hinder cultivation.

*Use and management.*—All of this phase, except a small percentage in open pasture and crops, remains in culled or cutover forest. It would be poor to fair for crops and only fair for pasture, even under good management. If cleared and cultivated for a few years under ordinary management, the soil would closely resemble Matney loam, eroded hilly phase.

**Matney loam, eroded hilly phase** (15- to 30-percent slopes) (Ma).—This phase is associated with other Matney soils and with Ramsey soils. It resembles Matney loam, rolling phase, except it has an eroded surface soil, somewhat shallower depths to bedrock, and a slightly coarser textured subsoil. In most places tillage has mixed the remaining original surface soil with subsoil material and formed a plow layer of moderate yellowish-brown friable heavy loam to light clay loam.

Surface runoff is medium to high; the soil is moderately to very erodible when not protected by vegetation or other means of water control.

*Use and management.*—Approximately 50 percent of this phase is in crops, and 35 percent in open pasture; the rest is idle land or in second-growth forest. The principal crops are red clover and timothy for hay, corn, potatoes, cabbage, and oats. Smaller acreages of most other crops except tobacco are grown. Liming is a common practice on most areas, and all crops are fertilized.

This phase is poor to fair cropland, largely because of its hilly relief, erosion hazard, and low fertility. Although most types of farm machinery can be used, some of the heavier implements are difficult to operate on the stronger slopes.

**Matney stony loam, hilly phase** (15- to 30-percent slopes) (Me).—This phase resembles Matney loam, rolling phase, except in stoniness, relief, and surface runoff. It has enough stones on or in the surface soil to interfere with tillage. The subsoil contains more rock fragments, is shallower to bedrock in more places, and in a few areas is somewhat coarser textured than that of the rolling phase. Surface runoff is medium to high.

The soil is all in forest, but, if cleared, it would be moderately to very erodible unless protected by close-growing vegetation or other measures. The areas are on rounded tops of ridges and mountains, mountain slopes, or hillsides in rolling to hilly sections. Associated are other Matney soils and Ramsey soils.

*Use and management.*—The forest that covers this phase has been cut over. If cleared, the soil would be poor for crops but fair for pasture under proper management. After being cleared and cultivated for a few years in the usual manner, the soil would closely resemble Matney stony loam, eroded hilly phase.

**Matney stony loam, eroded hilly phase** (15- to 30-percent slopes) (Md).—This phase is similar to Matney loam, eroded hilly phase, in surface runoff, eroded condition, soil association, and in most other respects except stoniness.

*Use and management.*—This phase is used largely for open pasture and crops. About 5 percent is in forest and approximately 15 percent is idle. The chief crops are clover and timothy for hay, corn, potatoes, cabbage, and oats. Other common crops except tobacco are grown to a small extent. Most of the soil has been limed, and all crops are fertilized. This soil is somewhat less productive than Matney loam, eroded hilly phase, and is more difficult to work because of its stoniness.

**Perkinsville loam, rolling phase** (7- to 15-percent slopes) (Pc).—This phase occupies rounded tops of mountains, ridges, hills, and other rolling country. It occurs at elevations of about 2,500 to 4,500 feet, mainly in the vicinity of the villages of Perkinsville, Boone, Bamboo, Aho, Blowing Rock, Matney, Rominger, and Reese. It is derived mainly from material weathered from low-micaceous granite and light-colored low-micaceous acidic schist and gneiss. In places some material is present that is weathered from metarhyolite and other similar rock.

The profile of this soil differs from that of a similar soil, such as Ashe loam, steep phase, principally in having a heavier textured moderate yellowish-brown subsoil. It differs from that of Halewood loam, hilly phase, mainly in being more yellowish; from Watauga loam, rolling phase, chiefly in being less micaceous; and from Matney loam, rolling phase, principally in character of parent material.

Surface runoff is medium; internal drainage, moderate. The soil is only slightly erodible when not protected. The original vegetation probably was a mixed hardwood forest of white, Northern red, chestnut, and black oaks, yellow-poplar, red maple, chestnut, basswood, sugar maple, and hickory, with some white pine and hemlock. Many areas may have had an undergrowth of rhododendron, mountain-laurel, wild azalea, and galax.

Profile in a virgin forest:

0 to 1 inch, dusky-brown to weak-brown to brownish-black very friable loam; weak fine crumb structure; cover of decaying leaves, twigs, and bark.
1 to 7 inches, dark yellowish-brown very friable mellow loam; weak to moderate medium crumb structure.
7 to 22 inches, strong to moderate yellowish-brown moderately porous friable to firm clay loam or heavy clay loam; moderate fine to medium nut structure; lower part of layer slightly lighter in color and texture than upper.
22 to 27 inches, strong to light yellowish-brown very friable loam or heavy fine sandy loam; mostly structureless.
27 inches +, brownish-gray, yellowish-gray, and light yellowish-brown soft disintegrated rock with strata, lenses, or pockets of strong to light yellowish-brown loam or heavy fine sandy loam; granite, low-micaceous acidic gneiss or schist, or metarhyolite bedrock at variable depths.

The surface soil contains a few to moderate number of rock fragments, mostly quartz, up to 1 inch across, and in places a few larger rock fragments as much as 6 inches across. Areas having rock fragments large enough to interfere with tillage are indicated on the soil map by symbols. The subsoil contains a few soft partly decayed rock fragments up to about 2 inches across. The surface soil and subsoil in most areas are slightly gritty. Small mica flakes generally are present in the profile and in a few small areas they are so numerous that the soil approaches Watauga soil in character.

Reaction is strongly to very strongly acid, and organic-matter content generally is low except in a thin dark surface layer that exists under virgin conditions. Fertility is relatively low to moderate. Permeability to roots, air, and water is moderate, although water percolation through the subsoil is less rapid than through the subsoil of Ashe or Porters soils.

Most of this soil has been cleared of forest, cultivated, and then slightly eroded, but the plow layer is still mainly surface soil in most places. The more eroded areas are indicated on the soil map by symbols.

*Use and management.*—All but about 8 percent of Perkinsville loam, rolling phase, has been cleared and is now mostly in crops and, to some extent, open pasture. The chief crops are red clover and timothy for hay, corn, oats, potatoes, and cabbage. Smaller acreages of most of the other crops are grown. Lime is applied to most areas, and fertilizer is generally used for crops. This is one of the better soils of the uplands for many crops. Although it has low to medium fertility, it responds well to good management. Surface relief is mild enough to allow use of all kinds of farm machinery.

Proper liming is one of the first things to be done in improving productivity. Manure and crop residues should be conserved and applied to increase supplies of organic matter. A suitable crop rotation would include legumes and grasses about 2 out of every 4 to 6 years. Proper fertilization is necessary. Simple erosion-control methods, such as contour tillage and stripcropping, are effective. The soil should be left bare of vegetation for as little of the rotation period as possible.

**Perkinsville loam, hilly phase** (15- to 30-percent slopes) (Pb).—The hilly phase of Perkinsville loam resembles the rolling phase except in relief and resultant greater surface runoff and more difficult tillage. The areas of this phase occur on rounded tops of ridges and mountains, mountain slopes, or hillsides in rolling to hilly country. The soil is associated with the other Perkinsville soils, and with Ashe and Tate soils. In most areas the subsoil layer is slightly finer textured and slightly shallower to bedrock than that of Perkinsville loam, rolling phase. In places this soil has a profile similar to that of the steep phase. Surface runoff is medium to high; internal drainage, moderate. The soil is moderately erodible when not protected by vegetation or other means of water-erosion control.

Some stones are on the surface or in the surface soil but not enough to really hinder tillage. An inclusion of about 384 acres has enough stones to interfere somewhat with cultivation. These stony areas, many of them in the southwestern part of the county near Blowing Rock, are indicated on the soil map by symbols.

*Use and management.*—Perkinsville loam, hilly phase, is almost entirely in culled or cutover forest. Only about 3 percent is in open pasture and 2 percent in crops. If cleared, this soil would be poor to fair for crops and only fairly good for pasture, even under good management. After being cleared and cultivated in the ordinary manne

for a few years, this soil would closely resemble Perkinsville loam, eroded hilly phase.

**Perkinsville loam, eroded hilly phase** (15- to 30-percent slopes) (Pa).—This phase differs from Perkinsville loam, rolling phase, mainly in being hilly and moderately eroded. It occurs on rounded tops of mountains or ridges, mountain slopes, and hillsides in rolling to hilly uplands. Most areas are relatively small and scattered. This soil is associated with the other Perkinsville soils and with those of the Ashe and Tate series.

Erosion has removed surface soil to such an extent that the subsoil is within plow depth on more than half the area. Tillage has mixed subsoil material with the remaining surface soil and formed a plow layer of moderate yellowish-brown, friable heavy loam, light clay loam, or clay loam.

The plow layer has only fairly good tilth and tends to clod when dry. The soil is relatively low to moderate in organic matter and fertility. Most farm machinery can be used, although the heavier types are difficult to operate on the steeper areas.

A few stones may occur here and there, but not enough to interfere with tillage. Surface runoff is medium to high; internal drainage, moderate. When not protected by vegetation or other methods, the soil is subject to further erosion. Areas where there is more sheet or gully erosion than the normal range for this soil are indicated on the soil map by symbols. A few areas that have been only slightly eroded are included.

*Use and management.*—Almost all of this phase has been cleared of its original forest and cultivated. In few areas there is a growth of white pine, black locust, or other trees. The soil is largely in crops and open pasture, although some is idle. The chief crops are red clover and timothy for hay, corn, oats, potatoes, and cabbage. Small acreages of most of the other common crops are grown. Liming is a common practice on most farms, and on some of them all crops, except possibly hay, are fertilized.

The soil is poor to fair for crops, chiefly because it is hilly and eroded. One of the first requirements for soil improvement is proper liming. An initial application of 2 tons an acre of ground limestone should be used. The crop rotation should include a cultivated crop only once every 5 years, and a legume and grass mixture about 3 years out of 5. It is important to conserve and return all available manure and crop residues to the land and to turn under green manure whenever possible. Fertilizer is necessary for all crops.

Special precautions should be taken to reduce or check surface runoff for erosion control. Stripcropping and tillage, as nearly as possible on the contour, are highly desirable for all areas. The soil should almost never be left bare of vegetation. Buckwheat and soybeans are not good crops, as they encourage further erosion. Keeping a good growth of mixed grass-legume hay or pasture on the soil is one of the most effective ways of controlling erosion.

**Perkinsville loam, undulating phase** (2- to 7-percent slopes) (Pd).—This phase is similar to Perkinsville loam, rolling phase, but differs mainly in having milder relief. It is associated with the rolling phase and occurs mainly on rolling to hilly uplands. Surface runoff is medium; internal drainage, moderate; and erosion hazard, very little.

*Use and management.*—All except a small part of this phase has been cleared of forest and is now used relatively intensively for crops, but some is in pasture. The principal crops are red clover and timothy for hay, corn, oats, potatoes, and cabbage. Most of the other common crops are grown to a small extent. Lime has been applied to most areas, and fertilizer is used for all crops. For many crops, this soil is one of the best of the uplands. Although it has low to medium fertility, it responds well to good management. The relief permits use of all kinds of farm machinery. Control of erosion is not difficult.

**Perkinsville stony loam, rolling phase** (7- to 15-percent slopes) (Pf).—This phase is similar to Perkinsville loam, rolling phase, in all respects except stoniness. Stones, as much as 12 inches or more across, are on and in the surface soil in sufficient numbers to interfere with tillage. The subsoil also contains rock fragments, and in places it is shallower to bedrock than that of Perkinsville loam, rolling phase. Scattered small outcrops of bedrock are indicated on the soil map by symbols. The soil has medium surface runoff and moderate internal drainage. It is subject to only slight erosion when cleared and not protected.

In a few included areas, especially on or near Beech Mountain, the subsoil is somewhat coarser textured than usual and the soil profile, except for stoniness, tends toward that of Ashe loam, steep phase. The areas are on rounded tops of mountains and ridges and on hillsides associated with areas of Perkinsville and Ashe soils.

*Use and management.*—Probably 20 percent of this phase—mainly near Blowing Rock and Beech Mountain—remains in forest. The cleared land is used for crops and pasture. Although this soil is less easily worked and somewhat less productive than Perkinsville loam, rolling phase, its management requirements are practically the same.

**Perkinsville stony loam, eroded hilly phase** (15- to 30-percent slopes) (Pe).—This phase is similar to Perkinsville loam, eroded hilly phase, except for stoniness. Stones as much as 12 inches or more across are on and in the surface soil in numbers that interfere somewhat with cultivation. In some areas, the subsoil contains more rock fragments and is shallower to bedrock than usual for this phase. In places the soil has a somewhat coarser textured subsoil and has a profile somewhat similar to that of Ashe stony loam, eroded hilly phase. Scattered small outcrops of bedrock are shown on the soil map by symbols. The soil is associated with other soils of the Perkinsville series and with Ashe and Tate soils.

*Use and management.*—This phase is used principally for open pasture and crops; about 2 percent is in forest and 18 percent is idle. Red clover and timothy for hay, corn, oats, potatoes, and cabbage are the main crops. Other common crops are grown to some extent. The soil is not so productive as Perkinsville loam, eroded hilly phase, and is more difficult to work because it is stony. Management requirements, however, are about the same for both soils.

**Porters loam, steep phase** (30- to 60-percent slopes) (Pl).—This soil is characterized by a moderate-brown very friable surface soil and subsoil. It occupies hillsides and mountainsides at altitudes of about 1,500 to 5,300 feet. It occurs particularly in the vicinity of Vilas, Sugar Grove, Amantha, and Mabel. The soil has formed from residuum of weathered low-micaceous igneous and metamorphic rocks, mainly granite and acidic gneiss

and schist, and to some extent hornblende gneiss, hornblende schist, diorite, and metadiabase. It differs from Ashe soils principally in being browner, and from Halewood and Clifton soils mainly in having a more friable medium-textured subsoil.

Surface runoff is high to very high, and internal drainage is moderate. The original vegetation was a mixed hardwood forest, principally of white, chestnut, Northern red, and black oaks, American chestnut, yellow-poplar, hickory, and red maple, with some white pine and hemlock. Many areas had an undergrowth of rhododendron, mountain-laurel, wild azalea, dogwood, and galax.

Profile in a forest:

0 to 1 inch, brownish-black or dusky-brown very friable loam; weak fine crumb structure; covering of decaying leaves, twigs, and bark.
1 to 7 inches, moderate-brown very friable loam; weak fine crumb structure; upper part of layer slightly darker than lower.
7 to 33 inches, moderate-brown very porous, very friable loam or heavy loam; weak medium to fine crumb to weak fine nut structure.
33 to 40 inches, moderate-brown very friable loam or heavy loam mixed with much soft disintegrated rock.
40 inches +, dark-gray to black and moderate-brown soft disintegrated rock with strata, lenses, or pockets of moderate-brown loam; lies on granite, gneiss, schist, diorite, or metadiabase at varying depths.

In some places this soil is nearly yellowish brown and is similar to Ashe loam, steep phase. In other areas at higher altitudes it has a relatively thick dusky-brown surface soil and in this respect is similar to Burton stony loam, hilly phase. At lower altitudes particularly on less steep slopes, the soil sometimes has a light clay loam subsoil and grades toward the profile of Halewood loam, steep phase. Where it has formed from material of dark-colored basic rocks, its subsoil varies from moderate brown to strong brown, is less friable, and resembles the subsoil of Clifton soils in color and texture.

In most places the surface soil contains rock fragments as much as 6 inches across. Generally, these are not numerous enough to interfere with tillage, except in a few areas that are indicated on the soil map by symbols. There are scattered areas of bedrock outcrops, which are indicated on the soil map by symbols. The subsoil generally contains a few soft disintegrated rock fragments measuring up to about 3 inches across. Some small mica flakes are mixed through the soil but mostly in the lower depths.

The soil is generally strongly to very strongly acid except in some areas of dark-colored surface layer, where it is medium. Organic matter is low to moderate, fertility is medium, and permeability is moderate.

*Use and management.*—Nearly all of this phase is in forest; the small cleared acreage is in crops. Most of the forest has been culled or cut over. The soil is too steep to be suitable for crops. If cleared, cultivated, and managed in the customary manner for a few years, it would closely resemble Porters loam, eroded steep phase. Under good management, the soil is well suited to permanent pasture. It should be sown to pasture immediately after being cleared to protect it from accelerated erosion. Improved pasture can be obtained if the soil is properly treated with lime and phosphate.

**Porters loam, eroded steep phase** (30- to 60-percent slopes) (Ph).—This phase resembles Porters loam, steep phase, in all profile characteristics except the eroded surface soil. The areas are scattered, but occur particularly in the northern part of the county west of Rich Mountain.

Accelerated erosion has removed enough of the original surface soil to bring the subsoil within ordinary plow depth in more than half the area. Tillage has mixed remnants of the original surface soil with subsoil material to form a plow layer of moderate-brown, dark yellowish-brown, or weak-brown friable loam. A few short shallow gullies have formed in places. Areas more sheet or gully eroded than normal for this phase are indicated on the soil map by symbols. Landslides occur infrequently during periods of heavy rainfall but are rarely disastrous. Surface runoff is high to very high. The soil is moderately to very erodible when not protected by vegetation; however, it is one of the least erodible soils on steep relief because it has a very friable subsoil and high capacity for absorbing water. The original moderate to relatively low organic-matter content has been reduced by cultivation and erosion.

*Use and management.*—Practically all of this phase has been cleared of its original forest, and most of it has been cultivated. Black locust, white pine, mixed hardwoods, or field brush have become established on a few acres. About 75 percent of the soil is in pasture, 15 percent is in crops, and 10 percent is idle. The principal crops are corn, potatoes, and oats. Smaller acreages are used for cabbage, buckwheat, rye, wheat, snap beans, red clover and timothy for hay, apples, and occasionally other crops.

Some lime has been used on this soil, but the majority of farmers do not apply it, partly because it is difficult to get it up to and spread over the steep slopes. The use of burned lime (calcium oxide) would reduce this difficulty, as it has nearly twice the acid-neutralizing value of ground limestone. By rough estimate, slightly more than half the farmers have used superphosphate for pasture.

This soil is not well suited to crops because it is steep and erodible. The slopes prevent satisfactory use of grain binders, mowers, wagons, and almost all except the very simplest of implements. Erosion is fairly active where intertilled crops are grown, even though the rows are frequently planted approximately on the contour. Strip-cropping is not a common practice.

Under most conditions this soil is best suited to permanent pasture (fig. 7). It is one of the best steep soils for

*Figure 7.*—**Oats, corn, and potatoes in left foreground, and pasture in right background on Porters loam, eroded steep phase, about half a mile northeast of Vilas. Patch of tobacco in center foreground is on Tusquitee loam, rolling phase.**

pasture. If properly limed, phosphated, seeded, and otherwise managed, it produces good mixed grass-legume pasture, including orchardgrass, fescue, Kentucky bluegrass, Ladino clover, and white clover. Pasture does fairly well without lime or fertilizer, but the use of these is advisable. The lime should be applied to cropped land before seeding to grass, so that it can be mixed well with the plow layer.

**Porters loam, hilly phase** (15- to 30-percent slopes) (Pk).—This phase resembles the steep phase in profile characteristics except that in many places it has a slightly finer textured, firmer, and thicker subsoil layer somewhat like that of Halewood loam, hilly phase. The soil occurs on rounded tops of mountains and ridges, mountain slopes, and in other hilly upland areas. It is associated with other Porters soils. Surface runoff is medium to high; internal drainage, moderate. The erosion hazard is moderate to slight and less than for most hilly soils of the county.

On about 320 acres accelerated erosion has removed a small part of the original surface soil, but in most areas enough remains to form the usual plow layer. An inclusion totaling about 50 acres on the tops of mountains and ridges has rolling slopes of 7 to 15 percent. The soil in these areas has less surface runoff and is less erodible, more easily cultivated, and more productive than is normal for this hilly phase.

*Use and management.*—Porters loam, hilly phase, is used largely for crops, open pasture, and forest. A small part is idle. The main crops are red clover and timothy for hay, corn, oats, potatoes, and cabbage. Smaller acreages are used for other common crops. Most areas have been limed. Fertilizer is used for all crops.

This soil has medium fertility but responds fairly well to good management. Most farm machinery can be used, but the strong slopes make use of the heavier types difficult.

**Porters loam, eroded hilly phase** (15- to 30-percent slopes) (Pg).—The eroded hilly phase represents areas of Porters loam, hilly phase, from which enough original surface soil has been removed by erosion to bring the subsoil within plow depth in more than half the area. Tillage has mixed remnants of the original surface soil with subsoil material to form a plow layer of moderate-brown, dark yellowish-brown, or weak-brown very friable loam to heavy loam. This soil is associated with other Porters soils on the tops of mountains and ridges and on mountainsides and hillsides. It has medium to high surface runoff and moderate internal drainage. When the soil is not protected, erodibility is moderate to only slight.

*Use and management.*—Nearly all of this phase is used for crops and open pasture. Red clover and timothy for hay, corn, oats, potatoes, and cabbage are the chief crops. The soil is less productive than Porters loam, hilly phase, but it responds well to suitable management.

**Porters stony loam, steep phase** (30- to 60-percent slopes) (Pr).—This phase differs from Porters loam, steep phase, mainly in being stony and, in many places, having slightly less depth to disintegrated rock or bedrock. The stones range widely in size and hinder but do not prevent tillage where slope is favorable for cultivation. Some areas containing a few small outcrops of bedrock are indicated on the soil map by symbols. The areas of this soil occur in the northern section. They are associated with areas of other Porters soils and to some extent with the Halewood, Clifton, and Tusquitee soils.

Surface runoff is high to very high; internal drainage, moderate. Erodibility would be moderate to great if the land were cleared and not protected by vegetation or some other means. In a few small areas at high altitudes, the soil has a darker colored surface soil than elsewhere and has a profile similar to that of Burton stony loam, hilly phase.

*Use and management.*—All of this phase is in forest. When cleared, it is best suited to pasture, although, because of its stoniness, it is a little less suitable for that use than Porters loam, steep phase. Management requirements for pasture, however, are about the same for both soils.

**Porters stony loam, eroded steep phase** (30- to 60-percent slopes) (Pn).—Stoniness is the chief difference between this phase and Porters loam, eroded steep phase. The stony phase, however, is slightly less erodible because its stony surface somewhat reduces runoff. A part of the original organic-matter content has been lost through accelerated erosion. The areas of this soil are scattered, but they occur most often in the northern part of the county.

*Use and management.*—Approximately 70 percent of this phase is in open pasture, and 15 percent is idle land. The rest is largely in crops, though a small percentage is in forest. The main crops are corn, potatoes, and oats. Small acreages are used for cabbage, buckwheat, rye, wheat, snap beans, red clover and timothy for hay, and apples. Other crops are grown occasionally.

Under most conditions this soil is best suited to permanent pasture. It is not well-suited to crops, largely because of steep relief, erosion hazard, and stoniness. The steep slopes prevent satisfactory use of almost all except the very simplest implements. Stones hinder tillage but do not prevent it if relief is favorable. Management requirements are similar to those for Porters loam, eroded steep phase, but productivity is somewhat less.

**Porters stony loam, very steep phase** (60 +percent slopes) (Ps).—This phase is like Porters stony loam in most features except the very strong relief. It occurs on very steep to precipitous mountain slopes or on hillsides at altitudes of about 1,500 to 5,500 feet. Surface runoff would be very high if this soil were cleared. The areas are scattered throughout the county. In a few places the surface soil is somewhat less stony than usual.

*Use and management.*—All of this phase is in forest. Under most conditions it is best used for this purpose, but some areas could be cleared if needed for pasture.

**Porters stony loam, eroded very steep phase** (60 +percent slopes) (Po).—Accelerated erosion has removed so much of the original surface soil from this phase that the subsoil has been brought within plow depth in most places. The hazard of further erosion is very great in areas not protected by vegetation. In a few areas stones are less numerous than for the rest of the soil.

*Use and management.*—All but about 10 percent of this phase is open land largely in pasture or idle. Very little is cropped. The soil is best suited to forest. Pastured areas should be treated with lime and phosphate and not overgrazed.

**Porters stony loam, hilly phase** (15- to 30-percent slopes) (Pp).—This phase is similar to Porters loam, steep phase, in most features except stoniness and milder relief. It contains stones up to 12 inches or more across

that interfere with but do not prevent tillage. The few places too stony for cultivation are indicated on the soil map by symbols. In some areas there are a few small outcrops of bedrock, which are also shown on the soil map by symbols.

This soil is associated with other Porters soils on rounded tops of mountains and ridges, mountain slopes, and hillsides. Surface runoff is medium to high; internal drainage, moderate; and erosion hazard, moderate to slight.

An inclusion totaling about 45 acres has rolling relief and occurs mainly on mountaintops and ridges. The soil in these areas has less surface runoff and is less erodible, more easily worked, and more productive than in the hilly areas.

*Use and management.*—Very nearly all of this phase is in forest; the small cleared part is in pasture. The soil is poor to fair for crops and fair for pasture. If it were cleared of forest and cultivated for a few years, it would closely resemble Porters stony loam, eroded hilly phase.

**Porters stony loam, eroded hilly phase** (15- to 30-percent slopes) (Pm).—This phase consists of former areas of Porters stony loam, hilly phase, that were cleared, cultivated, and then moderately eroded. Accelerated erosion has removed enough original surface soil to bring the subsoil within ordinary plow depth in more than half of the area. The soil is associated with other Porters soils. Surface runoff is medium to high; internal drainage is moderate. This soil is subject to further erosion unless protected by vegetation or by other methods.

*Use and management.*—About 70 percent of this phase is in pasture, and 25 percent in crops. About 5 percent is idle. The principal crops are red clover and timothy for hay, corn, oats, potatoes, and cabbage.

The soil is poor to fair for crops and fair for pasture, but it responds moderately well to good management. It requires management similar to that for Porters loam, hilly phase, but is less easily worked and somewhat less productive.

**Ramsey stony loam, steep phase** (30- to 60-percent slopes) (Rb).—This soil has a profile that is generally more shallow than that of most of the soils of the county. It occurs on hillsides, mountainsides, and sharp mountain ridges and peaks. Most of it is in the southwestern part of the county, but a few areas are east of Blowing Rock and on Stone Mountain near the North Carolina-Tennessee boundary. It is associated with Stony rough land (Ashe and Porters soil materials), Stony colluvium (Tusquitee and Tate soil materials), and Matney and Tate soils at elevations ranging from about 1,500 to 5,900 feet.

The soil is derived mainly from weathered products of conglomerate, sandstone, quartzite, shale, or other noncalcareous or only slightly calcareous rock of sedimentary origin. In a few areas, the parent rock probably includes schist, gneiss, metarhyolite, or similar igneous rock. This soil has a profile somewhat like that of the Ashe and Chandler soils but differs in character of parent material.

Surface runoff is high to very high; internal drainage is moderate. The hazard of erosion would be very great if the land were cleared for cultivation. The original vegetation was a mixed hardwood forest principally of chestnut, black, Northern red, and white oaks, American chestnut, red maple, black birch, and hickory. Hemlock, white pine, Virginia pine, and Table-mountain pine grew in some areas. Southern balsam fir and red spruce probably were common at the highest altitudes. Some areas had an undergrowth of rhododendron and mountain-laurel.

Profile in a forested area:

0 to 1 inch, dusky-brown very friable stony loam; weak fine crumb structure; contains some decayed leaves and wood; moderate covering of decaying leaves, twigs, and bark.
1 to 6 inches, dark yellowish-brown very friable loam; weak fine crumb structure; upper part of layer slightly darker than lower.
6 to 19 inches, moderate to light yellowish-brown very friable gritty loam, light loam, or fine sandy loam; structureless (single grain) to weak fine crumb structure; many soft decomposed rock fragments.
19 to 27 inches, light yellowish-brown very friable fine sandy loam or light loam; many soft decomposed rock fragments.
27 inches +, disintegrated or solid bedrock of sandstone, quartzite, conglomerate, shale, or other rock of sedimentary origin.

In most areas there are enough rock fragments, as much as 12 inches or possibly more across, on and in the surface soil to hinder tillage. There are scattered small bedrock outcrops, which are indicated on the soil map by symbols. In areas underlain by shale or slate, many small platy fragments generally are mixed through the soil, but only a few large stones are present. Considerable grit or coarse sand occurs in the soil.

Soil acidity is strong to very strong. Organic matter is generally low, although there may be a moderate amount to a depth of an inch or two, or still deeper at the higher altitudes. Fertility is low to very low, permeability is moderate, and water-holding capacity is moderate to low.

A few less stony areas are included with this soil, and in a few areas the subsoil is of finer texture than usual.

*Use and management.*—All of this phase is in forest, and all the forest, except possibly the most inaccessible, has been culled or cut over. This soil probably never supported a forest as good as that which grew on Porters, Ashe, Halewood, and Perkinsville soils. It is poorly to very poorly suited to crops or pasture because of low fertility, shallow depth, steep slopes, stony character, and erosion hazard when not adequately protected, but it is suitable for forest under most conditions.

**Ramsey stony loam, eroded steep phase** (30- to 60-percent slopes) (Ra).—This phase resembles Ramsey stony loam, steep phase, but accelerated erosion has removed most of the surface soil and brought the subsoil within plow depth in most of the area. Tillage has mixed remnants of surface soil with subsoil material and created a plow layer that is moderate yellowish-brown very friable stony loam. Areas significantly more gullied or sheet eroded than normal for this soil are indicated on the soil map by symbols. Surface runoff is high to very high, and the soil is very erodible when not protected by vegetation.

This soil is associated with other Ramsey soils, Matney and Tate soils, Stony rough land (Ashe and Porters soil materials), and Stony colluvium (Tusquitee and Tate soil materials). Included are about 200 acres that are less stony, and a few areas with a subsoil of somewhat finer texture.

*Use and management*—An estimated 50 percent of this phase is in open pasture, 15 percent in forest, 12 percent in crops, and about 23 percent is idle. The soil is best suited to forest under most conditions, and white pine and black locust make the best growth. It is very poorly suited to crops and pasture, largely because of low fertility, steep slopes, erosion hazard, shallow profile, and

stoniness. The soil will produce some pasture if properly limed, phosphated, seeded, and otherwise well managed.

**Ramsey stony loam, very steep phase** (60-percent+ slopes) (Rc).—This phase is like Ramsey stony loam, steep phase, in most respects, but it has steeper slopes and is shallower to bedrock. It occurs on very steep to precipitous mountain slopes or hillsides, and is associated with other Ramsey soils and with Stony rough land (Ashe and Porters soil materials). Surface runoff is very high, and the soil is extremely erodible when not protected by vegetation. About 50 cleared acres have been moderately eroded; these areas are indicated on the soil map by symbols.

*Use and management.*—All but about 7 percent of this phase is in forest. The cleared land is in pasture or is idle. Chiefly because of its very steep slopes, shallow profile, and low fertility, the soil is very poorly suited to crops and pasture and can be used best for forest. The forested land should not be cleared, and the cleared areas should be planted to white pine or black locust.

**Riverwash** (0- to 2-percent slopes) (Rd).—This land type, consisting principally of loose sandy, gravelly, cobbly, or stony material, occurs in and near streams. The areas are mainly a heterogeneous mass of material left by swiftly flowing floods. They occur mostly on the flood plains along Elk Creek, Stony Fork, and the Watauga River. In some of these areas, especially those along Elk Creek, a flood in 1940 removed all or almost all of the surface and subsoils, and deposited coarse material in some places on the remaining very coarse textured substratum. The flood left remnants of the original soil—small areas of loam or fine sandy loam. All these areas are still subject to overflow by the adjacent streams.

*Use and management.*—Riverwash is practically worthless for crops, pasture, or forest. Many areas are bare or almost bare of vegetation. Scattered among areas of Riverwash are a few remnants of original bottom land and the few bodies of loam and fine sandy loam that support some plant growth and furnish a little pasture.

**Rock outcrop** (60-percent+slopes) (Re).—This land type consists of outcrops of bedrock large enough to be delineated on the soil map. The bedrock varies greatly and to varying extent is cracked or broken. Some areas are mainly rock ledges or cliffs. A little soil material has accumulated in cracks and fissures. The rock faces are generally very steep. The areas are mainly on Grandfather and Beech Mountains and along Howard Creek. Rock outcrop has no agricultural value.

**State loam, undulating phase** (2- to 7-percent slopes) (Sa).—This well-drained relatively light-colored soil developed on low stream terraces consisting of moderately old alluvium. Although the alluvium was washed from the soils and rock material of the drainage basin, it originally came from granite, gneiss, schist, and other igneous or metamorphic rocks. This soil is not extensive and occurs in scattered areas near the rivers and many of the creeks. Most of these areas lie 1 to 6 feet above the adjacent first bottoms and are overflowed only by exceptionally high floods.

Relief is gently sloping, gently undulating, or undulating. Surface runoff is medium; internal drainage, moderate. Much of the soil on the stronger slopes has been slightly eroded, but there is very little erosion hazard. The original vegetation probably was a forest of mixed hardwoods and hemlock with an undergrowth of rhododendron and mountain-laurel.

Profile in a field:

0 to 8 inches, dark yellowish-brown to weak-brown friable or very friable loam; weak fine crumb structure.
8 to 33 inches, moderate-brown to moderate yellowish-brown very porous friable clay loam or light clay loam; weak fine nut structure: lower part of layer generally slightly lighter in color than upper.
33 to 45 inches, moderate yellowish-brown to moderate-brown very friable loam, very fine sandy loam, or fine sandy loam.
45 inches +, moderate yellowish-brown loose sand, loamy sand, or sandy gravel; stratified; textures generally light and variable.

This soil is medium to strongly acid, and its organic-matter content is moderate to low. Fertility is medium to high. The profile is moderately permeable to water, roots, and air. Some small mica flakes are distributed through the soil. The soil also contains rounded gravel or small cobbles in some places. Gravelly or cobbly material is only about 30 to 36 inches below the surface in some areas.

In a few included areas the subsoil is more yellowish and less brownish than usual. This soil inclusion is somewhat like Altavista loam, undulating phase, in other profile characteristics.

*Use and management.*—All of State loam, undulating phase, has been cleared, and about 90 percent is now used for crops. The rest is in open pasture. All the common crops are grown, and the soil is well suited to most of them. Lime and fertilizer are used on most areas. The soil is very easily worked, though most areas are relatively small and irregular in shape. It is one of the most productive soils in the county.

**Stony colluvium (Tusquitee and Tate soil materials)** (2- to 30-percent slopes) (Sb).—In this land type are areas of Tusquitee and Tate soil materials that are too stony for cultivation. Except for stoniness, the soil would be fairly representative of Tusquitee or Tate loam. These stones are derived from various kinds of rock and range up to several feet across. They are numerous on the surface and, in many areas, through the soil mass; they are rounded or angular. In a few areas the soil is Worsham loam, which also contains many stones.

This Stony colluvium occupies small alluvial or colluvial fans and sloping areas at the base of mountains or hills. It is derived from local alluvial or colluvial material that washed or crept from nearby higher land. Surface runoff is medium to high; internal drainage, moderate; and erosion hazard, very little to moderate. The original vegetation was mainly mixed hardwoods, with some hemlock and white pine. Many areas had an undergrowth of rhododendron and mountain-laurel.

Acidity is medium to strong; organic matter, moderately low; and fertility, medium. Permeability to roots, water, and air is moderate to moderately rapid, and water-holding capacity is moderate to moderately low.

*Use and management.*—About 60 percent of this miscellaneous land type is in forest; the rest is nearly all in open pasture. A few small areas are used for crops, although most tillage is done with hoes because the land is stony. Removal of stones has improved some areas for tillage and cropping. This stony land type is very poorly suited to crops but can be used fairly well for

pasture. Lime and probably phosphate should improve pasture growth. Many areas would be suited to crops if enough stones were removed to allow improved tillage.

**Stony hilly land (Ashe and Porters soil materials)** (15- to 30-percent slopes) (Sc).—Represented in this land type are hilly areas of Ashe and Porters soil materials with enough loose stones or rock outcrops to prevent cultivation. This land type differs from Stony rough land (Ashe and Porters soil materials) principally in having milder relief. The soil material around the stones is fairly representative of Ashe or Porters soils, though in places it could be more closely classified as Burton, Chandler, Clifton, Halewood, Matney, Perkinsville, Ramsey, or Watauga soils.

This stony hilly land type occurs in various parts of the county, mainly on tops of ridges and mountains. Surface runoff is medium, and internal drainage is moderate. Erodibility is moderate. The original vegetation was chiefly chestnut and oaks, with some hickory, maple, yellow-poplar, beech, black birch, hemlock, and white pine.

The soil is strongly to very strongly acid and has a low to moderate supply of organic matter. Fertility is low to medium. Permeability to roots, water, and air is moderate to moderately rapid.

*Use and management.*—About 85 percent of this land type is in cutover forest, and 11 percent in open pasture. The rest is mostly idle; only a few patches are cropped.

Because of its stoniness, this land is poorly suited to crops. Most areas are suitable for permanent pasture, the degree of suitability depending on the number of stones and nature of the soil material. Those areas with Chandler or Ramsey material are the least suitable. Stones have been picked up and placed in piles in some areas to improve the land for pasture or sometimes for crops. Application of lime and phosphate should increase pasture growth on most areas.

**Stony rough land (Ashe and Porters soil materials)** (30- to 60-percent slopes) (Sd).—This is a steep or very steep land type that contains a large number of loose stones and outcrops of bedrock. The soil material around the stones is fairly representative of the Ashe or Porters series but in some areas it more nearly resembles the Chandler or Clifton.

There is considerable variation in the stony character of this land type. Rock fragments may be strewn on the surface or embedded in the soil, or there may be outcroppings of bedrock. In some areas the rock fragments are mostly angular. Outcrops are common in areas where the parent material is mainly of hornblende gneiss, hornblende schist, or diorite. Most of these areas are found in the northeastern part of the county. There are many rock ledges and cliffs, especially on Grandfather Mountain, the west side of Rich and Snake Mountains, and in the drainage basin of Elk Creek south of the crest of the Blue Ridge.

This land type has the largest acreage of any in the county. Its areas are scattered through the rougher and most mountainous sections on or near Grandfather, Rich, Snake, Sugarloaf, Stone, and Beech Mountains, Hanging Rock, and Elk Knob, and south of the crest of the Blue Ridge (fig. 8).

Surface runoff is high to very high; internal drainage, moderate; and erosion hazard, moderate to great. The original vegetation was influenced by altitude. Most areas were in hardwood forest, mainly of black, chestnut, Northern red, and white oaks, chestnut, hickory, maple, yellow-poplar, beech, and black birch. Hemlock and white pine grew in many areas. South of the crest of the Blue Ridge, some areas had Virginia pine. At some of the highest elevations there probably was a growth of Southern balsam fir, red spruce, and fire cherry.

*Figure 8.*—**Stony rough land (Ashe and Porters soil materials) along the Watauga River about a mile southeast of Zion Hill Church.**

*Use and management.*—Forest covers nearly all of this land type. The small cleared area is used almost entirely for pasture. In a few small tracts, crops are planted among the stones and tillage must be done mostly with hoes.

Largely because of stoniness, shallow depths to bedrock, and steep slopes, most of this land type is not suitable for crops and is best used for forest. Much of it is not even well suited to forest. Many less steep areas, especially of Porters, Ashe, or Clifton soil material, can be used for permanent pasture; their suitability depends to a large extent on degree of stoniness. In areas having few bedrock outcrops, loose stones have been picked up and placed in piles to improve the land for pasture.

**Tate loam, rolling phase** (7- to 15-percent slopes) (Tb).—This brown, friable, well-drained soil occupies foot slopes of mountains and hills and alluvial or colluvial fans. It is formed from old alluvium or colluvium that washed or crept from soils or rock material on nearby mountains and hills. The areas, generally small and scattered, occur mainly near tracts of Chandler, Watauga, Ashe, Perkinsville, Ramsey, and Matney soils. This soil differs from Tusquitee loam, rolling phase, principally in having a more yellowish and less brownish subsoil, and from Worsham loam in being better drained and more productive.

Surface runoff is medium. Internal drainage is generally moderate, but is slow in a few places. Some of the lower lying areas may be inundated by exceptional floods. The soil is slightly erodible when not protected by vegetation or by other water-erosion control. A small part of the surface soil in cleared areas has been lost through accelerated erosion, but in most places

enough remains to form the usual plow layer. The more significantly eroded areas are indicated on the soil map by symbols. The original vegetation was probably mixed hardwood-hemlock-white pine forest. Many areas probably had a thick undergrowth of rhododendron and and mountain-laurel.

Profile in a field:

0 to 7 inches, dark yellowish-brown very friable loam; weak fine crumb structure.
7 to 37 inches, moderate or light yellowish-brown friable clay loam to light clay loam; weak to moderate fine nut structure.
37 inches +, light or moderate yellowish-brown friable heavy loam or loam; in most places grades into lighter colored loam, fine sandy loam, or mixed soil material; contains many rock fragments moved by local wash or creep from nearby slopes; underlain mainly by light-colored acidic rocks.

Where this soil lies near Chandler or Watauga soils, a moderate to large quantity of small mica is mixed through the profile. In many places the soil contains varying quantities of pebbles and larger stones, though seldom enough to interfere with tillage. In the few imperfectly drained areas the profile has light olive-gray, pale-olive, weak-yellow, yellowish-gray, or dark-orange mottlings below depths of about 36 inches.

The soil is strongly to very strongly acid throughout, and organic-matter content is relatively low. Fertility is medium. The soil is moderately permeable to roots, water, and air. Its water-holding capacity is moderate.

*Use and management.*—Most of this phase has been cleared and is now rather intensively cropped. About 80 percent is in crops, 15 percent in open pasture, and 5 percent is in forest. The principal crops are corn, red clover and timothy for hay, oats, potatoes, and cabbage. Smaller acreages of the other common crops are grown (fig. 9). Most areas have been limed, and fertilizer is used for almost all crops.

This is one of the better soils of the county. It responds well to good management. It is fairly easily worked. All types of farm machinery can be satisfactorily used, although many areas are small and irregular in shape.

**Tate loam, hilly phase** (15- to 30-percent slopes) (Ta).—This phase is similar to the rolling phase except for stronger relief. Surface runoff is medium to high; internal drainage, moderate. When not protected by vegetation or some other means, the soil is moderately erodible. In cleared areas a small part of the original surface soil has been lost through accelerated erosion, but in most areas enough remains to form the usual plow layer. Areas significantly more eroded than this are indicated on the soil map by symbols.

*Use and management.*—Almost all of this phase has been cleared and is now used for crops and pasture. The principal crops are corn, red clover and timothy for hay, oats, potatoes, and cabbage; other common crops are grown to a small extent. Most of the areas have been limed, and fertilizer is used for almost all crops. This soil is fair for crops and pasture. Some of the heavier types of farm machinery are difficult to use, especially on the stronger slopes. Special methods to prevent any accelerated erosion are needed in most areas where intertilled crops are grown.

**Tate loam, undulating phase** (2- to 7-percent slopes) (Tc).—In profile characteristics, this phase is similar to Tate loam, rolling phase, but it differs in having gentler slopes. Surface runoff is medium to low; and internal drainage, moderate. Accelerated erosion is negligible.

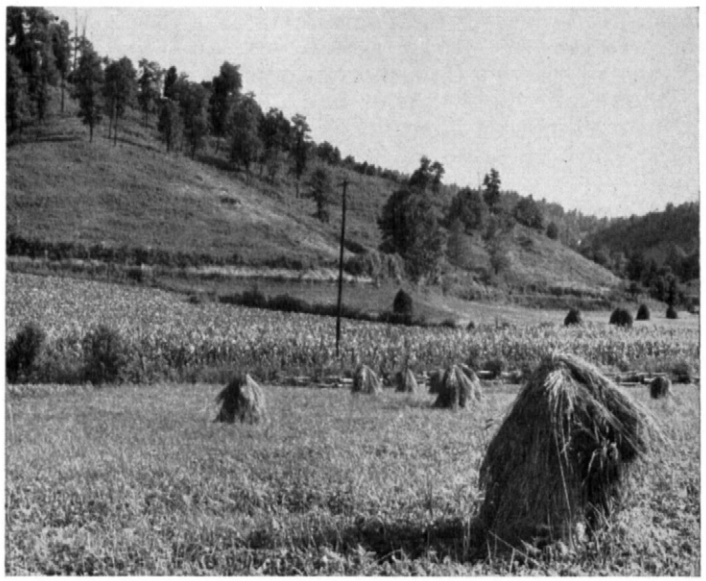

*Figure 9.*—**Wheat in foreground on Tate loam, rolling phase; corn and haystacks in center on Chewacla loam; poor pasture in background on Chandler loam, eroded steep phase, and Clifton stony clay loam, eroded steep phase.**

*Use and management.*—Most of this phase has been cleared and is now intensively cropped. About 10 percent remains in forest, and about 5 percent is used for pasture. The chief crops are corn, red clover and timothy for hay, oats, potatoes, and cabbage. Smaller acreages of the other common crops are grown. Most of this soil has been limed, and fertilizer is used for almost all crops on most areas.

This is one of the better soils of the county. It has medium fertility, responds well to good management, and works easily, although many areas are small and have irregular shape. Areas of this soil at favorable altitudes are well suited to the common crops if properly managed (fig. 10).

**Tate stony loam, rolling phase** (7- to 15-percent slopes) (Te).—This phase is similar to Tate loam, rolling phase, in all respects except stoniness. It has loose stones or cobbles on or in the surface soil that interfere with but do not prevent tillage. A few spots too stony for cultivation are indicated on the soil map by symbols. The stones are angular to roundish and range up to 12 inches across.

This phase has medium surface runoff and moderate internal drainage, and there is little hazard of erosion. An inclusion totaling about 120 acres has a gently sloping to undulating surface (2 to 7 percent). Surface runoff from these areas is less, and the soil is more productive than the rolling areas.

*Use and management.*—About 70 percent of Tate stony loam, rolling phase, is used about equally for crops and open pasture. About 20 percent is in forest, and 10 percent is idle land. The main crops are corn, red clover and timothy for hay, oats, potatoes, and cabbage. Smaller areas are planted to the other common crops. Most of the land has been limed, and almost all crops receive fertilizer. The soil responds well to good management,

*Figure 10.*—**Representative farmsteads in the less stony and mountainous areas: Left, Oats and corn on Tate loam, undulating phase, in foreground and center; farm buildings on Tusquitee loam, rolling phase. Right, Red clover and timothy hay on Congaree loam in foreground; Porters stony loam, eroded steep phase, on hills behind the farm buildings.**

but, largely because of its stoniness, it is less easily worked and not so productive as Tate loam, rolling phase.

**Tate stony loam, hilly phase** (15- to 30-percent slopes) (Td).—This phase differs from Tate stony loam, rolling phase, mainly in having stronger slopes. It is, therefore, more difficult to work and to conserve. Surface runoff is medium to high; internal drainage, moderate. The soil is subject to moderate erosion when not protected by vegetation or other methods. A small part of the original surface soil in cleared areas has been washed away by accelerated erosion, but in most places enough is left to form the plow layer. The more significantly eroded areas are indicated on the soil map by symbols.

*Use and management.*—A large part of this phase has been cleared and is now used for crops and pasture. About 10 percent of the total is idle. The main crops are corn, red clover and timothy for hay, oats, potatoes, and cabbage. Small acreages of other common crops are grown. Most areas have been limed, and almost all crops receive fertilizer. This soil is fairly well suited to crops and pasture, but it is somewhat less productive than Tate loam, hilly phase. The heavier farm machinery is difficult to use on the stony slopes. Where intertilled crops are grown, care must be taken to control erosion.

**Toxaway loam** (0- to 2-percent slopes) (Tf).—A dark-colored surface soil and subsoil containing a large quantity of organic matter characterize this poorly drained soil of first bottoms. It has developed in alluvium that originated chiefly from gneiss, schist, granite, and diorite. Material may be deposited on this soil during floods. Most of the areas are in the broader bottoms, especially along the South Fork New River near the mouth of Meadow Creek, east of Riverview School; east and southeast of Boone, along Meat Camp Creek near Miller Church; and along Howard Creek near the Howard Creek School. This soil is distinguished from Wehadkee loam, peaty phase, by having more mineral material in the surface soil and a finer textured subsoil. It is associated with Chewacla, Wehadkee, and Augusta soils but is darker colored than any of them.

The nearly level to slightly depressed areas of this soil are some distance from the main stream channel; they lie near or at the base of the hills or adjacent to alluvial fans emerging from nearby hills. Surface runoff is very slow. Internal drainage is slow because it is restricted by a high water table. Springs or seeps at the base of nearby hills probably make many of the areas wet. Most of the areas have been partly drained by ditches or tile.

The soil probably supported a native forest of mixed hardwoods and hemlock and a relatively dense undergrowth of rhododendron, alder, or other water-loving plants.

Profile in a field:

0 to 11 inches, brownish-black or black very friable loam or silt loam; weak fine crumb structure; contains a large quantity of well-decomposed organic matter.

11 to 37 inches, brownish-black, brownish-gray, or black slightly to moderately compact clay loam to silty clay loam; plastic and sticky when wet; weak fine blocky structure to structureless (massive); fairly high content of organic matter.

37 to 68 inches, friable slightly plastic massive clay loam or light clay loam of light olive-gray color when wet; includes layers of brownish-gray or light brownish-gray fine sandy loam in places.

68 inches +, light olive-gray stratified loose loamy sand, gravel, or other light-textured alluvial material.

Finely divided mica flakes are mixed in the profile; the quantity varies from place to place, and to some extent in the different layers. Variations occur in different areas, especially in depth of the dark-colored material and texture and consistence of the subsoil. Some areas have a thin layer of recently deposited dark yellowish-brown to light yellowish-brown loam, silt loam, or fine sandy loam material on the surface. There are a few inches of very sandy material in places indicated on the soil map by symbols. Natural drainage also varies somewhat. In the naturally better drained areas, some light yellowish-brown or moderate yellowish-brown mottlings appear in the subsoil.

The soil is strongly to very strongly acid and its natural fertility (plant nutrient content) is very high. Under natural conditions its high water table restricts penetration of roots and circulation of air. Where the water table has been lowered by drainage, the subsoil is moderately

permeable to water and roots in most areas. Crawfish holes are noticeable in many places.

*Use and management.*—All of this soil has been cleared and is now used principally for crops and pasture. Hay and corn are the chief crops; rye, wheat, oats, and buckwheat are minor crops. Most of the areas have been inadequately drained by open ditches or ditches enclosed with stones, boards, or poles. Tile has been used in some areas.

This is perhaps the most fertile soil of the county, but poor drainage limits its use for crops to some extent. Where inadequately drained, the soil is poorly suited to tobacco, alfalfa, and fruit trees, and production of winter grains is risky because of the danger of their drowning or freezing. The soil is not well suited to potatoes. Adequate drainage is necessary to improve productivity. The drains need to be placed fairly close together because the subsoil is moderately heavy textured. In the long run tile might prove to be the most practical and effective means of draining the soil. Liming is essential for improvement of this soil.

**Tusquitee loam, rolling phase** (7- to 15-percent slopes) (Th).—A well-drained, light-colored profile that has a fairly heavy subsoil is characteristic of this phase. It occurs on foot slopes of mountains and hills and on colluvial or alluvial fans. The soil has formed from relatively old alluvium or colluvium that washed or crept from soils or rock material on nearby mountains and hills. It differs from similar soils such as Tate loam, rolling phase, principally in being browner and less yellowish, and from Worsham loam in having better drainage. Most of the areas are small and are scattered throughout the county. They occur adjacent to areas of Porters, Clifton, Halewood, and Hayesville soils.

Surface runoff is medium; internal drainage, moderate. Some lower lying areas may be overflowed by exceptional floods. The soil is susceptible to some erosion when not protected. Accelerated erosion has removed a small part of the surface soil from cleared areas but in most places enough remains to form the usual plow layer. Areas appreciably eroded are indicated on the soil map by symbols. A mixed hardwood-hemlock forest with some white pine was probably the original vegetation. Many areas doubtless had an undergrowth of rhododendron and mountain-laurel.

Profile in a field:

0 to 8 inches, dark yellowish-brown to weak-brown friable or very friable loam; weak fine crumb structure.

8 to 33 inches, moderate-brown to moderate yellowish-brown porous firm to friable clay loam, heavy clay loam, or light fine sandy clay; moderate fine to medium nut structure.

33 inches +, moderate-brown to moderate yellowish-brown friable loam, heavy loam, or light clay loam; contains varying quantities of rounded to angular rock fragments as much as about 12 inches across; rock fragments generally become more numerous with increasing depth.

In most areas there are a few angular to rounded rock fragments on and in the surface soil measuring 6 inches or less across. These stones generally are not numerous enough to hinder tillage. The number of rock fragments in the substratum varies greatly. In most areas some small mica flakes are scattered through the soil, and in a few areas the subsoil is coarser textured than usual and only slightly different from the surface soil.

This soil is naturally medium to strongly acid, and its content of organic matter is moderate to relatively low. Fertility is medium to high; permeability to water, roots, and air, moderate; and water-holding capacity, moderate.

*Use and management.*—Nearly all of this phase has been cleared and is now used intensively for crops. Of the total acreage, about 85 percent is in crops, 10 percent in open pasture, and 5 percent in forest. Corn, red clover and timothy for hay, oats, potatoes, and cabbage are leading crops. Other common crops are grown to some extent. Most areas have been limed, and fertilizer is used for almost all crops.

This is one of the better soils of the county, and it responds well to good management. It is fairly easily worked. All types of farm machinery can be used satisfactorily although many areas are small and of irregular shape.

**Tusquitee loam, hilly phase** (15- to 30-percent slopes) (Tg).—Stronger slopes are the main difference between this soil and the rolling phase. Surface runoff and susceptibility to erosion are greater because of the steeper slopes and the soil is less easily worked and conserved. Surface runoff is medium to high, and the erosion hazard is moderate in areas not protected by vegetation or other methods. In cleared areas a small part of the original surface soil has been lost through accelerated erosion, but in most places enough remains to form the usual plow layer. Areas significantly more eroded than this are indicated on the soil map by symbols.

*Use and management.*—This phase is largely in crops, open pasture, and forest. A small acreage is idle. Some areas are less intensively used than the rolling phase. The chief crops are corn, red clover and timothy for hay, oats, potatoes, and cabbage; smaller acreages are planted to other common crops. This soil is only fair for crops, largely because it is hilly. It is rather difficult to operate some of the heavier types of farm machinery on the stronger slopes. The soil is fair for pasture. Special precautions are necessary to prevent accelerated erosion on most areas used for intertilled crops.

**Tusquitee loam, undulating phase** (2- to 7-percent slopes) (Tk).—This phase has the smoothest areas of Tusquitee loam. Surface runoff is medium to low; internal drainage, moderate; and erosion hazard, very slight. In places soil material may be washed onto the soil from adjacent slopes, and in a few small included areas the soil is relatively recent wash without surface and subsoil differentiation.

*Use and management.*—All of this phase has been cleared. About 90 percent is now used for crops, and 10 percent for pasture. The soil is one of the best in the county for crops and pasture. It has medium to high fertility and responds well to good management. The chief crops are corn, red clover and timothy for hay, oats, potatoes, and cabbage. A small area is used for other common crops. Lime has been applied to most areas, and almost all the crops receive fertilizer.

The soil has excellent workability. All types of farm machinery can be used, although many areas are small and of irregular shape. Under good management burley tobacco does exceptionally well. Those areas at low altitudes are not so well suited to late cabbage, potatoes, and buckwheat as those at higher altitudes.

**Tusquitee stony loam, rolling phase** (7- to 15-percent slopes) (Tn).—This phase differs from Tusquitee loam, rolling phase, in having loose stones on or in the surface

soil that interfere with but do not prevent cultivation. Areas of greater stoniness are indicated on the soil map by symbols. Most of the stones are dark colored, angular to moderately rounded, and a few inches to as much as 12 inches across. Some stones occur in the subsoil and substratum.

Included is a total area of about 50 acres that has been eroded to the extent that the subsoil is within plow depth in most places. These eroded places are indicated on the soil map by symbols. A few small areas of relatively recent wash from nearby eroding hills and mountains also are included. Little, if any, subsoil has developed in this recent wash.

*Use and management.*—About 80 percent of this phase has been cleared and is now used largely for crops and pasture. A small part is idle. The soil is fair to good for crops and good for pasture. The crops grown and management practiced are similar to those for Tusquitee loam, rolling phase, but this soil is less productive and less easily worked because it is stony.

**Tusquitee stony loam, hilly phase** (15- to 30-percent slopes) (Tm).—This phase is distinguished from Tusquitee stony loam, rolling phase, by its stronger slopes. Except in areas indicated by symbols on the soil map, the stones interfere with but do not prevent cultivation. Many of the larger areas are just west of Rich and Snake Mountains.

The soil is moderately erodible in areas not protected by vegetation or other means. Accelerated erosion has removed a small part of the original surface soil in cleared areas but in most places enough is left for the usual plow layer. More appreciably eroded areas are indicated on the soil map by symbols.

*Use and management.*—Approximately 75 percent of this phase has been cleared and is now used mostly for crops and pasture. About 10 percent is idle. The soil is used for about the same crops as those grown on Tusquitee loam, rolling phase, but some areas are less intensively used. The soil is only fair for crops, largely because it is hilly and stony. Heavier types of farm machinery are difficult to use, especially on the stronger slopes. Special precautions for preventing accelerated erosion are needed for most areas where intertilled crops are grown. Removal of the stones increases the workability and use value of this soil and makes it very similar to Tusquitee loam, hilly phase.

**Tusquitee stony loam, eroded hilly phase** (15- to 30-percent slopes) (Tl).—This phase resembles Tusquitee stony loam, hilly phase, except that accelerated erosion has removed enough original surface soil to bring the subsoil within plow depth in more than half the area. Plowing has mixed subsoil material with remaining surface soil and formed a plow layer of moderate yellowish-brown friable stony loam. A few short shallow gullies occur. Areas more eroded than usual are indicated on the soil map by symbols.

Stones hinder but do not prevent cultivation. The areas too stony for tillage are shown on the soil map by symbols. Surface runoff is medium to high; internal drainage, moderate. The soil is subject to further erosion where not protected by vegetation or by other measures for erosion control.

*Use and management.*—Almost all of this phase is used for crops and open pasture; a small part is idle. The soil is used less intensively than Tusquitee loam, rolling phase, and is considerably less productive, although the crops are about the same for both soils. It is somewhat less productive than Tusquitee stony loam, hilly phase, and greater care is necessary to control erosion. Largely because of hilly relief, stony nature, and eroded condition, the soil is only fair for crops. It is fair pasture land.

**Tusquitee stony loam, undulating phase** (2- to 7-percent slopes) (To).—This phase is similar to Tusquitee loam, rolling phase, except it is stony and undulating or gently sloping. Normally there are enough loose stones to interfere with but not prevent tillage. Areas of greater stoniness are indicated on the soil map by symbols. Most of the stones are dark colored, and angular, subangular, or moderately rounded; they range up to 12 inches across. Some stones are mixed through the subsoil and substratum.

This soil has medium to low surface runoff and moderate internal drainage. Erosion is generally negligible. Included are a few small areas that differ somewhat from the rest of the soil by not having a subsoil that is distinctly heavier textured than the surface soil.

*Use and management.*—About 20 percent of this phase remains in forest. Much of the forest is in areas where stones are more numerous than average for the soil. About 60 percent is intensively used for crops and 20 percent for pasture, and this is one of the better soils of the county for crop and pasture use (fig. 11). It is nearly as productive as Tusquitee loam, rolling phase. Workability can be improved by removal of stones, and when this is done the soil is very similar to Tusquitee loam, undulating phase.

**Watauga loam, rolling phase** (7- to 15-percent slopes) (Wd).—Rounded tops of hills, ridges, and mountains or other smooth uplands are occupied by this well-drained, light-colored micaceous soil. It has developed mainly from weathered products of mica schist, mica gneiss, and granitoid, and to some extent from beds or lenses of pegmatite. It is somewhat like Chandler loam, steep phase, in color and character of parent material but differs in having a heavier textured subsoil, milder relief, and

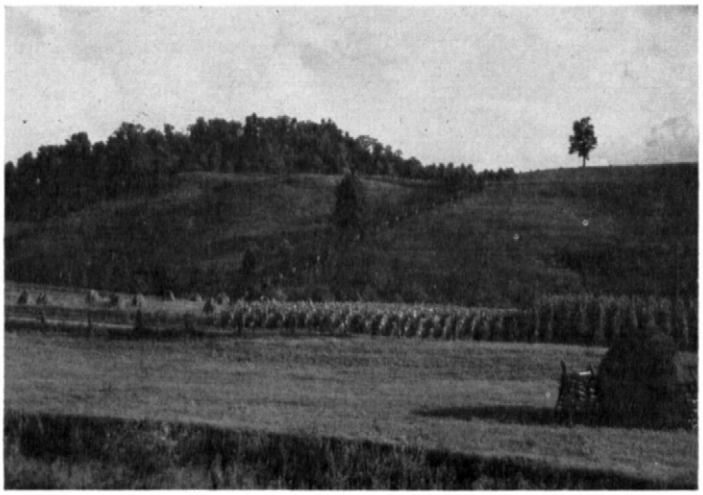

*Figure 11.*—**Corn, tobacco, rye, and red clover and timothy (to left of rye) on Tusquitee stony loam, undulating phase, about a mile and a half southeast of Vilas. The hillside pasture is on Porters loam, eroded steep phase.**

greater depth to disintegrated bedrock. It is associated with the other Watauga soils, the Chandler soils, and to some extent with the Halewood and Clifton soils. The soil occurs in the same general area as Chandler soils principally in the east-central part of the county in the area bounded roughly by lines through Todd, Meat Camp, Rich Mountain School, Boone, Bamboo, Triplett, and Elk Creek, and along the eastern boundary of the county. It occurs mostly at elevations of about 2,000 to 4,500 feet.

Surface runoff is medium; internal drainage, moderate; and erosion hazard, slight. The original vegetation was mainly deciduous forest, although areas in the southeastern part of the county may have had a growth of white pine and possibly Virginia pine. Practically all the forest has been culled or cut over, and the remaining trees are mostly black, white, Northern red, and chestnut oaks; and some hickory, beech, red maple, chestnut (mainly dead), sassafras, dogwood, and sourwood. White pine grows in some areas. Rhododendron, mountain-laurel, and wild azalea form an undergrowth in parts of the forest.

Profile in a virgin forest:

0 to 1 inch, brownish-black or dusky-brown very friable loam; weak fine crumb structure; moderate to small quantity of fine mica flakes; thin cover of decaying leaves and twigs.
1 to 6 inches, dark yellowish-brown to weak-brown very porous friable loam; weak fine crumb structure; moderate to large content of small mica flakes.
6 to 9 inches, moderate yellowish-brown to moderate-brown moderately porous friable heavy loam or light clay loam; weak fine crumb to weak fine nut structure; moderate to large content of small mica flakes give material a somewhat greasy feel.
9 to 26 inches, moderate to strong yellowish-brown moderately porous friable clay loam; weak fine crumb or medium crumb to weak fine nut structure; large quantity of small mica flakes producing a greasy slick feel.
26 to 33 inches, moderate to strong yellowish-brown very friable heavy loam to light clay loam; weak fine crumb structure; large content of mica imparts a greasy slick feel; contains a little soft disintegrated mica schist or mica gneiss.
33 to 37 inches, moderate yellowish-brown very friable light loam mixed with moderate yellowish-brown and brownish-gray soft disintegrated mica schist and mica gneiss that contains a large to very large amount of mica.

Under cultivated conditions the first two layers are mixed together, much of the organic matter disappears rapidly, and the plow layer becomes similar to the second layer in color, or slightly lighter.

Some angular quartz fragments up to about 2 inches across are on the surface and mixed through the soil. In places larger angular quartz rocks or other rock fragments, some a foot across, are on or in the surface soil. Areas with enough stones to hinder but not prevent tillage are indicated on the soil map by symbols.

This soil is naturally strongly to very strongly acid. Organic matter is generally low except for a moderate to large quantity in the surface inch or two. Fertility is low; permeability to roots, water, and air, moderate to moderately rapid; and water-holding capacity, moderate to high.

Included with this soil because of limited extent is about 40 acres that differs principally in being browner or redder. Under virgin conditions, the surface soil under a thin, dark-colored humus layer is moderate-brown, light-brown, or moderate yellowish-brown friable micaceous loam. The subsoil is strong-brown, light-brown, or pale reddish-brown to moderate reddish-brown micaceous clay loam. Most of this included soil is in the vicinity of Laxon and Deep Gap.

*Use and management.*—About 85 percent of Watauga loam, rolling phase, has been cleared and is now largely cropped intensively. A small part is in pasture. Forest occupies about 15 percent of the total area. The principal crops are red clover and timothy for hay, corn, oats, potatoes, and cabbage. Most of the other crops of the county are planted to some extent, but little tobacco is grown. Lime is used on most areas, and fertilizer is applied for all crops.

For many crops, this is one of the better soils of the uplands (fig. 12). Although relatively low in natural fertility, it has fairly mild relief, few stones, good tilth, and other favorable qualities. It has moderately good productivity when properly limed, fertilized, and well managed in other respects.

Correct liming is one of the first requirements for improving the productivity of this soil. Liming of some areas indicates that the quantity should be relatively small but application should be made often. Manure and crop residues should be conserved and applied to build up organic matter in the soil. A suitable crop rotation should include legumes and grasses for about 2 out of every 4 to 6 years. Proper fertilizers are necessary for satisfactory yields, and contour tillage and stripcropping are effective means for controlling erosion. Close-growing crops should occupy the soil as much of the time as possible.

**Watauga loam, eroded rolling phase** (7- to 15-percent slopes) (Wb).—This phase has lost enough surface soil by erosion to cause the subsoil to be within ordinary plow depth on more than half the area. Plowing has mixed some of the subsoil with remaining surface soil and formed a plow layer of moderate yellowish-brown, friable loam or heavy loam. Symbols on the soil map indicate areas are more eroded than normal. In a few small included areas, erosion has been only slight. In a few other included areas the soil is browner than usual, or tends more to red.

*Use and management.*—All of Watauga loam, eroded rolling phase, is in crops and pasture—about 60 percent in crops, and about 40 percent in open pasture. The soil is used nearly as intensively as Watauga loam, rolling phase, but its supplies of organic matter and nitrogen,

*Figure 12.*—**Potatoes in bloom on Watauga loam, rolling phase, at an altitude of about 4,000 feet on Rich Mountain; forested land in the background is mostly Stony rough land (Ashe and Porters soil materials).**

and its productivity are lower. Practically the same crops are grown as on the rolling phase and management requirements are similar in most respects. This soil, however, requires more organic matter and nitrogen, longer use of legumes and grasses in the crop rotation, and more care in controlling erosion.

**Watauga loam, hilly phase** (15- to 30-percent slopes) (Wc).—Except for stronger relief and, in many places, somewhat shallower depths to rock, this soil is like the rolling phase of Watauga loam. It occupies rounded tops of mountain ridges as well as hillsides in less mountainous country. It occurs in the same part of the county as the rolling phase. Surface runoff is medium to high; internal drainage, moderate. Erodibility is moderate in cleared areas not protected from erosion by vegetation or other means.

Included with this soil is about 25 acres of a soil near Laxon and Deep Gap that is similar in all characteristics except color. It is browner than the rest of this soil, or tends to be red.

*Use and management.*—Approximately 3 percent of Watauga loam, hilly phase, is used for crops; the rest is in forest. If cleared, this soil would be only fair for crops largely because it has low fertility, hilly relief, and medium to high surface runoff. Most types of farm machinery can be used, but the larger ones only with considerable difficulty. If it were cleared and cropped for a few years in the customary manner, this soil would be similar to Watauga loam, eroded hilly phase, and would require practically the same management.

**Watauga loam, eroded hilly phase** (15- to 30-percent slopes) (Wa).—This phase represents former areas of Watauga loam, hilly phase, that have been cleared of forest, cropped for varying periods, and then eroded to the extent that the subsoil is within plow depth for most of the area. The remaining surface soil—altered in texture and color by an admixture of subsoil material through tillage—is a moderate yellowish-brown friable loam or heavy loam. Short shallow gullies have formed in places. Small areas significantly more gullied or sheet eroded than the normal for this soil are indicated on the soil map by symbols.

This soil occurs in the same general area as Watauga loam, rolling phase. Surface runoff is medium to high. Erodibility is moderate when the soil is not protected by grass or other close-growing plants. Cultivation and erosion have reduced the low content of organic matter that was present before the soil was cleared. The soil is low in fertility. Most farm machinery can be used but some of the heavier types are difficult to handle because of the hilly relief.

Included with this soil because of its small total area is about 20 acres occurring mostly near Laxon and Deep Gap. This soil differs principally in being browner or more reddish. An inclusion totaling about 150 acres has somewhat lighter textured subsoil and approaches Chandler loam, eroded steep phase, in profile characteristics.

*Use and management.*—About 45 percent of this phase is in crops, 35 percent in open pasture, and 10 percent in forest; an additional 10 percent is idle. In a few areas in the southeastern part of the county, white pine has become established or has been planted. These trees range up to 38 years old, and some of the older growth is now cut for lumber.

Corn and hay are the principal crops, and next in importance are potatoes, cabbage, oats, buckwheat, rye, and wheat, in about that order. The hay is mainly timothy and red clover, although orchardgrass, redtop, and tall oatgrass, alone or mixed, are also grown.

This soil is only poor to fair for crops because it is eroded and has low fertility, hilly relief, and medium to high surface runoff. It is poorly suited to intertilled crops and buckwheat because it is susceptible to erosion. In many places the hilly relief makes the use of grain binders or other heavier machinery difficult.

The soil is best suited to hay crops and pasture. It is advisable to use a fairly long crop rotation that includes an intertilled crop only about 1 year in every 5 or 6. Crop rows should follow the contour as nearly as possible, and stripcropping should be used for erosion control. Lime greatly improves yields, especially of corn, small grains, hay, and pasture. Small quantities of lime should be applied often, rather than large quantities infrequently. In addition to lime, an application of phosphate is advisable for hay and pasture.

**Watauga loam, undulating phase** (2- to 7-percent slopes) (We).—This phase differs from Watauga loam, rolling phase, principally in having an undulating or gently sloping surface. Surface runoff is medium; internal drainage, moderate; and erosion hazard, very slight. The aggregate area is relatively very small.

*Use and management.*—Approximately 90 percent of this phase is in crops; the rest is in open pasture. The crops and management practices are about the same as for Watauga loam, rolling phase. This undulating soil is one of the best in the uplands for many crops and pasture. Although it is low in fertility, it responds well to good management and is very easily worked and conserved.

**Watauga stony loam, rolling phase** (7- to 15-percent slopes) (Wh).—This phase is like Watauga loam, rolling phase, except it has stones on or in the surface soil that interfere with but do not prevent tillage. The stones—principally quartzite, mica gneiss, and mica schist—range from a few inches to 12 inches or more across and are mostly angular. In most places the subsoil contains some rock fragments, and in areas it is shallower to bedrock than Watauga loam, rolling phase. Scattered small outcrops of bedrock are indicated on the soil map by symbols. This soil is associated with other Watauga and Chandler soils and occurs on rounded tops of ridges, hills, mountains, or other relatively smooth upland country.

The soil has medium surface runoff, moderate internal drainage, and slight erosion hazard when not protected by vegetation or other methods. In a few small areas indicated on the soil map by symbols, enough surface soil has been lost through accelerated erosion to bring the subsoil within plow depth.

*Use and management.*—All but about 10 percent of this phase has been cleared and is now largely used for crops and pasture. A small percentage is idle. The principal crops are red clover and timothy for hay, corn, oats, potatoes, and cabbage. Other common crops are grown to a small extent. Usual management and management requirements are about the same as for Wautaga loam, rolling phase, but this soil is somewhat less productive and is less easily worked because it is stony.

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**Watauga stony loam, hilly phase** (15- to 30-percent slopes) (Wg).—This phase is similar to Watauga loam, rolling phase, in most profile characteristics, but differs in being hilly, stony, and in places, shallower to bedrock. Stones as much as 12 inches across are numerous enough to interfere with but not prevent tillage. Small outcrops of bedrock are indicated on the soil map by symbols. Most of the soil is on hillsides in less mountainous areas, though some is on rounded tops of mountain ridges. It is associated mainly with other Watauga soils and Chandler soils, and to a less extent with Halewood and Clifton soils. Included are a few acres of soil near Deep Gap that are browner or more reddish than usual for this phase.

Surface runoff is medium; internal drainage, moderate. The soil is subject to moderate erosion if not protected by vegetation or by other means.

*Use and management.*—All except about 2 percent of this phase used for crops, is in forest. The soil is only fair for the production of most crops because of its relatively low fertility, hilly relief, moderate erodibility, and stony nature. If cleared and cropped in the usual manner for a few years, it would closely resemble Watauga stony loam, eroded hilly phase.

**Watauga stony loam, eroded hilly phase** (15- to 30-percent slopes) (Wf).—This phase consists of areas of the stony hilly phase that have been cleared of their forest, cultivated, and then moderately eroded. The original surface soil has been lost through accelerated erosion to the extent that subsoil is within plow depth in more than half the area. Plowing has mixed subsoil material with remaining surface soil and formed a moderate yellowish-brown friable stony loam or heavy loam. Areas significantly more eroded than this are shown on the soil map by symbols. Surface runoff is medium to high, but erosion hazard is moderate.

In a few small included areas the soil has been only slightly eroded. In another small inclusion of about 20 acres in the vicinity of Deep Gap, the soil is either more brown or more red than is usual for this soil.

*Use and management.*—Except for about 10 percent in forest, this phase is all in pasture, in crops, or is idle. The soil is poor to fair for crops and fair for pasture. Because of erodibility it is poorly suited to intertilled crops and buckwheat. It is best suited to hay and pasture. Largely because of strong slopes, heavier types of farm machinery are difficult to use.

This soil is used for about the same crops as Watauga loam, eroded hilly phase. It has similar management requirements but is more difficult to work and is less productive.

**Wehadkee loam** (0- to 2-percent slopes) (Wk).—This light-colored, poorly to very poorly drained soil has formed on first bottoms from young alluvial material. It is not as dark or as high in organic matter as Toxaway loam, and is more poorly drained than Chewacla loam. The areas are scattered along streams throughout the county, but most of them are on very narrow stream bottoms.

Relief is nearly level to depressed, although most areas have a slight gradient downstream. Surface runoff is low to very low; internal drainage, slow to very slow. In most areas there is a permanently high water table fed by springs and seepage from nearby hills. Because of low relief near streams, the soil is quickly flooded during heavy rains. The original vegetation was mainly hemlock, red and silver maples, birch, oak, willow, and an undergrowth of alder, rhododendron, mountain-laurel, and small water-loving plants. Bulrushes are common on cleared or partly cleared areas.

Profile in a field:

0 to 15 inches, slightly plastic loam, medium olive gray or brownish gray when wet; contains some moderate-brown mottlings.
15 to 30 inches, slightly plastic loam or fine sandy loam, brownish gray or light brownish gray when wet; shows a few moderate yellowish-brown mottlings.
30 inches +, loamy fine sand, coarse sand, or fine gravel, brownish gray or light brownish gray when wet.

Finely divided mica flakes are distributed through the profile. The soil varies considerably in texture and to some extent in color. In most places there are stratified layers within the profile. These layers range in texture from loam, through loamy fine sand, to fine gravel. Stones are on or in the surface soil in places. These stony areas are indicated on the soil map by symbols. In many areas there are thin very recent deposits of dark yellowish-brown (when wet) silt loam, loam, or fine sandy loam.

The soil naturally is strongly to very strongly acid, and its organic-matter content is medium to relatively low in the upper part and low in the bottom part. Under virgin conditions a thin layer of more or less decomposed organic debris covers the surface. The high water table restricts root penetration and air circulation. If the water table has been sufficiently lowered by artificial drainage, all the soil layers will be moderately or rapidly permeable to water, roots, and air. Crawfish holes are common in most places.

*Use and management.*—About 70 percent of this type is in open pasture, 25 percent in forest, and 5 percent in crops. Some of the pastured land has a growth of water-loving bushes. A few acres have been drained artificially by open or closed ditches or tile and are cropped mainly to corn and hay plants. Fairly good yields are produced on the adequately drained soil. Undrained areas are best suited to pasture, but lime should improve its growth. Because of the small total acreage of soils well suited to crops, this soil, wherever possible, should be prepared for crop use by artificial drainage. Engineering problems may arise on some areas, but most of them can be drained without too much difficulty. Some stream channels may need to be deepened or straightened. A few already have been. In most areas tile is the most feasible means of draining the land.

**Wehadkee loam, peaty phase** (0- to 2-percent slopes) (Wl).—This phase differs from the Wehadkee loam principally in having a 2- to 5-inch surface layer of peat or muck that is nearly black when wet. The organic material is thoroughly decomposed in most places, but here and there brown woody material or other plant remains are less decayed. This highly organic layer overlies a brownish-gray or medium olive-gray (when wet) mottled, slightly plastic, brown loam a few inches thick. This plastic layer grades into brownish-gray or light brownish-gray loamy fine sand, coarse sand, or fine gravel.

This soil occurs at fairly high altitudes in very poorly drained bottoms and basinlike areas around the heads of streams fed by springs. Several of the larger areas are at or near the heads of Beech, Howard, and Long Hope Creeks. The water table is naturally very high, and in some places water covers the surface.

Some areas have a forest cover of hemlock, birch, and red maple and a dense undergrowth of rhododendron. Others have a cover of water-loving grasses and sedges mixed to varying degrees with water-loving shrubs and small trees.

*Use and management.*—This phase is too poorly drained to be suitable for crops. Because most areas are fed by springs, artificial drainage probably would not be feasible. Deepening the main stream channel and opening side ditches, however, would improve the soil for pasture, the use to which it is best suited.

**Worsham loam** (2- to 7-percent slopes) (Wm).—This imperfectly to poorly drained soil occurs on alluvial and colluvial fans and the foot slopes of mountains and hills. It has developed from old alluvium and colluvium derived from soils and rock material on nearby slopes. The parent material and topographic position are similar to those for Tusquitee and Tate soils, but drainage and color are different. The profile somewhat resembles that of Augusta loam, and this soil calls for similar use and management, although it has a different topographic position. Most of the areas are relatively small; they occur in various parts of the county.

Relief is gently sloping and undulating for the most part, but a total area of about 160 acres has slopes of slightly more than 7 percent. Surface runoff is low to medium, and internal drainage is slow. In many areas water from springs or seeps near the base of adjacent hills keeps the soil partly saturated and causes a high or moderately high water table. Some of the lower lying areas may be overflowed during exceptional floods. The more sloping soil is somewhat erodible when not protected by vegetation or by other methods, but there is little or no erosion hazard in the gently sloping and undulating areas. The original vegetation probably was a mixed hardwood-hemlock-white pine forest.

Profile in a field:

0 to 7 inches, brownish-gray or dusky-brown friable or very friable loam; a few light brownish-gray and moderate-brown to moderate yellowish-brown mottlings.

7 to 36 inches, slightly to moderately porous, slightly plastic, somewhat gritty light to heavy clay loam, brownish gray or light brownish gray when wet; moderate-brown, moderate yellowish-brown, or light yellowish-brown mottlings, varying in degree from place to place; weak to moderate fine to medium nut structure; upper part of layer somewhat darker than lower in places.

36 inches +, massive light clay loam or loam, yellowish gray or light olive gray when wet; some yellowish-white, strong yellowish-brown, dusky-yellow, or dark-orange mottlings; forms a layer a few feet thick in places, but in others grades into sandy or gravelly material or broken rock fragments at varying depths.

The first inch or two in virgin areas consists of dark soil covered with leaf litter. Throughout the soil some small mica flakes are present, and in most places there is some gravel on the surface. Stones occur locally, and areas containing enough to interfere with tillage are indicated on the soil map by symbols. Drainage conditions vary considerably from place to place and affect the degree and character of mottling in the soil. A few seepy spots occur near springs. Crawfish holes are in the soil in most places. In a few small included areas, the subsoil is not distinctly heavier in texture than the surface soil.

This soil is naturally very strongly acid, and its upper part contains a moderate quantity of organic matter. It has low fertility. The subsoil is slowly to moderately permeable to water, roots, and air in areas not affected by a high water table.

*Use and management.*—An estimated 95 percent of Worsham loam has been cleared and is now used largely for pasture and crops. A small part is idle. The main crops are legume-grass hay, and corn; minor crops are potatoes, cabbage, oats, rye, and buckwheat.

Much of this soil has been partly drained by open ditches, closed wooden or stone drains, or tile. Drainage is adequate in only a few areas. Lime is used on most areas and apparently it improves the soil considerably.

Unless adequately drained, the soil is only poor to fair for crops. It is poorly suited to many crops such as tobacco, alfalfa, potatoes, cabbage, and fruit trees. Grass hay, lespedeza, soybeans, buckwheat, and pasture grow fairly well on limed areas that are not too poorly drained.

Adequate drainage is necessary for the improvement of this soil. Tile would prove the most satisfactory means of drainage, although other types of drains could be used. When the soil has been sufficiently drained, about 2 tons of ground limestone an acre, or its equivalent in other liming material, should be used. Another application of lime should be made in 4 to 6 years.

## Capability Groups of Soils

The capability grouping is an arrangement of soils to show relative suitability for tilled crops, hay, pasture, forestry, wildlife, watersheds, or recreation and the risks of erosion or other damage. It is widely used in helping farmers plan their practices for soil and water conservation.

Eight broad classes are provided in the capability arrangement, although not all of these classes are used in Watauga County. Each soil is placed in one of these broad classes after joint study by several persons who have knowledge of the soils and agriculture of the area.

Soils that are easy to farm and have no serious limitations for use are placed in capability class I. Such soils are not subject to more than slight erosion, drought, wetness, or other limitations and are at least fairly fertile. They are good for many uses. The farmer can use his class I soils for crops without special practices, other than those needed for good farming anywhere, and can choose one of several cropping patterns; or if he wishes he may use the soil for pasture, trees, or for other purposes.

Soils are placed in class II if they are a little less widely adaptable, and thus more limited than those in class I. For example, a gently sloping soil may have a slight erosion hazard that requires contour farming or other practices to control runoff. Other soils may be placed in class II because they are too droughty, too wet, or too shallow to be in class I. Climate can also be a limiting factor if too cool or too dry, but is not a limiting factor in the capability grouping in Watauga County.

Class III contains soils suitable for regular cropping but they have more stringent management requirements than those in class II. The soils that are even more limited and have more narrow crop adaptations than those in class III, but are still suitable for tillage part of the time, or with special precautions, are placed in class IV.

Soils not suitable for cultivation, or on which cultivation is not advisable, are in classes V, VI, VII, or VIII. Class

V consists of soils not subject to erosion but unsuited to cultivation because of stoniness, standing water, or frequency of overflow. Class VI contains soils that may be steep, droughty, or shallow but will produce fairly good amounts of forage, orchard, or forest products. As a rule class VI soils should not be cultivated, but some of them can safely be disturbed to prepare for planting trees or seeding extremely long-producing forage crops.

Soils in class VII are more limited than those in class VI, require more care in handling, and usually give only fair to poor yields of forage or wood products. Class VIII consists of soils so severely limited that they produce little useful vegetation. They may make attractive scenery or may be parts of useful watersheds. Some may have value as wildlife habitats.

SUBCLASSES: Although the soils within a single capability class have limitations and, therefore, use and management problems of about the same degree, the kinds of problems may differ greatly. These problems and limitations may result from risk of erosion, designated by the symbol (e), excess water (w), or shallow soil, low capacity for holding moisture available, or low fertility(s). The subclass symbol, indicating the kind of limitation, is added to the capability class number.

### Capability Classes and Subclasses in Watauga County

CLASS II.—Soils that can be used for tilled crops with slight risks of erosion, or with slight limitations caused by wetness or other properties.
- IIe: Generally well drained to slowly drained undulating soils subject to erosion.
- IIw: Nearly level bottom and terrace soils with inadequate natural drainage.

CLASS III.—Soils with moderate limitations due to erosion risk, wetness, droughtiness, or other properties but suitable for regular use for tilled crops.
- IIIe: Rolling and undulating soils subject to erosion.
- IIIw: Imperfectly and poorly drained soils on flood plains and colluvial slopes.
- IIIs: Sandy, droughty soils.

CLASS IV.—Soils that have severe limitations due to erosion risk, wetness, or other properties and, if used for cultivation, require special management.
- IVe: Rolling, hilly, and eroded soils.
- IVw: Slowly to very slowly drained soils on flood plains.

CLASS V.—Soils not suitable for cultivation because of wetness, stoniness, or frequency of overflow, but well suited to grazing or forestry.
- Vs: Stony colluvium.

CLASS VI.—Soils that are too steep or too wet for cultivation except occasionally in preparation for seeding or for planting trees.
- VIe: Hilly, steep, and eroded soils.

CLASS VII.—Soils unsuited to cropping or any cultivation because they are too steep, too shallow, too droughty, too stony, or too eroded.
- VIIe: Hilly, steep, very steep, stony, eroded, or severely eroded soils, plus Stony hilly land and Stony rough land.

CLASS VIII.—Soils in this class are very steep, rocky, stony, sandy, or wet and are unsuited to commercial production of vegetation. They may be useful as food and shelter areas for wildlife or for recreational or water yielding purposes.
- VIIIs: Riverwash and Rock outcrop.

The capability class and subclass for each soil in the county is shown in the following list:

| | *Capability class and subclass* |
|---|---|
| Ashe loam: | |
| Eroded steep phase (Aa) | VIIe. |
| Steep phase (Ab) | VIIe. |
| Ashe stony loam: | |
| Eroded hilly phase (Ac) | VIIe. |
| Eroded steep phase (Ad) | VIIe. |
| Hilly phase (Ae) | VIIe. |
| Steep phase (Af) | VIIe. |
| Very steep phase (Ag) | VIIe. |
| Augusta loam (Ah) | IIw. |
| Buncombe loamy fine sand (Ba) | IIIs. |
| Burton stony loam, hilly phase (Bb) | VIe. |
| Chandler loam: | |
| Eroded steep phase (Ca) | VIIe. |
| Steep phase (Cb) | VIIe. |
| Chandler stony loam: | |
| Eroded steep phase (Cc) | VIIe. |
| Severely eroded steep phase (Cd) | VIIe. |
| Steep phase (Ce) | VIIe. |
| Very steep phase (Cf) | VIIe. |
| Chewacla cobbly loam (Cg) | IIIw. |
| Chewacla loam (Ch) | IIIw. |
| Clifton clay loam: | |
| Eroded hilly phase (Ck) | IVe. |
| Eroded steep phase (Cl) | VIIe. |
| Clifton stony clay loam: | |
| Eroded hilly phase (Cm) | VIe. |
| Eroded steep phase (Cn) | VIIe. |
| Clifton stony loam: | |
| Hilly phase (Co) | VIe. |
| Rolling phase (Cp) | IVe. |
| Steep phase (Cr) | VIe. |
| Congaree cobbly fine sandy loam (Cs) | IIw. |
| Congaree fine sandy loam (Ct) | IIw. |
| Congaree loam (Cu) | IIw. |
| Gullied land (Chandler and Clifton soil materials) (Ga) | VIIe. |
| Halewood clay loam: | |
| Eroded hilly phase (Ha) | VIIe. |
| Eroded steep phase (Hb) | VIIe. |
| Halewood loam: | |
| Hilly phase (Hc) | IVe. |
| Rolling phase (Hd) | IIIe. |
| Steep phase (He) | VIe. |
| Halewood stony clay loam: | |
| Eroded hilly phase (Hf) | VIe. |
| Eroded steep phase (Hg) | VIIe. |
| Halewood stony loam: | |
| Hilly phase (Hh) | VIe. |
| Steep phase (Hk) | VIIe. |
| Hayesville clay loam: | |
| Eroded hilly phase (Hl) | VIIe. |
| Eroded steep phase (Hm) | VIIe. |
| Hayesville loam, hilly phase (Hn) | IVe. |
| Hayesville stony loam, steep phase (Ho) | VIIe. |
| Matney loam: | |
| Eroded hilly phase (Ma) | IVe. |
| Hilly phase (Mb) | IVe. |
| Rolling phase (Mc) | IIIe. |
| Matney stony loam: | |
| Eroded hilly phase (Md) | VIe. |
| Hilly phase (Me) | VIe. |
| Perkinsville loam: | |
| Eroded hilly phase (Pa) | IVe. |
| Hilly phase (Pb) | IVe. |
| Rolling phase (Pc) | IIIe. |
| Undulating phase (Pd) | IIe. |
| Perkinsville stony loam: | |
| Eroded hilly phase (Pe) | VIe. |
| Rolling phase (Pf) | IVe. |
| Porters loam: | |
| Eroded hilly phase (Pg) | IVe. |
| Eroded steep phase (Ph) | VIIe. |
| Hilly phase (Pk) | IVe. |
| Steep phase (Pl) | VIe. |

| | *Capability class and subclass* |
|---|---|
| Porters stony loam: | |
| Eroded hilly phase (Pm) | VIe. |
| Eroded steep phase (Pn) | VIIe. |
| Eroded very steep phase (Po) | VIIe. |
| Hilly phase (Pp) | VIe. |
| Steep phase (Pr) | VIIe. |
| Very steep phase (Ps) | VIIe. |
| Ramsey stony loam: | |
| Eroded steep phase (Ra) | VIIe. |
| Steep phase (Rb) | VIIe. |
| Very steep phase (Rc) | VIIe. |
| Riverwash (Rd) | VIII. |
| Rock outcrop (Re) | VIII. |
| State loam, undulating phase (Sa) | IIe. |
| Stony colluvium (Tusquitee and Tate soil materials) (Sb) | V. |
| Stony hilly land (Ashe and Porters soil materials) (Sc) | VIIe. |
| Stony rough land (Ashe and Porters soil materials) (Sd) | VIIe. |
| Tate loam: | |
| Hilly phase (Ta) | IVe. |
| Rolling phase (Tb) | IIIe. |
| Undulating phase (Tc) | IIe. |
| Tate stony loam: | |
| Hilly phase (Td) | VIe. |
| Rolling phase (Te) | IVe. |
| Toxaway loam (Tf) | IIIw. |
| Tusquitee loam: | |
| Hilly phase (Tg) | IVe. |
| Rolling phase (Th) | IIIe. |
| Undulating phase (Tk) | IIe. |
| Tusquitee stony loam: | |
| Eroded hilly phase (Tl) | VIe. |
| Hilly phase (Tm) | VIe. |
| Rolling phase (Tn) | IVe. |
| Undulating phase (To) | IIIe. |
| Watauga loam: | |
| Eroded hilly phase (Wa) | VIe. |
| Eroded rolling phase (Wb) | IVe. |
| Hilly phase (Wc) | VIe. |
| Rolling phase (Wd) | IIIe. |
| Undulating phase (We) | IIe. |
| Watauga stony loam: | |
| Eroded hilly phase (Wf) | VIe. |
| Hilly phase (Wg) | VIe. |
| Rolling phase (Wh) | IVe. |
| Wehadkee loam (Wk) | IVw. |
| Peaty phase (Wl) | IVw. |
| Worsham loam (Wm) | IIIw. |

## Soil Use and Management

Soil use refers to broad farm uses, as for (1) tilled crops (row crops, small grains, and annual hay); (2) permanent pasture; and (3) forest.

Soil management refers to such practices as (1) choice and rotation of crops; (2) use of lime, commercial fertilizer, and manure; (3) tillage practices; and (4) engineering methods for control of water on the land, all used, as needed, to maintain or improve workability and conserve soil material, plant nutrients, and soil moisture.

The soils of the county differ in texture, structure, consistence, depth of layers in the profile, chemical and biological makeup, moisture conditions, content of stones, and relief or lay of the land. Because of these differences they vary greatly in their suitability for agricultural use and in the management they require. In this section the soils are placed in use classes according to their relative suitability for agriculture, and in management groups according to the kinds of management they need.

*Use classes.*—According to their relative suitability for agriculture under good management, the soils of the county have been placed in five use classes—First-, Second-, Third-, Fourth-, and Fifth-class soils. These classes indicate the relative physical suitability of the various soils for use in the present agriculture. In making the use-class groupings, it was assumed that a soil suited only to pasture or forest is less desirable than one suited to crops, and that a soil suited only to forest is less desirable than one suited to pasture. This assumption generally holds true, but there are some exceptions.

The use classes should not be considered as recommendations for use of any particular tract or farm. First-class soils, for example, are those best suited to cropping, but it does not follow that all First-class soils on all farms should be cropped. A number of additional factors must be considered before even general recommendations on land use can be made. For an individual farm, a great number of factors related to that specific farm also must be taken into account.

*Management groups.*—All the soils in a given use class that require about the same kind of management are placed in one group. These groups are necessary because not all of the soils in one use class require the same management. For example, a soil on rolling upland and an imperfectly drained soil on a first bottom may be in the same use class because they have about the same suitability for agricultural use, but they are widely different in the kind of management they require.

In the pages following, present use and management and requirements for good management are discussed for each management group. The practices of management recommended in these discussions are those considered necessary to obtain the crop yields given in columns B of table 9. These recommended practices are intended as guides, not as plans of management for individual farms. Not enough information is available to permit stating the requirements of good management for a specific soil planted to a particular crop, nor for a specific crop planted on different kinds of soils. Furthermore, management must be adapted to individual farms, and this requires taking into account not only the relation of a given crop to a specific soil, but also the relation of other soils to other crops on the farm, the prices that may be expected, the types of enterprises on the farm, the distance to markets, and many other factors.

### *First-class soils*

The First-class soils are those best suited physically to agriculture. They are good to excellent for crops and very good to excellent for pasture. They differ somewhat in characteristics, but are relatively similar in physical suitability for agricultural use. Compared with other soils of the county, First-class soil is moderately well supplied with plant nutrients and has fairly high natural productivity. Even the most fertile, however, responds to lime and fertilizer when used for some crops. All are well drained, yet their physical characteristics are such that they provide a relatively even and adequate supply of moisture for plant growth. Good tilth is easily maintained, and the range of moisture conditions suitable for tillage is comparatively wide.

First-class soils are moderately supplied with organic matter, and their physical properties favor the movement of air and moisture in the soil and the free penetration of roots into all parts of the subsoil. Of these soils, not one has an adverse condition or property, such as stoniness, poor tilth, or unfavorable relief. For each soil the problem of conserving fertility and soil material is relatively simple,

and each is capable of intensive use if special management practices are followed.

Table 2 lists the First-class soils by management groups and gives the estimated percentage of each used for crops, pasture, and forest, or left idle.

TABLE 2.—*First-class soils of Watauga County, N. C., arranged by management groups, and estimated percentage of each in crops, open pasture, forest, or idle*

| Management group and soil | Crops | Open pasture | Forest | Idle |
|---|---|---|---|---|
| Group 1–A: | *Percent* | *Percent* | *Percent* | *Percent* |
| Congaree fine sandy loam | 85 | 14 | 1 | 0 |
| Congaree loam | 90 | 9 | 1 | 0 |
| Group 1–B: | | | | |
| Perkinsville loam, undulating phase | 85 | 13 | 2 | 0 |
| State loam, undulating phase | 90 | 10 | 0 | 0 |
| Tate loam, undulating phase | 85 | 5 | 10 | 0 |
| Tusquitee loam, undulating phase | 90 | 10 | 0 | 0 |
| Watauga loam, undulating phase | 90 | 10 | 0 | 0 |

### MANAGEMENT GROUP 1–A

The fertile, well-drained soils of group 1–A occur on first bottoms that are inundated by the higher floods. They are relatively young and do not have heavy-textured subsoils. Their medium- to somewhat light-textured surface soils enable easy tillage. The soils are naturally medium to very strongly acid, moderately fertile, and among the best in the county for corn, potatoes, hay, and pasture. Productivity is fairly easy to maintain or improve, and there is no erosion hazard. Some areas of the soils are almost inaccessible, and others are very narrow along streams.

The risk of damage by floods somewhat limits use for high-value crops such as tobacco, potatoes, snap beans, and cabbage. Areas that are infrequently or never flooded, however, are well suited to burley tobacco, onions, potatoes, snap beans, and most of the common crops. The soils are not well suited to late or medium-late cabbage, a cool weather crop, because most of their area is at medium or relatively low altitudes where summer temperatures are comparatively high.

Practically all of group 1–A has been cleared, and about 90 percent of the cleared land is used for crops. The rest is in open pasture. These 1–A soils are used principally for corn, red clover and timothy for hay, and pasture. Small acreages of crops—mainly of oats, potatoes, buckwheat, and snap beans—are grown.

Crop rotations are indefinite and commonly are not followed. Little effort is made to protect the land from floods. The soils generally receive applications of mixed fertilizer, and some farmers apply manure. About 40 percent of the land has been limed at least once with about 1½ tons of ground limestone an acre. Fertilizer and manure should be applied. Hybrid corn and disease-resistant varieties of potatoes and other crops should be used.

Because good cropland is scarce in the county, it is necessary to make as intensive use as possible of most areas of group 1–A soils. Although intensive use is advocated, sustained good yields require a crop rotation that includes legumes and grasses for maintaining or improving the supplies of nitrogen and organic matter. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements. For land that has not been limed, use 1½ tons of ground limestone per acre on the corn so that acidity can be reduced before red clover is sown. Tobacco and potatoes should not follow liming within 3 years, as they are subject to lime-induced diseases.

### MANAGEMENT GROUP 1–B

The soils of group 1–B have nearly level, gently sloping, or undulating relief with slopes ranging up to about 7 percent. They occupy smooth uplands, colluvial accumulations, or low stream terraces; are well drained; and are not appreciably susceptible to accelerated erosion. They have a loam surface soil and a fairly heavy-textured subsoil. They are easily worked but in places occur in small, narrow, or nearly inaccessible areas. Soil of this group contains enough stones or gravel to materially interfere with tillage. Acidity is medium to very strong; organic matter is low to medium, and fertility low to high.

These soils are among the best in the county for almost all the crops grown. They include the best soils for burley tobacco, although some areas of the Perkinsville and Watauga may be less well suited because of high elevation or prevalence of fogs in the tobacco-curing season. These soils are not so well suited to the development of good quality potatoes as the soils of group 1–A because they have heavier textured subsoils. Areas occurring at lower altitudes are not so well adapted to medium-late or late cabbage as those at higher altitudes.

Group 1–B soils are the most intensively used in the county; nearly 90 percent of the total area is in crops, and the rest largely in open pasture. Practically all common crops are grown on these areas. Crops with the largest acreages, in approximately decreasing order, are corn, red clover and timothy for hay, potatoes, oats, cabbage, wheat, rye, tobacco, and snap beans.

Definite crop rotations are not practiced, although the same crop is seldom grown for more than 2 years in succession on the same tract. Lime has been applied to the crop acreage in recent years on about two-thirds of the farms. About 1½ tons of ground limestone an acre is the most common application. Manure is used mostly for tobacco but to some extent for cabbage and corn. Red clover and timothy meadow usually is not fertilized. Hybrid corn, blight-resistant varieties of potatoes, and improved varieties of other crops should be planted more extensively.

As with soils of group 1–A, the scarcity of good cropland makes advisable as intensive use as possible of most areas of group 1–B soils. It is good practice, however, to use a crop rotation that includes legumes and grasses for maintaining or improving supplies of organic matter and nitrogen. All manure available should be carefully handled and used, and all possible crop residues should be returned to the soil. As these soils are naturally medium to very strongly acid, about 2 tons of ground limestone per acre should be worked into the unlimed land after it is plowed for corn. Tusquitee and

State soils require less lime than the other soils in this group, especially if potatoes or tobacco are grown. Because potatoes and tobacco may be injured indirectly by overliming, it is advisable to grow them as late as possible in the rotation after application of lime. If field tests for acidity or a poor growth of red clover indicate reliming in 4 years, an additional ton of ground limestone an acre will be sufficient. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements.

### *Second-class soils*

The Second-class soils are only moderately well suited to the intensive agriculture of the county. They are fair to good for crops, and good to very good for pasture. They are placed in this group because of one or more of the following: Relatively strong surface relief, stoniness, inadequate drainage. These soils differ within a limited range in productivity, workability, and conservability. The detrimental effect of these conditions upon the physical suitability for agriculture makes these soils less valuable than any of the First-class soils, but they are more valuable than any of the Third-class soils. Much of the forested land is suitable for clearing, and some of the open pasture could be used for cropland (fig. 13).

Table 3 lists the Second-class soils by management groups and gives the estimated percentage of each in crops, in open pasture, in forest, or idle.

TABLE 3.—*Second-class soils of Watauga County, N. C., arranged by management groups, and estimated percentage of each in crops, open pasture, forest, or idle*

| Management group and soil | Crops | Open pasture | Forest | Idle |
|---|---|---|---|---|
| Group 2–A: | *Percent* | *Percent* | *Percent* | *Percent* |
| Chewacla loam | 75 | 20 | 0 | 5 |
| Toxaway loam | 45 | 45 | 0 | 10 |
| Group 2–B: | | | | |
| Clifton stony loam, rolling phase | 70 | 15 | 10 | 5 |
| Halewood loam, rolling phase | 80 | 15 | 5 | 0 |
| Matney loam, rolling phase | 65 | 25 | 10 | 0 |
| Perkinsville loam, rolling phase | 72 | 20 | 8 | 0 |
| Perkinsville stony loam, rolling phase | 55 | 25 | 20 | 0 |
| Tate loam, rolling phase | 80 | 15 | 5 | 0 |
| Tate stony loam, rolling phase | 35 | 35 | 20 | 10 |
| Tusquitee loam, rolling phase | 85 | 10 | 5 | 0 |
| Tusquitee stony loam: | | | | |
| Rolling phase | 60 | 15 | 20 | 5 |
| Undulating phase | 60 | 20 | 20 | 0 |
| Watauga loam: | | | | |
| Eroded rolling phase | 60 | 40 | 0 | 0 |
| Rolling phase | 70 | 15 | 15 | 0 |
| Watauga stony loam, rolling phase | 55 | 30 | 10 | 5 |

#### MANAGEMENT GROUP 2-A

The soils of group 2–A are imperfectly or poorly drained, occur on first bottoms, and are subject to overflow. Chewacla loam is medium in organic matter and medium to strongly acid; Toxaway loam is high in organic matter and strongly to very strongly acid. The Toxaway soil is perhaps the most fertile in the county. Inadequate natural drainage limits the productivity and suitability of both soils.

*Figure 13.*—**Two Second-class soils: Haystack and meadow on Chewacla loam in foreground; and potatoes on Tate loam, rolling phase, below fence. Pasture on hill in left background is on Chandler loam, eroded steep phase.**

All areas have been cleared and are now used mainly for crops and open pasture. About 30 percent of their total area is used for corn, and slightly more for red clover and timothy or other hay. Other common crops are oats, buckwheat, and sorghum. Minor crops are wheat, rye, and snap beans.

Crop rotations on group 2–A soils are indefinite and not commonly followed. Methods for controlling overflow are not employed. Many areas have been drained by open ditches, closed wooden or rock drains, or tile drains, but most areas are as yet inadequately drained. Yields given for these soils in columns A, table 9, are for areas that have been partly but inadequately drained. The first essential in improving group 2–A soils is adequate drainage, and this is possible in most areas.

See tables 7 and 8 for information on suggested crop rotations, water control practices, and fertilizer requirements.

When the soils are adequately drained, their management requirements are very similar to those of group 1–A, except that Toxaway loam may require somewhat less nitrogen in the fertilizer and a slightly larger application of lime. The risk of floods damaging high-value crops is somewhat greater; and, in general, burley tobacco, potatoes, and cabbage should not be grown on the Toxaway soil if other suitable soils are available which are not subject to flooding.

#### MANAGEMENT GROUP 2-B

All the soils of group 2–B are rolling or sloping (7 to 15 percent), except for Tusquitee stony loam, undulating phase, which has slopes of 2 to 7 percent. The Tusquitee and Tate soils occur on local alluvial and colluvial accumulations; the others, on rolling uplands. All are well drained. Acidity ranges from medium to very strong, and natural fertility from low to high. The organic-matter content is medium. The soils are fairly easy to work, although many areas are small and irregular in shape, and some are isolated or almost inaccessible.

These soils are moderately well suited to nearly all of the crops grown on them, though some crops do better than others. There is great variation in adaptation of

these soils to crops. Suitability to the same crop on the same soil will vary widely by topographic location. For example, the Clifton, Halewood, Tate, and Tusquitee soils everywhere except at the higher elevations are better suited to burley tobacco than the others of the group. Those at the higher altitudes are better suited to medium-late and late cabbage and late potatoes but are less suited to corn and tobacco than similar soils at lower altitudes. The somewhat more fertile Tusquitee soils need less fertilizer than the others, and the somewhat less fertile Watauga and Matney soils need more.

About 12 percent of group 2–B is in forest; the cleared land is in intensive agricultural use. Practically all the various crops common to the county are grown; the main crops, in decreasing order by acreage, are corn, red clover and timothy for hay, potatoes, oats, cabbage, rotation pasture, wheat, rye, buckwheat, burley tobacco, and snap beans. Tobacco is grown on all the soils except the Matney, but to only a minor extent on Perkinsville and Watauga soils. Engineering methods for surface-runoff control are not used, although contour cultivation is carried out to a considerable extent on most areas having slopes of 7 to 15 percent.

Lack of good cropland may require as intensive use as possible of most areas in this group. Forested land could be cleared for cultivated crops; many areas now in permanent pasture could be used more profitably for tilled crops; and steeper soils on the farm could be put in permanent pasture.

A crop rotation for group 2–B soils should include legumes and grasses. Manure should be properly handled and used, and all crop residues should be returned to the soil. See tables 7 and 8 for information on crop rotations, water-control practices, and fertilizer requirements. Adapted hybrid corn and adapted high-yielding seed for other crops should be used to a greater extent.

Soils of group 2–B having slopes greater than about 7 percent are slightly to moderately susceptible to accelerated erosion when not covered by sufficient vegetation. When cultivated, adequate methods are needed to control surface runoff. The soils should not be left without protective cover. Tillage operations and crop rows should follow the contour as nearly as possible. Stripcropping is very desirable on the larger areas, especially those with the longer slopes. Narrow strips of intertilled crops grown approximately on the contour should be alternated with strips of close-growing crops or meadow.

Tusquitee stony loam, undulating phase, is subject to very little erosion because of its relatively mild relief. Although special measures for runoff control ordinarily are not necessary, contour cultivation should be followed wherever possible.

### *Third-class soils*

The Third-class soils are poor to fair for crops and only fair for pasture. There is something about every one of these soils that limits its suitability for the common crops of the county, but in spite of this they are suited to a few, if good farming practices are followed. Some of their limitations are susceptibility to erosion, eroded condition, hilly relief, inadequate drainage, stoniness, low water-holding capacity, and low plant-nutrient content.

Table 4 lists Third-class soils by management groups and gives the estimated percentage of each in crops, open pasture, and forest, or idle.

TABLE 4.—*Third-class soils of Watauga County, N. C., arranged by management groups, and estimated percentage of each in crops, open pasture, forest, or idle*

| Management group and soil | Crops | Open pasture | Forest | Idle |
|---|---|---|---|---|
| Group 3–A: | *Percent* | *Percent* | *Percent* | *Percent* |
| Buncombe loamy fine sand | 80 | 15 | 1 | 4 |
| Congaree cobbly fine sandy loam | 70 | 24 | 1 | 5 |
| Group 3–B: | | | | |
| Chewacla cobbly loam | 60 | 30 | 0 | 10 |
| Group 3–C: | | | | |
| Augusta loam | 75 | 25 | 0 | 0 |
| Worsham loam | 35 | 50 | 5 | 10 |
| Group 3–D: | | | | |
| Ashe stony loam, eroded hilly phase | 35 | 45 | 5 | 15 |
| Clifton clay loam, eroded hilly phase | 65 | 30 | 0 | 5 |
| Clifton stony clay loam, eroded hilly phase | 50 | 35 | 3 | 12 |
| Halewood clay loam, eroded hilly phase | 55 | 35 | 0 | 10 |
| Halewood stony clay loam, eroded hilly phase | 45 | 40 | 0 | 15 |
| Hayesville clay loam, eroded hilly phase | 40 | 35 | 3 | 22 |
| Matney loam, eroded hilly phase | 50 | 35 | 5 | 10 |
| Matney stony loam, eroded hilly phase | 30 | 50 | 5 | 15 |
| Perkinsville loam, eroded hilly phase | 50 | 35 | 2 | 13 |
| Perkinsville stony loam, eroded hilly phase | 30 | 50 | 2 | 18 |
| Porters loam, eroded hilly phase | 50 | 45 | 0 | 5 |
| Porters stony loam, eroded hilly phase | 25 | 70 | 0 | 5 |
| Tusquitee stony loam, eroded hilly phase | 35 | 60 | 0 | 5 |
| Watauga loam, eroded hilly phase | 45 | 35 | 10 | 10 |
| Watauga stony loam, eroded hilly phase | 30 | 40 | 10 | 20 |
| Group 3–E: | | | | |
| Ashe stony loam, hilly phase | 0 | 5 | 95 | 0 |
| Burton stony loam hilly phase | 2 | 98 | 0 | 0 |
| Clifton stony loam, hilly phase | 2 | 3 | 95 | 0 |
| Halewood loam, hilly phase | 2 | 3 | 95 | 0 |
| Halewood stony loam, hilly phase | 2 | 3 | 95 | 0 |
| Hayesville loam, hilly phase | 0 | 0 | 100 | 0 |
| Matney loam, hilly phase | 2 | 3 | 95 | 0 |
| Matney stony loam, hilly phase | 0 | 0 | 100 | 0 |
| Perkinsville loam, hilly phase | 2 | 3 | 95 | 0 |
| Porters loam, hilly phase | 40 | 30 | 28 | 2 |
| Porters stony loam, hilly phase | 0 | 2 | 98 | 0 |
| Tate loam, hilly phase | 75 | 20 | 5 | 0 |
| Tate stony loam, hilly phase | 50 | 20 | 20 | 10 |
| Tusquitee loam, hilly phase | 50 | 25 | 20 | 5 |
| Tusquitee stony loam, hilly phase | 40 | 25 | 25 | 10 |
| Watauga loam, hilly phase | 3 | 0 | 97 | 0 |
| Watauga stony loam, hilly phase | 2 | 0 | 98 | 0 |

#### MANAGEMENT GROUP 3-A

The very permeable soils of group 3–A occur on first bottoms, have somewhat excessive drainage, and occasionally are overflowed. They are light textured, low in water-holding capacity, organic-matter content, and plant nutrient content, and are medium to strongly acid. These features limit their suitability for crops.

An estimated 40 percent of the total area is in open pasture, and the rest mainly in corn, oats, and red clover and timothy for hay. Crop rotations are indefinite and usually not followed. No methods are employed for the control of overflows.

Corn, red clover, timothy, potatoes, onions, rye, and buckwheat are best adapted to group 3–A soils. Lime requirements are the same as for soils of group 1–A. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements.

#### MANAGEMENT GROUP 3-B

Chewacla cobbly loam, the only soil in group 3–B, is a naturally imperfectly drained soil of the first bottoms. It is subject to flooding. The soil is medium in fertility, good in conservability, and medium to strongly acid. Cobblestones and gravel on and in the soil somewhat interfere with but do not prevent tillage.

The soil has been cleared of forest, and is now used for crops and open pasture. Corn, oats, buckwheat, sorghum, and red clover and timothy for hay are the chief crops. Definite crop rotations are normally not followed and the soil is not protected from floods. Some areas have been drained partly but inadequately; yields for the soil given in columns A of table 9 are for such land. The most important management practice needed for improvement is adequate drainage. Most areas can be drained by open ditches.

When adequate drainage has been established, lime requirements are very similar to those for group 1–A. Because of flood hazard, high-value crops such as burley tobacco, potatoes, and cabbage should not be grown if more favorably situated soils are available. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements.

#### MANAGEMENT GROUP 3-C

The soils of group 3–C are naturally poorly or imperfectly drained. They occur on low stream terraces, foot slopes, or local alluvial and colluvial accumulations and have level to undulating relief. They are strongly or very strongly acid. Inadequate drainage limits the suitability and productivity. These soils are suited to tobacco, alfalfa, fruit trees, potatoes, and cabbage only when drained. Except on the wetter areas, grass hay, pasture, lespedeza, soybeans, corn, and buckwheat do fairly well when the soils are limed.

Nearly all the total area of group 3–C soils has been cleared and is now used largely for crops and open pasture. Corn and clover and grass for hay are the principal crops; potatoes, cabbage, rye, oats, and buckwheat are minor crops. Crop rotations are not commonly followed.

Many areas have been partly drained by open ditches, closed wooden or stone drains, or tile, but only a few areas are adequately drained for crops. Yields given for the soils of this group in columns A of table 9 are for areas that have been slightly but inadequately drained.

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The first essential for the improvement of group 3–C soils is, therefore, adequate drainage, which is feasible in nearly all places. When the soils have been adequately drained, a crop rotation that includes legumes and grasses for supplying nitrogen and organic matter should be used. If the soils have not been limed, an application of 2½ to 3 tons of ground limestone per acre should be made at least a year before sowing a meadow mixture. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements. Yields for group 3–C soils given in columns B of table 9 are for adequately drained areas.

#### MANAGEMENT GROUP 3-D

The soils of group 3–D occur on uplands or local alluvial and colluvial accumulations. They are hilly or strongly sloping (15 to 30 percent). All areas have been almost completely cleared for cultivation, and in most places 15 to 75 percent of the original surface soil has been lost through erosion. Surface runoff from unprotected slopes is medium to high.

The suitability of these soils for crops is limited by hilly relief, surface runoff from unprotected slopes, eroded condition, and susceptibility to erosion. Some have one or more other limiting features such as stoniness, poor tilth, fairly low content of plant nutrients, or low supply of organic matter. In general, the soils are better suited to grass-hay crops and pasture than to intertilled crops, buckwheat, and soybeans.

Hilly relief in many areas makes it difficult to use grain binders or other heavy machinery. Different areas of similar soils may also vary in suitability for certain crops because of differences in altitude or topography. Medium-late and late cabbage, potatoes, snap beans, onions, and buckwheat are suited to areas in higher altitudes, but are very seldom grown at the lowest altitudes. Corn, crimson clover, burley tobacco, and peaches do not thrive at the highest altitudes. Burley tobacco is not suited where fogs are prevalent, especially late in summer or in fall. Cabbage can be grown in these foggy places. Apple and other fruit trees may be suited to some areas but not to others because of differences in temperature and occurrence of frosts.

It is estimated that half the total area of these soils is in crops, and about one-third in pasture. The rest is mainly idle cropland. All common crops are grown to some extent. Corn, and red clover and timothy for hay are the principal crops; other crops in decreasing order by acreage are potatoes, oats, cabbage, buckwheat, rye, wheat, orchardgrass, snap beans, apples, and burley tobacco. On the Hayesville soil of this group, cabbage, potatoes, snap beans, and tobacco are not usually grown; tobacco is seldom grown on the Matney and Watauga soils.

Definite crop rotations are not commonly followed, but a majority of farmers grow cultivated crops for 2 or 3 years and then hay or pasture for like periods. About two-thirds of the farmers have used some form of lime in recent years. The usual application is 2 tons of ground limestone per acre. Manure is used for the tobacco, and any other manure available is used lightly for corn, cabbage, onions, and garden vegetables. Hybrid corn and other high-yielding varieties of crops should be planted to a greater extent. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements.

A suitable rotation for this group should keep a cover of vegetation on the land the greatest possible time. It should include an intertilled crop only once every 4 to 6 years. Legumes and grasses should be grown half or more of the time. The suggested rotations take into consideration the tilth and structure of the soil by reducing to a minimum the number of times the land must be plowed and heavy machinery employed.

Where only slightly eroded, Tusquitee, Porters, and Ashe soils may need less fertilizer than recommended in table 8; whereas the Watauga and Matney soils and severely eroded areas in all the soils may need more. As soils of this group are naturally acid, liming is highly desirable. If tobacco or potatoes are grown, the lime should be applied after their harvest.

Engineering or special measures for control of surface runoff are not common, but contour cultivation is practiced on almost all farms. Accelerated erosion, however, is a serious problem on this group, and special means of controlling surface runoff are essential. Slopes should be protected by vegetation as much of the time as possible. Contour tillage and stripcropping are advised for all areas. Narrow strips of intertilled crops (or buckwheat or soybeans, if grown) should be alternated with strips of legume-grass hay or other close-growing crops. The strips should be placed as nearly as possible on the contour, and strips of intertilled crops should not be too wide.

#### MANAGEMENT GROUP 3-E

The uneroded, hilly, or strongly sloping soils of group 3–E have slopes of 15 to 30 percent. They occur on uplands or on local alluvium and colluvium. Nearly all the soils are 95 percent or more in forest. Five of the group are 28 percent or less in forest. The Burton soil is practically treeless. Part of it has a grass cover and part has been cultivated but not materially eroded.

When cleared of forest, group 3–E soils are only poor to fair for crops. In general, they are better suited to grass-hay crops and pasture than to intertilled crops such as buckwheat and soybeans. After they have been cleared and cultivated, these soils would have group characteristics and management requirements similar to those for group 3–D. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements.

### *Fourth-class soils*

Fourth-class soils are very poorly suited to the agriculture of the county. They are poor to very poor for crops but are at least fairly good for pasture and fair to good for forest. Each soil has one or more unfavorable characteristics, alone or in combination, that eliminate its use for any of the crops commonly grown. Among these limitations are steep relief, excessive stoniness, very poor or poor drainage, low plant-nutrient supply, or shallow soil profile. Nevertheless, use for crops cannot be avoided in the present agricultural economy, as some parts of the county have only relatively small acreages of better soils. When adequate areas of suitable soils are available, most of the Fourth-class soils should be used for pasture or forest.

Table 5 lists the Fourth-class soils by management groups and gives the estimated percentage of each in crops, open pasture, and forest, or idle.

TABLE 5.—*Fourth-class soils of Watauga County, N. C., arranged by management groups, and estimated percentage of each in crops, open pasture, forest, or idle*

| Management group and soil | Crops | Open pasture | Forest | Idle |
|---|---|---|---|---|
| Group 4–A: | *Percent* | *Percent* | *Percent* | *Percent* |
| Wehadkee loam | 5 | 70 | 25 | 0 |
| Peaty phase | 0 | 0 | 100 | 0 |
| Group 4–B: | | | | |
| Stony colluvium (Tusquitee and Tate soil materials) | 0 | 37 | 60 | [1] 3 |
| Stony hilly land (Ashe and Porters soil materials) | 1 | 11 | 85 | 3 |
| Group 4–C: | | | | |
| Ashe loam, eroded steep phase | 15 | 70 | 0 | 15 |
| Ashe stony loam, eroded steep phase | 5 | 75 | 0 | 20 |
| Chandler loam, eroded steep phase | 13 | 50 | 12 | 25 |
| Clifton clay loam, eroded steep phase | 20 | 65 | 0 | 15 |
| Clifton stony clay loam, eroded steep phase | 10 | 65 | 5 | 20 |
| Halewood clay loam, eroded steep phase | 15 | 70 | 3 | 12 |
| Halewood stony clay loam, eroded steep phase | 10 | 70 | 5 | 15 |
| Hayesville clay loam, eroded steep phase | 8 | 55 | 10 | 27 |
| Porters loam, eroded steep phase | 15 | 75 | 0 | 10 |
| Porters stony loam, eroded steep phase | 10 | 70 | 5 | 15 |
| Group 4–D: | | | | |
| Ashe loam, steep phase | 1 | 3 | 96 | 0 |
| Ashe stony loam, steep phase | 0 | 2 | 98 | 0 |
| Chandler loam, steep phase | 1 | 1 | 98 | 0 |
| Clifton stony loam, steep phase | 0 | 2 | 98 | 0 |
| Halewood loam, steep phase | 1 | 1 | 98 | 0 |
| Halewood stony loam, steep phase | 0 | 0 | 100 | 0 |
| Hayesville stony loam, steep phase | 0 | 0 | 100 | 0 |
| Porters loam, steep phase | 2 | 0 | 98 | 0 |
| Porters stony loam, steep phase | 0 | 0 | 100 | 0 |

[1] Includes about 0.1 percent in crops.

#### MANAGEMENT GROUP 4-A

The soils of group 4–A occur on first bottoms and are subject to overflow by the adjacent streams. They have medium or relatively light texture, poor to very poor drainage, and strong to very strong acidity.

About 60 percent of the total area is in forest, and nearly all the rest is in open pasture. Some of the pasture land has a growth of water-loving bushes or shrubs. A few areas have been drained by open or closed ditches or by tile and are cropped chiefly to corn and hay. Most of this soil, however, is undrained and has no protection from overflow. Fertilizers or other amendments are not commonly used for pasture.

Better drainage is the first essential for improvement of the nonforest areas of group 4–A soils. These soils have permeable medium- or light-textured subsoil that can be effectively drained. Practicability of draining depends on the availability of good outlets, kind of soils on the

rest of the farm, type of farm, economic conditions, and other miscellaneous factors. Because of the small county acreage of soils well suited to crops, the soils of group 4–A should be drained for cropland wherever feasible. When adequately drained, they would be classified as Third-class soils, though their management requirements would be similar to those of group 2–A. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements. The drained land would be restricted to such crops as corn, oats, sorghum, buckwheat, soybeans, hay, and pasture. Alsike clover and redtop would be preferable for hay crops. Even when drained, this soil management group would be poorly suited to tobacco, alfalfa, potatoes, cabbage, fruit trees, and snap beans.

Permanent pasture is best for these soils if they are only partly drained. For this use, an initial application of 2 to 3 tons of ground limestone per acre should be made. An additional ton should be applied in 5 to 8 years. Superphosphate should be added in the spring of alternate years. A pasture mixture of Ladino clover and tall fescue is recommended. If desired, redtop, reed canarygrass, and Korean lespedeza may be added to this mixture.

Yields for these soils given in columns B of table 9 are for the adequately drained areas.

#### MANAGEMENT GROUP 4–B

Group 4–B is made up of Stony colluvium (Tusquitee and Tate soil materials) and Stony hilly land (Ashe and Porters soil materials). These miscellaneous land types occur on local alluvial and colluvial accumulations and hilly uplands. They have slopes ranging up to 30 percent and are strewn with stones and cobbles that prevent tillage. In the stony colluvium, the stones are mainly fragments of rocks, whereas in the hilly stony land they are loose stones, bedrock outcrops, or both. The soil material around the stones varies greatly.

About 75 percent of this land is in forest, though most of it is suitable for permanent pasture. The extent of rock fragments and bedrock outcrops largely determines the value of the land for pasture, but the nature of the rock and soil material is also important. Numerous stones make small areas unsuitable even for permanent pasture. The cleared areas are mainly in open pasture. Only a few small areas are in crops, and tillage must be done largely with hoes. Probably over half the land in pasture has been limed with about 1½ tons of ground limestone an acre.

Good management for pasture on group 4–B soils includes the use of lime and phosphate. If no lime has been used, an application should be made of 1½ to 2 tons of ground limestone per acre, followed in 5 to 8 years by a second application of about 1 ton. A pasture mixture of Ladino clover and orchardgrass is recommended. If desired, Kentucky bluegrass, white clover, redtop, tall fescue, timothy, alsike, and Korean lespedeza may be added to the mixture. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements.

#### MANAGEMENT GROUP 4–C

The soils of group 4–C are found on upland slopes of 30 to 60 percent. For the most part they have been cleared of forest and cropped, so slight to severe erosion is evident nearly everywhere. Consequently, the subsoil is within plow depth on most soils of this group. Largely because of these conditions, the erosion hazard is moderate to very great in those areas not protected by close-growing vegetation and having a generally high to very high surface runoff. Erosion is particularly active under intertilled crops, even those grown on the contour.

Fertility and tilth conditions vary considerably. The soils are unsuitable for crops because of their steep relief and erodibility. Relief is so steep that it prevents satisfactory use of grain binders, mowers, wagons, and almost all except the very simplest farm machinery, such as hoes, grain cradles, sleds, hillside plows, and small one-horse cultivators.

About two-thirds of the acreage of group 4–C is open pasture (fig. 14); the rest is half in crops and half idle cropland. The principal crops are corn, potatoes, and oats; minor crops are cabbage, buckwheat, rye, wheat, snap beans, and apples. Definite crop rotations are not commonly practiced, but a row crop is seldom grown on the same land 2 years in succession. Hybrid corn and blight-resistant varieties of potatoes are not planted to any extent.

Most farmers do not lime soils of group 4–C because it is difficult to do on the steep slopes. Complete fertilizers, however, are commonly used for all crops. Another common management practice is contour tillage, but special measures for surface-runoff control are not used. Pastures are poorly managed. Most of them are overgrazed, particularly early in spring, late in fall, and during dry periods. The majority of farmers cut down blackberry briers and bushes in pastures every year. Droppings are left undisturbed.

Group 4–C soils are best suited to permanent pasture. The results obtained by some farmers indicate that, with proper management, fairly good pasture can be grown on each of these soils. Of course, suitability of the soils for this use varies to some extent; the Porters soils, in general, are best, and the Chandler soils poorest.

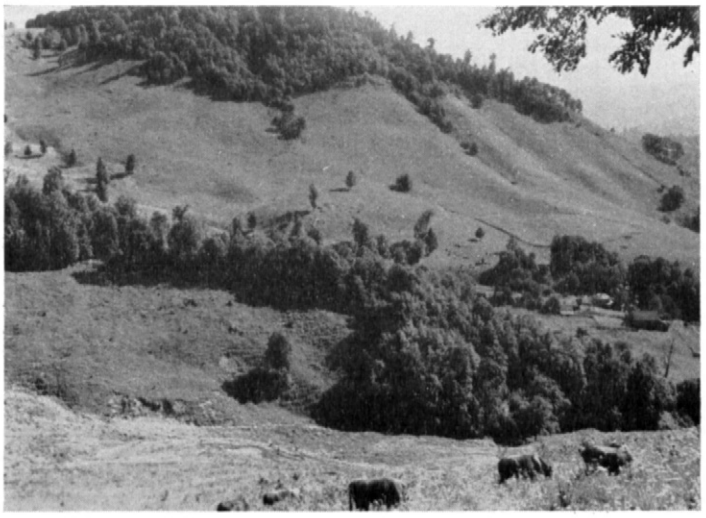

*Figure 14.*—**Some Fourth-class soils: Pasture on Ashe stony loam, eroded steep phase (left background) and Porters stony loam, eroded steep phase (right background) southeast of Zionville. The wooded areas are largely Fifth-class soils—Stony rough land (Ashe and Porters soil materials).**

Liming is very essential to obtain good pasture. Because of the difficulty of applying ground limestone to the steep slopes, it is suggested that burned lime (calcium oxide) be used instead. It has about twice the acid-neutralizing value, so only about half the weight of ground limestone need be carried up hilly slopes. About three-fourths of a ton of burned lime would be sufficient, and reliming usually would not be necessary for another 6 to 10 years. A heavier application may benefit the Chandler and Hayesville soils, but less may be needed for the Porters soils. Application of phosphate also improves pasture land, and it can be applied with or after the lime, but not before.

If a new pasture is being started, the lime and initial application of phosphate should be mixed with the surface soil as completely as possible. If an old pasture is being renovated, it is preferable to apply the lime and phosphate as a topdressing after the weeds, briers, and shrubs have been cut down. The soil should then be thoroughly worked to a depth of 3 or 4 inches—with a heavy spike-toothed harrow or disk harrow with the disks set almost straight—and then reseeded. Tests indicate that superphosphate and lime applied as a topdressing penetrate the soil very slowly below depths of 1 or 2 inches, unless worked deeper in the soil at time of application.

A pasture mixture of Ladino clover, orchardgrass, and Korean lespedeza is recommended; tall fescue and redtop may be added if desired. All these do well on most of the soils after they have been treated with lime and phosphate.

Other management practices are important in obtaining and maintaining good pasture. Grazing should not be allowed in the early spring before the grass has had a chance to make its first growth, or after seeding; nor in early spring or late fall when the land is wet. Overgrazing should be avoided, particularly during dry weather. Weeds should be removed before full bloom or seed formation, and briers and shrubs should be cut down. Pasture will be more productive if the droppings can be scattered over the land; harrows or other dragging implements can be used for this purpose when the slope permits. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements.

#### MANAGEMENT GROUP 4-D

The soils of group 4–D are on upland slopes of 30 to 60 percent. Over 95 percent of these areas are in forest. When cleared, they are very poorly suited to crops because of steep relief and erodibility, but under careful management are capable of supporting fairly good pasture.

When cleared, group 4–D soils would need management similar to that for group 4–C. See tables 7 and 8 for information on suggested crop rotations, water-control practices, and fertilizer requirements. It would be advisable to put these cleared soils into permanent pasture at once rather than into cultivated crops, because cultivation would accelerate erosion. The feasibility of clearing land in this group for pasture depends upon location, association with other soils, type and size of farm, cost of clearing, and possible alternate value of forest products.

Additional information about pasture management can be obtained by writing to the North Carolina Agricultural Experiment Station, at Raleigh.

### *Fifth-class soils*

The Fifth-class soils are unsuitable for crops, and poorly suitable to unsuitable for pasture. While they are capable of supporting forest growth, most of these soils are unsuitable for forestry. Nevertheless, forest and recreation are the best uses to which these soils can be put under most conditions. Each soil has one or a combination of factors that make it unfit for crops or pasture. Among these are steep or very steep relief, severe or very severe erosion, excessive stoniness, low plant-nutrient content, and shallow profile. Therefore, the greatest acreage of these soils should be kept in forest.

The Fifth-class soils have not been subdivided into groups according to soil-management requirements. Table 6 lists the Fifth-class soils and gives the estimated percentage of each in crops, open pasture, and forest, or idle.

TABLE 6.—*Fifth-class soils of Watauga County, N. C., arranged by management groups, and estimated percentage of each in crops, open pasture, forest, or idle*

| Management group and soil | Crops | Open pasture | Forest | Idle |
|---|---|---|---|---|
| Group 5: | | | | |
| Ashe stony loam, very steep phase | *Percent* 1 | *Percent* 15 | *Percent* 82 | *Percent* 2 |
| Chandler stony loam: | | | | |
| Eroded steep phase | 7 | 48 | 15 | 30 |
| Severely eroded steep phase | 1 | 20 | 5 | 74 |
| Steep phase | 1 | 0 | 99 | 0 |
| Very steep phase | 0 | 5 | 80 | 15 |
| Gullied land (Chandler and Clifton soil materials) | 0 | 0 | 20 | 80 |
| Porters stony loam: | | | | |
| Eroded very steep phase | 1 | 59 | 10 | 30 |
| Very steep phase | 0 | 0 | 100 | 0 |
| Ramsey stony loam: | | | | |
| Eroded steep phase | 12 | 50 | 15 | 23 |
| Steep phase | 0 | 0 | 100 | 0 |
| Very steep phase | 0 | 5 | 93 | 2 |
| Riverwash | 0 | 5 | 0 | 95 |
| Rock outcrop | 0 | 0 | 0 | 100 |
| Stony rough land (Ashe and Porters soil materials) | 0 | [1] 3 | 97 | 0 |

[1] Includes about 0.1 percent in crops.

#### MANAGEMENT GROUP 5

All the soils and land types of management group 5 except Riverwash are on the uplands. They have very steep relief of 60 percent or more, or a combination of steep relief, shallowness, and generally low fertility.

Most of the soils are forested, but some areas have been cleared and cultivated and have become moderately or severely eroded. These cleared and eroded areas are mapped as Chandler stony loam, eroded steep phase; Chandler stony loam, severely eroded steep phase; Gullied land (Chandler and Clifton soil materials); Porters stony loam, eroded very steep phase; and Ramsey

stony loam, eroded steep phase. Considering the total area of these eroded soils, about 48 percent is in idle cropland, 35 percent in open pasture, 13 percent in forest, and 4 percent in crops. A few areas of these eroded soils, especially of the Porters soil, will produce some pasture, but it is doubtful that the yields would warrant the cost and effort expended to obtain them. These soils are best used for forest. White pine or black locust are recommended for planting.

The soils of management group 5 that remain in forest have undergone little erosion. These account for about 80 percent of the total area in the group and are listed as follows; Ashe stony loam, very steep phase; Chandler stony loam, steep phase; Chandler stony loam, very steep phase; Porters stony loam, very steep phase; Ramsey stony loam, steep phase; Ramsey stony loam, very steep phase; and Stony rough land (Ashe and Porters soil materials).

Aside from the soils already listed, there are two miscellaneous land types—Riverwash and Rock outcrop—that are not forested and have not been cultivated. Riverwash consists principally of loose sandy, gravelly, cobbly, or stony material near streams but includes a few remnants of original bottom land and small areas of fine-textured soil material that sustain meager pasture. Riverwash is not suited to crops or pasture, and is poorly suited to forest. Rock outcrop consists of bare exposures of bedrock somewhat broken in places; it supports little or no tree growth, but most areas have some recreational value.

*Management requirements.*—Although most soils of this management group would produce some kind of pasture under proper management, it probably would be better to develop the whole group for forest products and recreation. This would involve reestablishing stands on the areas that have been cleared and eroded and practicing good forest management. Some important practices of good forest management are (1) selective cutting of trees; (2) growing of desirable species; (3) harvesting so as to avoid overcutting and serious damage to the undergrowth; and (4) protecting skidways. See last part of section on Forests for additional management suggestions for forests and woodlots.

## Management practices and estimated yields

Suitable crops, rotations, and water-control practices are listed by management groups in table 7; fertilizer requirements by crops and rotations, and dates for planting and fertilizing are given in table 8.

Average acre yields of more important crops to be expected over a period of years on the soils of Watauga County are listed in table 9. In columns A are yields to be expected under the prevailing, or common management practices; and in columns B are yields to be expected under improved management. Because these yields express the combined effect of soil characteristics, climate, and management, they also express the relative productivity of the soils.

The estimates in columns A are based on prevailing management as it is described for the various management groups in the section on Soil Use and Management. The estimates were derived primarily through observations and interviews made during the progress of field work. Farmers, county agricultural agents, and staff members of the North Carolina Agricultural Experiment Station were consulted. Their judgments were evaluated in arriving at the final yield figures. Many of the yield figures, especially those for hay and pasture, are almost entirely based on estimates. This was necessary because long-term records of actual yields could not be obtained.

The yields in columns B are almost entirely estimates, because data on crop yields under improved management are scarce. They are the judgments of men familiar with the agriculture of the county, who have taken into account the deficiencies of the soils and calculated the response those soils would make if management were designed to correct those deficiencies as far as feasible. Management considered necessary to obtain yields listed in columns B is equivalent to that given in tables 7, 8, and 9.[3] Such management includes (1) proper choice and rotation of crops; (2) correct use of commercial fertilizer, lime and manure; (3) use of proper tillage methods; (4) return of organic matter to the soils; (5) use of engineering methods for water control. All of these must be carried on, within practical limits, to maintain or increase productivity, to maintain or improve workability, and to conserve soil materials, plant nutrients, and soil moisture.

[3] Recommendations for liming are not given in these tables, but will be found under the various management groups in the section on Soil Use and Management.

TABLE 7.—*Suitable crops, rotations, and water control practices by management groups of the soils of Watauga County, N. C.*

| Management group and soil | Specially suited crops | Suggested rotations [1] | Water control | Remarks |
|---|---|---|---|---|
| Group 1-A:<br>Congaree fine sandy loam<br>Congaree loam | Corn, truck crops, tobacco, small grains, hay, and pasture. | 1. Tobacco, corn, rye as winter cover to be turned under.<br>3. Potatoes or cabbage, corn, crimson clover<br>6. Snap beans or corn, crimson clover<br>9. Corn or buckwheat, crimson clover | Protection from floods by deepening stream channels and where practicable by constructing levees. | When row crops are grown, the soils should be handled intensively. |
| Group 1-B:<br>Perkinsville loam, undulating phase<br>State loam, undulating phase<br>Tate loam, undulating phase<br>Tusquitee loam, undulating phase<br>Watauga loam, undulating phase | Corn, truck crops, tobacco, small grains, hay, and pasture. | 1. Tobacco, corn, rye as winter cover to be turned under.<br>4. Potatoes or cabbage, small grain, hay for 2 years.<br>7. Snap beans, small grain, hay for 2 years<br>9. Corn or buckwheat, crimson clover<br>10. Corn, small grain, hay for 2 years<br>11. Corn, crimson clover, alfalfa 4 years<br>12. Corn, small grain, alfalfa 3 years, or more | Contour tillage | Most of the forested areas could be cleared and used for crops. |
| Group 2-A:<br>Chewacla loam<br>Toxaway loam | Corn, small grains, hay, and pasture; truck crops when soil is adequately drained. | 3. Potatoes or cabbage, corn, crimson clover<br>6. Snap beans or corn, crimson clover<br>13. Continuous hay of mixed grasses and clover.<br>14. Continuous pasture | Some artificial drainage necessary for crops and pasture. | Soils excellent for truck crops and corn when adequately drained; Toxaway soil difficult to drain in many places because of low-lying position. |

See footnotes at end of table.

TABLE 7.—*Suitable crops, rotations, and water control practices by management groups of the soils of Watauga County, N. C.*—Continued

| Management group and soil | Specially suited crops | Suggested rotations [1] | Water control | Remarks |
|---|---|---|---|---|
| Group 2-B:<br>Clifton stony loam, rolling phase<br>Halewood loam, rolling phase<br>Matney loam, rolling phase<br>Perkinsville loam, rolling phase<br>Perkinsville stony loam, rolling phase<br>Tate loam, rolling phase<br>Tate stony loam, rolling phase<br>Tusquitee loam, rolling phase<br>Tusquitee stony loam:<br>Rolling phase<br>Undulating phase<br>Watauga loam:<br>Eroded rolling phase<br>Rolling phase<br>Watauga stony loam, rolling phase | Hay, pasture, apple orchards; small grains, corn, truck crops, and pasture on nonstony areas. | 2. Tobacco, small grain, hay for 2 years<br>3. Potatoes or cabbage, corn, crimson clover<br>6. Snap beans or corn, crimson clover<br>9. Corn or buckwheat, crimson clover<br>10. Corn, small grain, hay for 2 years<br>11. Corn, crimson clover, alfalfa 4 years<br>13. Continuous hay of mixed grasses and clover<br>14. Continuous pasture | Contour tillage; strip crops on the more sloping areas. | In the stony soils, stones interfere with cultivation, but many farmers remove most of them; rolling phases of Perkinsville, Tate, and Tusquitee loams are excellent for tobacco and truck crops. |
| Group 3-A:<br>Buncombe loamy fine sand<br>Congaree cobbly fine sandy loam | Corn, hay, and pasture.[2] | 3. Potatoes or cabbage, corn, crimson clover<br>4. Potatoes or cabbage, small grain, hay for 2 years.<br>6. Snap beans or corn, crimson clover<br>7. Snap beans, small grain, hay for 2 years<br>13. Continuous hay of mixed grasses and clover<br>14. Continuous pasture | Protect from floods by deepening stream channels or by constructing levees if practicable. | Soils somewhat loose and open; tend to be droughty; subject to flooding, usually once every 4 to 5 years. |
| Group 3-B:<br>Chewacla cobbly loam | Hay, pasture, corn | 3. Potatoes or cabbage, corn, crimson clover<br>6. Snap beans or corn, crimson clover<br>13. Continuous hay of mixed grasses and clover<br>14. Continuous pasture | Protect from floods by deepening stream channels or by constructing levees if practicable. | When enough stones are removed, the soil is very good for truck crops. |
| Group 3-C:<br>Augusta loam<br>Worsham loam | Hay, pasture, corn | 3. Potatoes or cabbage, corn, crimson clover<br>6. Snap beans or corn, crimson clover<br>13. Continuous hay of mixed grasses and clover.<br>14. Continuous pasture [3] | Some artificial drainage necessary for crops and pasture. | Soils somewhat difficult to handle because of their heavy subsoil. |
| Group 3-D:<br>Ashe stony loam, eroded hilly phase<br>Clifton clay loam, eroded hilly phase<br>Clifton stony clay loam, eroded hilly phase.<br>Halewood clay loam, eroded hilly phase.<br>Halewood stony clay loam, eroded hilly phase.<br>Hayesville clay loam, eroded hilly phase.<br>Matney loam, eroded hilly phase<br>Matney stony loam, eroded hilly phase.<br>Perkinsville loam, eroded hilly phase<br>Perkinsville stony loam, eroded hilly phase.<br>Porters loam, eroded hilly phase<br>Porters stony loam, eroded hilly phase.<br>Tusquitee stony loam, eroded hilly phase.<br>Watauga loam, eroded hilly phase<br>Watauga stony loam, eroded hilly phase. | Pasture, hay, small grains, apple orchards, and forest. | 2. Tobacco, small grain, hay for 2 years<br>5. Potatoes or cabbage, hay for 2 years, pasture 2 years.<br>7. Snap beans, small grain, hay for 2 years<br>8. Snap beans or corn, hay for 2 years, pasture 2 years.<br>10. Corn, small grain, hay for 2 years<br>13. Continuous hay of mixed grasses and clover.<br>14. Continuous pasture | Contour tillage and stripcropping. | For erosion control, cleared land should be protected by grass cover and that uncleared should remain in forest; if row crops must be grown, suggested rotations will afford maximum protection against erosion. |
| Group 3-E:<br>Ashe stony loam, hilly phase<br>Burton stony loam, hilly phase<br>Clifton stony loam, hilly phase<br>Halewood loam, hilly phase<br>Halewood stony loam, hilly phase<br>Hayesville loam, hilly phase<br>Matney loam, hilly phase<br>Matney stony loam, hilly phase<br>Perkinsville loam, hilly phase<br>Porters loam, hilly phase<br>Porters stony loam, hilly phase<br>Tate loam, hilly phase<br>Tate stony loam, hilly phase<br>Tusquitee loam, hilly phase<br>Tusquitee stony loam, hilly phase<br>Watauga loam, hilly phase<br>Watauga stony loam, hilly phase | Forest, pasture, and hay. | 5. Potatoes or cabbage, hay for 2 years, pasture 2 years.<br>7. Snap beans, small grain, hay for 2 years<br>8. Snap beans or corn, hay for 2 years, pasture 2 years.<br>10. Corn, small grain, hay for 2 years<br>13. Continuous hay of mixed grasses and clover.<br>14. Continuous pasture | None for pasture or forest; contour tillage and stripcropping for cultivated land. | Practically all or all areas are in forest; if necessary to use land for cultivation, rotations 5, 7, 8, and 10 are suitable if row crops are to be grown. |
| Group 4-A:<br>Wehadkee loam<br>Peaty phase | Pasture, hay, and forest. | 3. Potatoes or cabbage, corn, crimson clover<br>6. Snap beans or corn, crimson clover<br>13. Continuous hay of mixed grasses and clover.<br>14. Continuous pasture | All areas subject to flooding every 2 or 3 years; Wehadkee loam must be adequately drained for cultivated crops; some drainage necessary for hay and pasture; none of peaty phase used for agriculture; phase very difficult to drain. | Wehadkee loam good to very good for corn and truck crops if adequately drained. |
| Group 4-B:<br>Stony colluvium (Tusquitee and Tate soil materials).<br>Stony hilly land (Ashe and Porters soil materials). | Forest and pasture | 14. Continuous pasture | Keep in permanent sod or forest. | Stones may be removed from some areas, and soils handled as suggested for Group 3-D. |

**See footnotes at end of table.**

TABLE 7.—*Suitable crops, rotations, and water control practices by management groups of the soils of Watauga County, N. C.*—Continued

| Management group and soil | Specially suited crops | Suggested rotations [1] | Water control | Remarks |
|---|---|---|---|---|
| Group 4-C:<br>Ashe loam, eroded steep phase<br>Ashe stony loam, eroded steep phase<br>Chandler loam, eroded steep phase<br>Clifton clay loam, eroded steep phase<br>Clifton stony clay loam, eroded steep phase.<br>Halewood clay loam, eroded steep phase.<br>Halewood stony clay loam, eroded steep phase.<br>Hayesville clay loam, eroded steep phase.<br>Porters loam, eroded steep phase<br>Porters stony loam, eroded steep phase. | Forest, pasture, hay, and apple orchards. | 5. Potatoes or cabbage, hay for 2 years, pasture 2 years.<br>8. Snap beans or corn, hay for 2 years, pasture 2 years.<br>13. Continuous hay of mixed grasses and clover.<br>14. Continuous pasture | Contour tillage and strip-cropping on all cultivated areas. | Great care must be taken to control erosion; all areas should be in permanent sod; but as this is not feasible in present economy, strip rotations should be followed and a half to two-thirds of each tilled area used every year for sod-type vegetation; a tilled crop should not occupy field or strip more often than 1 year in 5. |
| Group 4-D:<br>Ashe loam, steep phase<br>Ashe stony loam, steep phase<br>Chandler loam, steep phase<br>Clifton stony loam, steep phase<br>Halewood loam, steep phase<br>Halewood stony loam, steep phase<br>Hayesvile stony loam, steep phase<br>Porters loam, steep phase<br>Porters stony loam, steep phase | Forest | None | The soils are all or nearly all in forest. | All areas are too steep, stony, or both, for cultivation without great difficulty; cleared land subject to severe erosion if not protected. |
| Group 5:<br>Ashe stony loam, very steep phase<br>Chandler stony loam:<br>Eroded steep phase<br>Severely eroded steep phase<br>Steep phase<br>Very steep phase<br>Gullied land (Chandler and Clifton soil materials).<br>Porters stony loam:<br>Eroded very steep phase<br>Very steep phase<br>Ramsey stony loam:<br>Eroded steep phase<br>Steep phase<br>Very steep phase<br>Riverwash<br>Rock outcrop<br>Stony rough land (Ashe and Porters soil materials). | Forest | None | | Forested land should remain in forest; cleared land should be reforested with white pine or locust; in severely eroded areas, trees should be mulched and dams constructed in gullies; where necessary to keep pasture on the land, special care must be used to maintain a good sod by reseeding, liming, fertilizing, clipping undesirable herbage, controlling grazing, or by other similar methods. |

[1] The number preceding the rotation refers to the number of the rotation in table 8.
[2] These crops are only fairly well suited.
[3] An additional suggested rotation is corn, crimson clover (to be plowed under for buckwheat), wheat, hay for 2 years.

TABLE 8.—*Fertilizer requirements by crops, suggested rotations, and dates for planting crops and applying fertilizer in Watauga County, N. C.*

| Rotation and crop [1] [2] | Date of planting [3] | Date of fertilizer application | Fertilizer requirements per acre [4] [5] | | | Remarks |
|---|---|---|---|---|---|---|
| | | | Nitrogen (N) | Phosphoric acid ($P_2O_5$) | Potash ($K_2O$) | |
| | | | *Pounds* | *Pounds* | *Pounds* | |
| Rotation 1 (for management groups 1-A and 1-B): | | | | | | If land is low in organic matter, apply 5 to 7 tons of manure late in winter; rye should be sown in tobacco or in corn stubble before Oct. 10 and turned under in spring in time to prepare a good seedbed for the next tobacco or corn crop. |
| Tobacco | May 20-June 15 | May 1-15 | 24 | 72 | 72 | |
| Corn | May 1-June 1 | At planting | 36 | 48 | 36 | |
| | | 6 to 8 weeks after planting | 48 | | | |
| Rotation 2 (for management groups 2-B and 3-D): | | | | | | Add manure late in winter to land for tobacco; if hay yields are low, increase applications of phosphoric acid and potash. |
| Tobacco | May 20-June 15 | May 1-15 | 36 | 108 | 108 | |
| Small grain | Sept. 25-Oct. 20 | Mar. 10-30 | 32 | | | |
| Hay | Mar. 10-Apr. 10 | At seeding | | 72 | 72 | |
| Hay | | | | | | |
| Rotation 3 (for management groups 1-A, 2-A, 2-B, 3-A, 3-B, 3-C, and 4-A): | | | | | | Lime may be added when cabbage is grown in the rotation; when potatoes are grown, however, lime may result in an increase in potato scab; additional nitrogen may be necessary for soils of group 2-B. |
| Potatoes | Mar. 10-Apr. 15 | At planting | 36 | 48 | 36 | |
| Or cabbage | June 1-July 1 | At setting | 56 | 56 | 56 | |
| | | 3 weeks after setting | 24 | | | |
| Corn | May 1-June 1 | At planting | 36 | 48 | 36 | |
| | | 6 to 8 weeks after planting | 64 | | | |
| Crimson clover | Last corn cultivation | | | | | |
| Rotation 4 (for management groups 1-B and 3-A): | | | | | | Lime applications should not be heavy when potatoes are grown in the rotation. |
| Potatoes | Mar. 10-Apr. 15 | At planting | 42 | 56 | 42 | |
| Or cabbage | June 1-July 1 | At setting | 63 | 63 | 63 | |
| | | 3 weeks after setting | 32 | | | |
| Small grain | Sept. 25-Oct. 20 | Mar. 10-30 | 48 | | | |
| Hay | Mar. 10-Apr. 10 | At seeding | | 84 | 84 | |
| Hay | | | | | | |

**See footnotes at end of table.**

TABLE 8.—*Fertilizer requirements by crops, suggested rotations, and dates for planting crops and applying fertilizer in Watauga County, N. C.*—Continued

| Rotation and crop [1] [2] | Date of planting [3] | Date of fertilizer application | Fertilizer requirements per acre [4] [5] | | | Remarks |
|---|---|---|---|---|---|---|
| | | | Nitrogen (N) | Phosphoric acid ($P_2O_5$) | Potash ($K_2O$) | |
| | | | *Pounds* | *Pounds* | *Pounds* | |
| Rotation 5 (for management groups 3-D, 3-E, 4-C): | | | | | | |
| Potatoes | Mar. 10-Apr. 15 | At planting | 54 | 72 | 54 | Where possible in the farm economy, pasture should be continued one or more years longer in the rotation. |
| Or cabbage | June 1-July 1 | At setting | 45 | 90 | 45 | |
| | | 3 weeks after setting | 48 | | | |
| Hay | Aug. 15-Sept. 15 | | | | | |
| Hay | | | | | | |
| Pasture | | Mar. 10-Apr. 10 | | 60 | 60 | |
| Rotation 6 (for management groups 1-A, 2-A, 2-B, 3-A, 3-B, 3-C, and 4-A): | | | | | | |
| Snap beans | Mar. 25-June 20 | At planting | 32 | 96 | 64 | On soils of group 2-B corn and beans may require an additional 10 to 20 pounds an acre of nitrogen. |
| | | At flowering | 24 | | | |
| Or corn | May 1-June 1 | At planting | 25 | 50 | 25 | |
| | | 6 to 8 weeks after planting | 64 | | | |
| Crimson clover | Last corn cultivation | | | | | |
| Rotation 7 (for management groups 1-B, 3-A, 3-D, and 3-E): | | | | | | |
| Snap beans | Mar. 25-June 20 | At planting | 32 | 95 | 64 | For soils of group 3-D, continue hay in the rotation for 1 or 2 years longer and apply additional phosphoric acid and potash. |
| | | At flowering | 24 | | | |
| Small grain | Sept. 25-Oct. 20 | Mar. 10-30 | 32 | | | |
| Hay | Mar. 10-Apr. 10 | At seeding | | 48 | 48 | |
| Hay | | | | | | |
| Rotation 8 (for management groups 3-D, 3-E, and 4-C): | | | | | | |
| Snap beans | Mar. 25-June 20 | At planting | 36 | 108 | 72 | It is advisable to keep pasture on the soils of group 4-C for 3 or 4 years and to apply additional phosphoric acid and potash. |
| | | At flowering | 32 | | | |
| Or corn | May 1-June 1 | At planting | 30 | 60 | 30 | |
| | | 6 to 8 weeks after planting | 64 | | | |
| Hay | Mar. 10-Apr. 10 | | | | | |
| Hay | | Mar. 10-30 | | 60 | 60 | |
| Pasture | | | | | | |
| Pasture | | Mar. 10-30 | | 60 | 60 | |
| Rotation 9 (for management groups 1-A, 1-B, and 2-B): | | | | | | |
| Corn | May 1-June 1 | At planting | 36 | 48 | 36 | Experience may indicate that yields can be increased by applying 10 to 20 pounds more nitrogen an acre for corn or buckwheat. |
| | | 6 to 8 weeks after planting | 48 | | | |
| Or buckwheat | June 1-July 20 | At planting | 6 | 24 | 12 | |
| Crimson clover | Aug. 20-Sept. 20 (after the buckwheat is cut). | | | | | |
| Rotation 10 (for management groups 1-B, 2-B, 3-D, and 3-E): | | | | | | |
| Corn | May 1-June 1 | At planting | 42 | 56 | 42 | On soils of group 3-D, continue hay 1 or 2 years longer and apply additional phosphoric acid and potash. |
| | | 6 to 8 weeks after planting | 48 | | | |
| Small grain | Sept. 25-Oct. 20 | Mar. 10-30 | 48 | | | |
| Hay | Mar. 10-Apr. 10 | At seeding | | 48 | 48 | |
| Hay | | | | | | |
| Rotation 11 (for management groups 1-B and 2-B): | | | | | | |
| Corn | May 1-June 1 | At planting | 42 | 56 | 42 | For alfalfa, plow under the crimson clover in the rotation and prepare a good seedbed; heavy applications of lime (test soil) will be necessary; agricultural borax should be applied at seeding (20 to 30 pounds an acre) unless the fertilizer contains this amendment; if alfalfa growth is unsatisfactory, apply additional phosphoric acid. |
| | | 6 to 8 weeks after planting | 48 | | | |
| Crimson clover | Last corn cultivation | | | | | |
| Alfalfa | Aug. 10-Sept. 10 | At seeding | 20 | 120 | 120 | |
| Alfalfa | | Mar. 20-Apr. 5 | | | 75 | |
| Alfalfa | | Mar. 20-Apr. 5 | | 60 | 60 | |
| Alfalfa | | Mar. 20-Apr. 5 | | | 75 | |
| Rotation 12 (for management group 1-B): | | | | | | |
| Corn | May 1-June 1 | At planting | 42 | 56 | 42 | For alfalfa, cut the small grain in the rotation and prepare a good seedbed; heavy applications of lime (test soil) will be necessary; agricultural borax should be applied at seeding (20 to 30 pounds an acre) unless the fertilizer contains this amendment; if alfalfa growth is unsatisfactory, apply additional phosphoric acid. |
| | | 6 to 8 weeks after planting | 48 | | | |
| Small grain | Sept. 20-Oct. 20 | Mar. 10-30 | 32 | | | |
| Alfalfa | Aug. 10-Sept. 10 | At seeding | 20 | 120 | 120 | |
| Alfalfa | | Mar. 20-Apr. 5 | | | 60 | |
| Alfalfa | | Mar. 20-Apr. 5 | | | 60 | |
| Rotation 13 (for management groups 2-A, 2-B, 3-A, 3-B, 3-C, 3-D, 3-E, 4-A, and 4-C): | | | | | | |
| Hay (continuous) | Mar. 10-Apr. 10 or Aug. 10-Sept. 10. | At seeding | | 56 | 28 | When seeding hay, sow the mixture in a small grain or in corn or some other clean-tilled crop; 1 to 2 tons of lime an acre will be needed to maintain a satisfactory stand of clover. |
| | | In alternate years | | 56 | 50 | |
| Rotation 14 (for management groups 2-A, 2-B, 3-A, 3-B, 3-C, 3-D, 3-E, 4-A, 4-B, 4-C:) | | | | | | |
| Pasture (continuous) | Mar. 10-Apr. 10 or Aug. 10-Sept. 10. | At seeding | | 70 | 35 | The pasture mixture may be sown in a small grain or in corn or some other clean-tilled crop at last cultivation; maintaining a satisfactory grass-clover balance will require addition of lime at intervals of 4 to 7 years as indicated by soil tests; controlled grazing, clipping to check weeds, and adequate fertilization are essential. |
| | | In alternate years | | 70 | 35 | |

[1] Hay in the rotations is a grass-legume mixture, usually orchardgrass, timothy ,and red clover, but occasionally also redtop, fescue, alsike, and white clover.

[2] Other rotations than those given may be used with the management groups. A good rotation should be well suited to the farming system, provide best protection for the soil, and maintain or improve fertility.

[3] Date of transplanting for tobacco an l cabbage.

[4] Each soil should be tested for lime requirements, and the lime applications should be most suitable for the crops grown and the type of rotation followed.

[5] Manure preferably should be applied to thin or galled spots, especially those in soils of uplands. When it is applied uniformly to a field, the best returns are usually made by corn, tobacco, and alfalfa. Fertilizer applications may be decreased by 10 pounds of nitrogen, 5 pounds of phosphoric acid, and 10 pounds of potash an acre for each ton of manure used.

TABLE 9.—*Average per-acre yields of the principal crops to be expected over a period of years under 2 levels of management and the pasture-carrying capacity of each soil in Watauga County, N. C.*

[In columns A, yields to be expected under prevailing, or common, management practices; in columns B, expected yields under better management practices. Blank spaces indicate crop is not generally grown and soil is considered poorly suited to it under the management specified]

| Soil | Management group | Corn | | Oats | | Rye | | Wheat | | Buckwheat | | Clover and grass hay | | Potatoes | | Snap beans | | Cabbage | | Tobacco (burley) | | Permanent pasture | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B |
| | | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Lb.* | *Lb.* | *Cow-acre-days* [1] | *Cow-acre-days* |
| Ashe loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded steep phase | 4-C | 8 | 24 | 15 | ----- | 6 | ----- | 5 | ----- | 10 | ----- | 0.5 | 1.0 | 60 | 130 | 75 | 120 | 5.0 | 8.0 | 500 | ------ | 45 | 70 |
| Ashe stony loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 12 | 35 | 17 | 28 | 7 | 11 | 7 | 12 | 11 | 19 | .7 | 1.2 | 80 | 140 | 85 | 130 | 6.0 | 9.0 | 600 | 900 | 55 | 80 |
| Eroded steep phase | 4-C | 6 | 20 | 12 | ----- | 5 | ----- | 4 | ----- | 9 | ----- | .4 | .9 | 50 | 100 | 60 | ----- | 4.0 | ----- | 400 | ------ | 30 | 65 |
| Augusta loam [3] | 3-C | 36 | 60 | 18 | 35 | 6 | 14 | 6 | 14 | 17 | 23 | 1.0 | 1.7 | 90 | 160 | 90 | 140 | 6.0 | 12.0 | ------ | 1,600 | 60 | 100 |
| Buncombe loamy fine sand [4] | 3-A | 12 | 30 | 20 | 30 | 5 | 10 | 5 | 10 | 12 | 18 | .6 | 1.2 | 60 | 100 | 80 | 110 | ----- | ----- | ------ | ------ | 50 | 65 |
| Burton stony loam, hilly phase | 3-E | 23 | 36 | 20 | 30 | ----- | ----- | ----- | ----- | 15 | 22 | 1.2 | 1.6 | 80 | 140 | ----- | ----- | 7.0 | 9.0 | ------ | ------ | 60 | 80 |
| Chandler loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded steep phase | 4-C | 8 | 20 | 10 | ----- | 5 | ----- | 4 | ----- | 7 | ----- | .3 | ----- | 50 | ----- | 40 | ----- | 3.0 | ----- | ------ | ------ | 20 | 45 |
| Chandler stony loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded steep phase | 5 | 6 | 15 | 8 | ----- | 4 | ----- | 3 | ----- | 5 | ----- | .2 | ----- | 35 | ----- | 30 | ----- | 2.0 | ----- | ------ | ------ | 10 | 25 |
| Severely eroded steep phase | 5 | ----- | ----- | 5 | ----- | 3 | ----- | 2 | ----- | ----- | ----- | .1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ------ | ------ | 8 | ------ |
| Chewacla cobbly loam [3 4] | 3-B | 18 | 45 | 12 | 30 | 5 | 12 | 4 | 12 | 10 | 18 | .9 | 1.5 | 60 | 120 | 60 | 120 | 2.5 | 7.0 | 500 | 1,000 | 65 | 90 |
| Chewacla loam [3 4] | 2-A | 38 | 75 | 18 | 36 | 6 | 15 | 6 | 14 | 17 | 23 | 1.2 | 1.8 | 90 | 160 | 95 | 150 | 5.0 | 12.0 | 700 | 1,600 | 75 | 100 |
| Clifton clay loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 18 | 45 | 22 | 34 | 10 | 18 | 10 | 20 | 12 | 20 | 1.0 | 2.0 | 100 | 140 | 110 | 140 | 7.0 | 9.0 | 900 | 1,500 | 60 | 80 |
| Eroded steep phase | 4-C | 12 | ----- | 14 | ----- | 7 | ----- | 6 | ----- | 9 | ----- | .4 | ----- | 60 | ----- | 75 | ----- | 4.0 | ----- | ------ | ------ | 30 | 60 |
| Clifton stony clay loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 15 | 40 | 18 | 30 | 8 | 12 | 8 | 12 | 10 | 18 | .7 | 1.3 | 70 | 115 | 85 | 120 | 3.5 | 7.0 | 800 | 1,100 | 55 | 70 |
| Eroded steep phase | 4-C | 10 | ----- | 12 | ----- | 6 | ----- | 5 | ----- | 7 | ----- | .3 | ----- | 50 | ----- | 60 | ----- | 3.0 | ----- | ------ | ------ | 20 | 50 |
| Clifton stony loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Rolling phase | 2-B | 32 | 55 | 26 | 38 | 15 | 22 | 12 | 22 | 16 | 28 | 1.2 | 2.1 | 100 | 160 | 120 | 160 | 8.0 | 11.0 | 1,200 | 1,700 | 70 | 90 |
| Congaree cobbly fine sandy loam [4] | 3-A | 25 | 40 | 18 | 25 | 7 | 11 | 8 | 12 | 10 | 15 | .6 | 1.2 | 70 | 120 | 60 | 90 | ----- | ----- | ------ | ------ | 50 | 70 |
| Congaree fine sandy loam [4] | 1-A | 45 | 80 | 32 | 45 | 12 | 18 | 12 | 18 | 18 | 25 | 1.2 | 2.0 | 145 | 200 | 135 | 170 | 7.5 | 15.0 | 1,500 | 2,000 | 75 | 100 |
| Congaree loam [4] | 1-A | 50 | 90 | 35 | 50 | 12 | 18 | 12 | 18 | 20 | 28 | 1.4 | 2.2 | 145 | 200 | 140 | 180 | 8.0 | 16.0 | 1,800 | 2,200 | 80 | 105 |
| Halewood clay loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 20 | 42 | 20 | 34 | 9 | 13 | 10 | 14 | 12 | 20 | .9 | 1.5 | 90 | 150 | 90 | 140 | 5.5 | 9.0 | 900 | 1,400 | 60 | 80 |
| Eroded steep phase | 4-C | 10 | 25 | 15 | ----- | 4 | 10 | 5 | 12 | 9 | ----- | .3 | .7 | 60 | 100 | 75 | 100 | 4.0 | 6.0 | ------ | ------ | 25 | 50 |
| Halewood loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Rolling phase | 2-B | 38 | 65 | 25 | 40 | 14 | 18 | 15 | 20 | 18 | 26 | 1.2 | 1.8 | 120 | 190 | 120 | 160 | 7.0 | 13.0 | 1,200 | 1,700 | 65 | 90 |
| Halewood stony clay loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 17 | 36 | 12 | 26 | 7 | 14 | 8 | 15 | 10 | 18 | .7 | 1.3 | 85 | 135 | 80 | 130 | 4.5 | 7.0 | 800 | 1,200 | 50 | 70 |
| Eroded steep phase | 4-C | 10 | ----- | 10 | ----- | 5 | ----- | 6 | ----- | 7 | ----- | .3 | ----- | 50 | ----- | 60 | ----- | 3.0 | ----- | ------ | ------ | 20 | 40 |
| Halewood stony loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Hayesville clay loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 15 | 35 | 18 | 30 | 9 | 14 | 10 | 15 | ----- | ----- | .8 | 1.3 | 60 | 100 | ----- | ----- | ----- | ----- | ------ | ------ | 50 | 70 |
| Eroded steep phase | 4-C | 10 | ----- | 11 | ----- | 6 | ----- | 7 | ----- | ----- | ----- | .2 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ------ | ------ | 10 | 45 |
| Matney loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 18 | 36 | 15 | 25 | 6 | 10 | 7 | 11 | 10 | 17 | .7 | 1.2 | 80 | 130 | 85 | 120 | 5.0 | 8.5 | 800 | 1,300 | 50 | 70 |
| Rolling phase | 2-B | 35 | 60 | 22 | 35 | 11 | 16 | 12 | 17 | 17 | 25 | 1.0 | 1.6 | 110 | 160 | 110 | 150 | 7.0 | 12.0 | 1,000 | 1,500 | 65 | 85 |
| Matney stony loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 15 | 32 | 12 | 22 | 5 | 9 | 6 | 10 | 8 | 16 | .5 | 1.0 | 70 | 110 | 70 | 100 | 4.0 | 6.0 | 700 | 1,100 | 40 | 55 |
| Perkinsville loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 28 | 48 | 20 | 32 | 8 | 12 | 9 | 13 | 11 | 19 | .8 | 1.4 | 100 | 160 | 100 | 130 | 6.0 | 12.0 | 1,000 | 1,400 | 60 | 75 |
| Rolling phase | 2-B | 38 | 70 | 30 | 42 | 13 | 18 | 14 | 19 | 20 | 30 | 1.2 | 2.0 | 125 | 190 | 125 | 160 | 8.5 | 14.0 | 1,400 | 1,800 | 70 | 90 |
| Undulating phase | 1-B | 45 | 80 | 32 | 45 | 14 | 20 | 16 | 22 | 22 | 30 | 1.4 | 2.0 | 140 | 200 | 135 | 165 | 10.0 | 15.0 | 1,600 | 2,000 | 75 | 90 |
| Perkinsville stony loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 20 | 38 | 15 | 28 | 6 | 10 | 7 | 11 | 9 | 16 | .6 | 1.2 | 90 | 130 | 80 | 110 | 4.5 | 8.5 | 800 | 1,200 | 50 | 65 |
| Rolling phase | 2-B | 30 | 55 | 20 | 35 | 9 | 14 | 10 | 15 | 16 | 22 | 1.0 | 1.7 | 115 | 150 | 115 | 145 | 7.0 | 9.0 | 1,000 | 1,300 | 60 | 80 |
| Porters loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 28 | 48 | 20 | 35 | 8 | 14 | 9 | 15 | 11 | 19 | 1.0 | 2.0 | 100 | 160 | 100 | 140 | 6.0 | 12.0 | 1,000 | 1,400 | 65 | 90 |
| Eroded steep phase | 4-C | 18 | 35 | 17 | ----- | 6 | ----- | 7 | ----- | 10 | ----- | .5 | 1.3 | 80 | 135 | 85 | ----- | 5.5 | ----- | 800 | ------ | 50 | 75 |
| Hilly phase | 3-E | 33 | 50 | 26 | 38 | 10 | 16 | 11 | 17 | 18 | 25 | 1.2 | 2.0 | 110 | 170 | 115 | 150 | 8.0 | 12.5 | 1,200 | 1,600 | 75 | 90 |
| Porters stony loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 20 | 45 | 15 | 30 | 6 | 11 | 7 | 12 | 9 | 17 | .8 | 1.7 | 80 | 140 | 85 | 125 | 4.5 | 9.0 | 800 | 1,200 | 60 | 80 |
| Eroded steep phase | 4-C | 10 | 25 | 10 | ----- | 4 | ----- | 5 | ----- | 7 | ----- | .3 | 1.1 | 65 | ----- | 65 | ----- | 3.5 | ----- | 500 | ------ | 40 | 65 |
| Eroded very steep phase | 5 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ------ | ------ | 20 | 40 |
| Ramsey stony loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded steep phase | 5 | 9 | ----- | 7 | ----- | 3 | ----- | 3 | ----- | 5 | ----- | .2 | ----- | 30 | ----- | ----- | ----- | 2.0 | ----- | ------ | ------ | 15 | ------ |
| State loam, undulating phase | 1-B | 45 | 90 | 40 | 60 | 12 | 20 | 14 | 22 | 22 | 34 | 1.5 | 2.4 | 150 | 210 | 150 | 185 | 10.0 | 17.0 | 1,800 | 2,400 | 80 | 100 |
| Stony colluvium (Tusquitee and Tate soil materials) | 4-B | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ------ | ------ | 30 | 60 |
| Stony hilly land (Ashe and Porters soil materials)[2] | 4-B | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ------ | ------ | 30 | 60 |
| Tate loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Hilly phase | 3-E | 28 | 50 | 26 | 38 | 11 | 16 | 12 | 17 | 15 | 22 | 1.0 | 1.6 | 110 | 160 | 115 | 145 | 7.0 | 9.5 | 1,100 | 1,600 | 70 | 85 |
| Rolling phase | 2-B | 35 | 70 | 30 | 42 | 13 | 20 | 14 | 21 | 17 | 23 | 1.1 | 1.9 | 130 | 180 | 130 | 160 | 8.0 | 12.0 | 1,300 | 1,900 | 75 | 90 |
| Undulating phase | 1-B | 40 | 75 | 32 | 45 | 15 | 21 | 16 | 22 | 18 | 25 | 1.2 | 2.0 | 140 | 190 | 135 | 170 | 10.0 | 14.0 | 1,800 | 2,100 | 80 | 95 |
| Tate stony loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Hilly phase | 3-E | 20 | 42 | 20 | 32 | 8 | 12 | 9 | 13 | 12 | 19 | .9 | 1.4 | 85 | 145 | 100 | 135 | 5.5 | 8.0 | 900 | 1,400 | 55 | 75 |
| Rolling phase | 2-B | 24 | 50 | 22 | 38 | 10 | 15 | 10 | 16 | 12 | 22 | 1.0 | 1.6 | 90 | 160 | 100 | 145 | 7.0 | 9.5 | 1,100 | 1,700 | 70 | 85 |
| Toxaway loam [3 4] | 2-A | 30 | 90 | 25 | 60 | ----- | 10 | ----- | 12 | 20 | 30 | 1.0 | 2.4 | ----- | 200 | ----- | 180 | ----- | 12.0 | ------ | ------ | 90 | 110 |
| Tusquitee loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Hilly phase | 3-E | 35 | 60 | 28 | 42 | 12 | 17 | 13 | 18 | 16 | 24 | 1.2 | 1.8 | 120 | 170 | 120 | 150 | 7.5 | 11.0 | 1,200 | 1,800 | 70 | 85 |
| Rolling phase | 2-B | 40 | 80 | 32 | 55 | 9 | 18 | 10 | 20 | 17 | 30 | 1.5 | 2.1 | 135 | 185 | 130 | 160 | 8.5 | 13.0 | 1,500 | 2,000 | 75 | 90 |
| Undulating phase | 1-B | 45 | 90 | 36 | 60 | 10 | 20 | 12 | 22 | 20 | 32 | 1.7 | 2.3 | 140 | 200 | 140 | 170 | 9.5 | 16.0 | 1,700 | 2,200 | 80 | 100 |
| Tusquitee stony loam: | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 20 | 45 | 18 | 32 | 7 | 11 | 8 | 12 | 10 | 18 | .8 | 1.3 | 80 | 145 | 95 | 130 | 5.0 | 8.5 | 900 | 1,500 | 55 | 70 |
| Hilly phase | 3-E | 25 | 48 | 22 | 35 | 9 | 13 | 10 | 14 | 13 | 20 | 1.0 | 1.6 | 90 | 150 | 105 | 140 | 6.0 | 9.0 | 1,000 | 1,600 | 60 | 80 |
| Rolling phase | 2-B | 32 | 60 | 25 | 42 | 11 | 17 | 12 | 18 | 14 | 24 | 1.1 | 1.8 | 110 | 170 | 110 | 150 | 7.0 | 11.0 | 1,100 | 1,800 | 65 | 90 |
| Undulating phase | 2-B | 36 | 80 | 30 | 55 | 9 | 18 | 10 | 20 | 17 | 30 | 1.3 | 2.0 | 130 | 185 | 125 | 160 | 8.0 | 13.0 | 1,400 | 2,000 | 70 | 95 |
| Watauga loam:[2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 25 | 45 | 22 | 34 | 9 | 13 | 10 | 14 | 10 | 18 | .9 | 1.2 | 85 | 150 | 95 | 140 | 6.5 | 9.5 | 900 | 1,400 | 55 | 70 |
| Eroded rolling phase | 2-B | 26 | 60 | 25 | 38 | 11 | 19 | 12 | 20 | 13 | 20 | 1.1 | 1.7 | 100 | 165 | 110 | 150 | 7.0 | 10.5 | 1,100 | 1,600 | 60 | 75 |
| Rolling phase | 2-B | 32 | 65 | 28 | 40 | 12 | 19 | 13 | 20 | 15 | 21 | 1.3 | 1.8 | 120 | 170 | 120 | 155 | 7.5 | 11.0 | 1,200 | 1,700 | 65 | 80 |
| Undulating phase | 1-B | 40 | 80 | 34 | 55 | 14 | 22 | 15 | 24 | 18 | 30 | 1.5 | 2.1 | 135 | 185 | 130 | 165 | 8.5 | 13.0 | 1,500 | 2,000 | 70 | 90 |

See footnotes at end of table.

TABLE 9.—*Average per-acre yields of the principal crops to be expected over a period of years under 2 levels of management and the pasture-carrying capacity of each soil in Watauga County, N. C.*—Continued

| Soil | Management group | Corn | | Oats | | Rye | | Wheat | | Buckwheat | | Clover and grass hay | | Potatoes | | Snap beans | | Cabbage | | Tobacco (burley) | | Permanent pasture | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B |
| | | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Lb.* | *Lb.* | *Cow-acre-days* [1] | *Cow-acre-days* |
| Watauga stony loam: [2] | | | | | | | | | | | | | | | | | | | | | | | |
| Eroded hilly phase | 3-D | 15 | 36 | 12 | 22 | 5 | 9 | 6 | 10 | 8 | 15 | .6 | 1.0 | 80 | 120 | 70 | 100 | 4.0 | 6.0 | 700 | 1,100 | 40 | 55 |
| Rolling phase | 2-B | 20 | 55 | 24 | 36 | 10 | 17 | 11 | 18 | 12 | 19 | 1.0 | 1.5 | 95 | 150 | 100 | 140 | 6.5 | 10.0 | 1,000 | 1,500 | 55 | 75 |
| Wehadkee loam [3] [4] | 4-A | ----- | 50 | ----- | 30 | ----- | 8 | ----- | 9 | ----- | 20 | ----- | 1.5 | ----- | 90 | ----- | 80 | ----- | 6.0 | ----- | ----- | 60 | 100 |
| Peaty phase [3] [4] | 4-A | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 30 | 60 |
| Worsham loam | 3-C | 18 | 40 | 18 | 35 | 6 | 14 | 6 | 15 | 17 | 23 | 1.0 | 1.5 | 70 | 140 | 80 | 140 | 2.0 | 8.0 | ----- | 1,400 | 60 | 85 |

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

[2] Not listed in the body of this table are soils and miscellaneous land types dominantly under forest that (a) are poorly suited or not suited to crops under the management specified or (b) are suitable under the management specified if they are cleared.

Soils not suited to crops if cleared:
- Ashe loam, steep phase (4-D)
- Ashe stony loam:
  - Steep phase (4-D)
  - Very steep phase (5)
- Chandler loam, steep phase (4-D)
- Chandler stony loam:
  - Steep phase (5)
  - Very steep phase (5)
- Clifton stony loam, steep phase (4-D)
- Gullied land (Chandler and Clifton soil materials) (5)
- Halewood loam, steep phase (4-D)
- Halewood stony loam, steep phase (4-D)
- Hayesville loam, hilly phase (3-E)
- Hayesville stony loam, steep phase (4-D)
- Porters loam, steep phase (4-D)
- Porters stony loam:
  - Steep phase (4-D)
  - Very steep phase (5)
- Ramsey stony loam:
  - Steep phase (5)
  - Very steep phase (5)
- Riverwash (5)
- Rock outcrop (5)
- Stony rough land (Ashe and Porters soil materials) (5)

Soils suited to crops if cleared:
- Ashe stony loam, hilly phase (3-E)
- Clifton stony loam, hilly phase (3-E)
- Halewood loam, hilly phase (3-E)
- Halewood stony loam, hilly phase (3-E)
- Matney loam, hilly phase (3-E)
- Matney stony loam, hilly phase (3-E)
- Perkinsville loam, hilly phase (3-E)
- Porters stony loam, hilly phase (3-E)
- Watauga loam, hilly phase (3-E)
- Watauga stony loam, hilly phase (3-E)

[3] For this soil, yields in columns A are obtained without artificial drainage; those in columns B, from areas with adequate drainage.

[4] High water causes damage at times, but this hazard is not taken into consideration in arriving at productivity of the soil.

## *Soil Series and Their Relations*

Watauga County, in the northwestern part of North Carolina, is a part of the Blue Ridge Plateau of the Appalachian Mountains. It lies in the Porters-Ashe geographical soil association area and is in the southeastern part of the region occupied by Gray-Brown Podzolic soils (*7*). The region of Red-Yellow Podzolic soils lies just to the southeast. Some soils of the county are transitional between the Gray-Brown Podzolic and Red-Yellow Podzolic soils. Two of the five soil-forming factors, climate and biologic forces, are active in soil genesis, and are of greatest importance in determining whether the normal soils of the county are similar to those of the Gray-Brown Podzolic, Red-Yellow Podzolic, or some other zonal great soil group. The other three soil-forming factors—parent material, relief, and time—are of particular importance in determining the local variations of the soils, especially the nature of the intrazonal and azonal soils (*5*). In the virgin condition, most of the soils have a thin layer of partly decayed forest debris over an inch or so of dark humus-mineral soil. The B horizon is 5 to 7 inches of relatively light colored loam or stony loam that grades into a yellowish-brown or moderate-brown heavier textured moderately permeable subsoil. Such soils are strongly or very strongly acid and medium or relatively low in natural fertility. The soil series are classified into orders and great soil groups in table 10, and some of the environmental features influencing the development of the soils are presented. The soil series are in seven great soil groups, and these, in turn, are divided into three orders. An order is the highest category in soil classification and consists of two or more great soil groups. A great soil group is a group of soils having common soil characteristics, and it includes one or more families of soils (*7*) (fig. 15). The parent material, relief, drainage, and profile development of the soils are given for each series. Climatic and biologic forces have largely brought about the two zonal great soil groups in the county.

***Figure 15.*—View showing most of the layout on a diversified farm about half a mile south of Rich Mountain School. Crops on Gray-Brown Podzolic soils in foreground and middle distance; pasture on Lithosols in background.**

The soil series of Watauga County are related as shown in table 11. There are four major groups of soils: (1) Soils formed from materials weathered from bedrock; (2) soils formed from local alluvial and colluvial accumulations; (3) soils formed from moderately old alluvium; and (4) soils formed from recent alluvium.

TABLE 10.—*Classification of the soil series of Watauga County, N. C., in orders and great soil groups, environmental features, and profile development*

| Great soil groups and series | Parent material | Relief | Natural drainage | Degree of horizon differentiation |
|---|---|---|---|---|
| **ZONAL** | | | | |
| Gray-Brown Podzolic soils: | Residuum from weathering of— | | | |
| Perkinsville | Low-micaceous acidic igneous and metamorphosed igneous rocks. | Undulating to hilly | Well to somewhat excessively drained. | Medium. |
| Watauga | High-micaceous rocks | Undulating to hilly | Same | Medium. |
| Matney | Sandstone, conglomerate, shale, and metamorphosed sedimentary rocks. | Rolling to hilly | Same | Medium. |
| Halewood | Low-micaceous acidic igneous and metamorphosed igneous rocks. | Rolling to steep | Well to excessively drained. | High. |
| Tusquitee | Local alluvium and colluvium originating in acidic and basic rocks. | Undulating to hilly | Well drained | Medium. |
| Tate | Local alluvium and colluvium originating in acidic rocks. | Undulating to hilly | Well drained | Medium. |
| State | Moderately old alluvium | Undulating | Well drained | Medium. |
| Lithosolic Gray-Brown Podzolic soils: | Residuum from weathering of— | | | |
| Ashe | Low-micaceous acidic igneous and metamorphosed igneous rocks. | Hilly to very steep | Well to excessively drained. | Low. |
| Porters | Low-micaceous less acidic igneous and metamorphosed igneous rocks. | Hilly to very steep | Well to excessively drained. | Low. |
| Red-Yellow Podzolic soils: | | | | |
| Hayesville | Low-micaceous acidic igneous and metamorphosed igneous rocks. | Hilly to steep | Well to excessively drained. | High. |
| Clifton | Basic igneous and metamorphic rocks. | Rolling to steep | Well to excessively drained. | High. |
| **INTRAZONAL** | | | | |
| Brown Forest soils: | | | | |
| Burton | Residuum from weathering of metamorphic rocks, mainly gneiss and schist; in places from sandstone or possibly metamorphosed sandstone. | Hilly | Well drained | Medium to high. |
| Planosols: | | | | |
| Worsham | Local alluvium and colluvium | Undulating | Imperfectly to poorly drained. | Medium to high. |
| Augusta | Moderately old alluvium | Level to nearly level | Poorly drained | Medium to high. |
| **AZONAL** | | | | |
| Lithosols: | Residuum from weathering of— | | | |
| Chandler | High-micaceous rocks, mainly mica schist. | Steep to very steep | Somewhat excessively to excessively drained. | Low. |
| Ramsey | Conglomerate, sandstone, shale, and metamorphosed sedimentary rocks. | Steep to very steep | Somewhat excessively to excessively drained. | Low. |
| Alluvial soils: | | | | |
| Congaree | Recent alluvium | Level to nearly level | Well drained | Low to very low. |
| Buncombe | Recent alluvium | Level to nearly level | Excessively drained | Very low. |
| Chewacla | Recent alluvium | Level to nearly level | Imperfectly drained | Low. |
| Wehadkee | Recent alluvium | Level to nearly level | Poorly to very poorly drained. | Very low. |
| Toxaway | Recent alluvium | Level to nearly level | Poorly drained | Low. |

TABLE 11.—*Key to the soil series of Watauga County, N. C.*

| Group and parent rock | Relatively light-colored surface soil | | | | | Dark-colored surface soil | |
|---|---|---|---|---|---|---|---|
| | Strong-brown or moderate reddish-brown subsoil | Moderate-brown subsoil | Yellowish-brown subsoil | Yellowish-brown upper and mottled gray lower subsoil | Gray or mottled gray subsoil | Yellowish-brown subsoil | Gray or mottled gray subsoil |
| Soils formed from material weathered from bedrock: | | | | | | | |
| With a medium-textured subsoil: | | | | | | | |
| From low-micaceous igneous or metamorphosed igneous bedrock. | ---------- | Porters----- | Ashe------ | ---------- | ---------- | Burton----- | |
| From high-micaceous bedrock. | ---------- | ---------- | Chandler--- | ---------- | ---------- | ---------- | |
| From sandstone, conglomerate, shale, or siliceous metamorphosed sedimentary bedrock. | ---------- | ---------- | Ramsey---- | ---------- | ---------- | ---------- | |
| With a heavy-textured subsoil: | | | | | | | |
| From low-micaceous igneous or metamorphosed igneous bedrock: | | | | | | | |
| a. Acidic, mainly light-colored bedrock. | Hayesville-- | Halewood--- | Perkinsville. | ---------- | ---------- | ---------- | |
| b. Basic, dark-colored bedrock. | Clifton----- | ---------- | ---------- | ---------- | ---------- | ---------- | |
| From high-micaceous bedrock. | ---------- | ---------- | Watauga--- | ---------- | ---------- | ---------- | |
| From sandstone, conglomerate, shale, or siliceous metamorphosed sedimentary bedrock. | ---------- | ---------- | Matney---- | ---------- | ---------- | ---------- | |
| Soils formed from local alluvial and colluvial accumulations. | Tusquitee [1] | Tusquitee--- | Tate------- | Worsham--- | Worsham--- | ---------- | |
| Soils formed from moderately old alluvium. | ---------- | State------- | State------- | Augusta---- | Augusta---- | ---------- | |
| Soils formed from recent alluvium---- | ---------- | ---------- | Congaree--- | Chewacla--- | Wehadkee-- | ---------- | Toxaway. |

[1] The same series listed in 2 columns has the range of subsoil color indicated at the head of the 2 columns.

## Soils Formed From Materials Weathered From Bedrock

The soils formed over bedrock are all the soils of the uplands, which together cover about 71 percent of the county. They are classified in two subgroups: (1) Soils with medium-textured subsoils, and (2) soils with heavy-textured subsoils. In general, the soils having the steepest relief are in the first subgroup, and those having hilly, rolling, or undulating relief are in the second subgroup. Nevertheless, the groups overlap to considerable extent.

The relatively light-colored soils with medium-textured subsoils are the Porters, Ashe, Burton, Chandler, and Ramsey. The Porters and Ashe soils have formed from residuum of low-micaceous igneous or metamorphic igneous bedrock and have only a small content of mica. They are distinguished from each other mainly by their color. The Porters soils have a dusky-brown or moderate-brown surface soil and moderate-brown subsoil; the Ashe soils, a dark yellowish-brown surface soil and strong to moderate yellowish-brown subsoil.

The Chandler soils have formed from residuum from mica schist or mica gneiss and contain a large quantity of mica flakes. They have yellowish-brown surface soil and subsoil.

The Ramsey soils have formed mainly from residuum from sandstone, conglomerate, shale, or noncalcareous metamorphosed sedimentary bedrock. They are mainly yellowish brown, contain little mica, and are generally shallower over bedrock than the Porters and Ashe.

The Burton is a dark-colored soil of the uplands. It has a black to brownish-black surface soil that grades through less dark material into a yellowish-brown subsoil only slightly or moderately heavier in texture than the surface soil. It occurs at high elevations, especially on naturally bald mountaintops, and its aggregate area is less than a square mile.

The relatively light-colored soils with moderately heavy or heavy-textured subsoils are the Hayesville, Halewood, Perkinsville, Clifton, Watauga, and Matney. The Hayesville, Halewood, and Perkinsville have developed mainly from residuum from acidic, low-micaceous, chiefly light-colored, igneous or metamorphosed igneous bedrock. They contain only a slight quantity of small mica flakes. These soils are distinguished from each other mainly by color.

The Hayesville soils have yellowish-brown surface soil and strong-brown or moderate reddish-brown clay or heavy clay loam subsoil. They occur only at the lower elevations in the southern part of the county.

The Halewood soils are somewhat similar to the Porters in color, but they have clay loam or clay subsoils and usually less steep slopes. Their surface soil is dusky brown or moderate brown, and the subsoil moderate brown.

The Perkinsville soils are somewhat similar to the Ashe in color, but they have clay loam or clay subsoil and usually less steep slope. They have a yellowish-brown surface soil and subsoil.

The Clifton soils have developed from residuum from basic dark-colored igneous or metamorphic igneous bedrock and contain only a small quantity of mica. They have a moderate-brown surface soil and strong-brown clay loam or clay subsoil.

The Watauga soils have formed from residuum from mica schist, mica gneiss, or other high-micaceous bedrock, and contain a relatively large quantity of small mica flakes. They are similar in color to the Chandler soils but have a clay loam subsoil and usually less steep slope. Their surface soil and subsoil are yellowish brown.

The Matney soils have formed from residuum from conglomerate, sandstone, shale, or metamorphosed sedimentary bedrock and are similar to the Perkinsville soils except for their parent material. They have a yellowish-brown surface soil and subsoil and differ from the Ramsey soils in having a heavier textured subsoil, in being deeper to bedrock, and usually in having less steep slope.

### Soils Formed From Local Alluvial and Colluvial Accumulations

The soils formed on local alluvial and colluvial accumulations occur at the base of strong slopes or on alluvial fans lying above first bottoms and stream terraces. They occupy about 6.4 percent of the county. Their parent material consists of mixed, poorly assorted material mainly washed from adjoining or nearby uplands.

The Tusquitee, Tate, and Worsham soils have a relatively heavy-textured subsoil that in most places is clay loam. The Tusquitee and Tate soils are well-drained, but the Worsham soil is imperfectly or poorly drained. The Tusquitee soils resemble the Halewood and Porters in color and are generally associated with Halewood, Porters, Clifton, and Hayesville soils. They have a dusky-brown or moderate-brown surface soil and moderate-brown or strong-brown clay loam subsoil. The Tate soils resemble the Perkinsville, Matney, Ashe, Chandler, and Watauga soils in color and are associated with them and the Ramsey soils. They have a yellowish-brown surface soil and subsoil. The Worsham soil has a slightly mottled brownish-gray surface soil and mottled brownish-gray, yellowish-gray, or light olive-gray clay loam subsoil.

### Soils Formed From Moderately Old Alluvium

The State and Augusta soils have formed from moderately old alluvium on low stream terraces and have relatively light-colored surface soils. The State soil is naturally well drained, whereas the Augusta soil is naturally poorly drained. The State soil has a weak-brown to moderate yellowish-brown surface soil and moderate-brown to moderate yellowish-brown light clay loam or clay loam subsoil. The Augusta soil has brownish-gray surface soil and mottled brownish-gray, weak-yellow, pale-olive, or yellowish-gray clay loam subsoil. The soils of this group cover about 0.4 percent of the county.

### Soils Formed From Recent Alluvium

The Congaree, Chewacla, Wehadkee, and Toxaway soils have formed from recent alluvium on first bottoms. They occupy about 3.4 percent of the county. The Congaree soils are naturally well drained, and the Chewacla imperfectly drained. The Wehadkee soils are naturally poorly to very poorly drained, and the Toxaway soil is poorly drained. The Congaree, Chewacla, and Wehadkee soils are relatively light colored and do not have a subsoil that is distinctly heavier textured than their surface soil. The Toxaway soil is dark-colored and has a heavy-textured subsoil.

The Congaree soils have a dark yellowish-brown or light yellowish-brown surface soil and subsoil. The Chewacla soils have a dark yellowish-brown surface soil and upper subsoil and a mottled brownish-gray or light brownish-gray lower subsoil. The Wehadkee soils have a mottled medium olive-gray or light brownish-gray surface soil and mottled brownish-gray, light brownish-gray, or light olive-gray subsoil. The Toxaway soil has a brownish-black or black surface soil and brownish-gray or light olive-gray subsoil.

## *General Soil Associations*

The general pattern of soils in the county is shown by the soil association map. Each soil association is a group of soils, most often of soils that differ greatly from each other. The groups of soils are called an association because they occur near each other in a more or less regular pattern and make up a distinct area in the county. For example, the level and gently sloping soils on the good-sized stream bottoms make up one association. Some of these bottom-land soils have good natural drainage, and others are imperfectly or poorly drained. In this county, for example, soils of the first bottoms and the low terraces are placed in the Congaree-Chewacla-State association. Another soil association that is easy to point out is the Stony rough land-Stony colluvium association, which occurs chiefly in the north-central and southwestern parts of the county and at scattered locations elsewhere.

Seven soil associations in the county are shown on the map and described in this section. Each association contains other soils besides the dominant ones for which it is named. The soil association map is useful as you study soil patterns; it gives the main soils that are likely to be present in each part of the county. The association map is not anywhere near detailed enough to show the exact soils on any one farm or small tract of land. The large-scale maps on the aerial photograph background should be used for that kind of reference.

### Congaree-Chewacla-State Association

The Congaree-Chewacla-State soil association occurs on first bottoms and low terraces. It has the highest proportion of First- and Second-class soils and the greatest proportionate area of soils physically suited to crops, but it has a small total area. Most of the soils are well drained, but some are imperfectly or poorly drained. The well-drained soils are intensively used for crops. Included in this association are minor areas of Wehadkee, Toxaway, Augusta, Worsham, Tusquitee, and Tate soils.

### Ashe-Perkinsville-Tate Association

The Ashe-Perkinsville-Tate soil association consists dominantly of soils on steep slopes and of Ashe soils. Perkinsville soils occupy most of the ridgetops, a considerable part of the hilly areas, and most of the rolling or undulating uplands. The Tate soils, and to minor extent the Tusquitee, are on the local alluvial and colluvial accumulations. Soils of the first bottoms and terraces occupy a minor area but are important soils where they occur.

In local areas Perkinsville soils dominate and the land is suited to crops, but considering the association as a whole, only a small part is physically suited to crops. Most of the association consists of Fourth-class soils.

### Chandler-Watauga-Tate Association

The Chandler-Watauga-Tate soil association consists principally of soils on steep uplands and of Chandler soils. Watauga soils occupy most of the ridgetops and undulating, rolling, or hilly upland. The Tate soils lie on the local alluvial and colluvial accumulations. Soils of the first bottoms are a minor but locally important part of the association. The greater part of the association consists of Fourth- and Fifth-class soils not physically suited to crops. The moderate-sized areas in which Watauga soils predominate are made up of Second- and Third-class soils, which are suited to crops. This association covers a fairly large total area. Much of it remains in forest.

### Porters-Halewood-Tusquitee Association

Much of the Porters-Halewood-Tusquitee soil association consists of steep Porters soils. Halewood soils occur on most of the ridgetops, much of the hilly areas, and a few of the steep slopes. The Tusquitee soils occur on the local alluvial and colluvial accumulations. Soils of the first bottoms and terraces occupy a minor but locally important acreage. There are several moderate-sized areas in which Halewood soils dominate, and two small areas in which Hayesville and Halewood soils occur together.

A relatively small to moderate proportion of this association is physically suited to crops. Most of the rest consists of Fourth-class soils. Considering fertility alone, the soils of this association generally are among the better ones of the county. This association covers a large total acreage and much of it is used for pasture.

### Clifton-Porters-Tusquitee Association

The Clifton-Porters-Tusquitee soil association consists principally of Clifton soils on steep or hilly uplands. The Porters soils occupy less extensive steep or very steep areas on slopes, and the Tusquitee soils occur on the local alluvial and colluvial accumulations. Minor areas of other soils are included.

A relatively small to moderate part of this association is suited to crops. Most of the rest consists of Fourth-class soils. A large part of this association is used for pasture. The total acreage of this association is moderately large.

### Ramsey-Matney-Tate Association

The Ramsey-Matney-Tate soil association covers a small total area and consists chiefly of Ramsey soils on steep uplands. Matney soils are on the undulating, rolling, or hilly uplands. The Tate soils, only a minor part of the association, lie on the local alluvial and colluvial accumulations. The Ramsey are Fifth-class soils, but the Matney and Tate are physically suited to crops. Most of this association remains in forest.

### Stony Rough Land-Stony Colluvium Association

The Stony rough land-Stony colluvium soil association consists of Stony rough land on steep or very steep uplands that are amost entirely forested, of stony colluvium on local alluvial and colluvial accumulations at the base of slopes, and of minor areas of stony, hilly or rolling upland soils. Practically none of the association is physically suited to crops. It consists of Fifth-class and some Fourth-class soils. The total area is large.

## *Additional Facts*

### Physiography, Relief, and Drainage

Watauga County lies within the Blue Ridge physiographic province of the Appalachian Highland (*3*), which comprises the belt of mountains lying west of the Piedmont Plateau. General land features are those of a fairly high, irregular plateau. The mountains rise above the plateau to considerably higher altitudes (fig. 16). The crest of the Blue Ridge extends across the southern part of the county from the Ashe-Wilkes County corner through Blowing Rock to the top of Grandfather Mountain. South of this crest, the plateau breaks sharply downward in most places to the foothills in adjoining counties to the south. This somewhat abrupt descent is produced by the backward wear of streams flowing eastward to the Atlantic Ocean (fig. 17).

Practically all the county is thoroughly and deeply dissected by streams. Over much of it there is only an indefinite dendritic drainage pattern caused by the uneven effect of rock differences. South of the crest of the Blue Ridge the dendritic pattern is more evident, and the relief is rough, broken, and very steep with narrow, descending

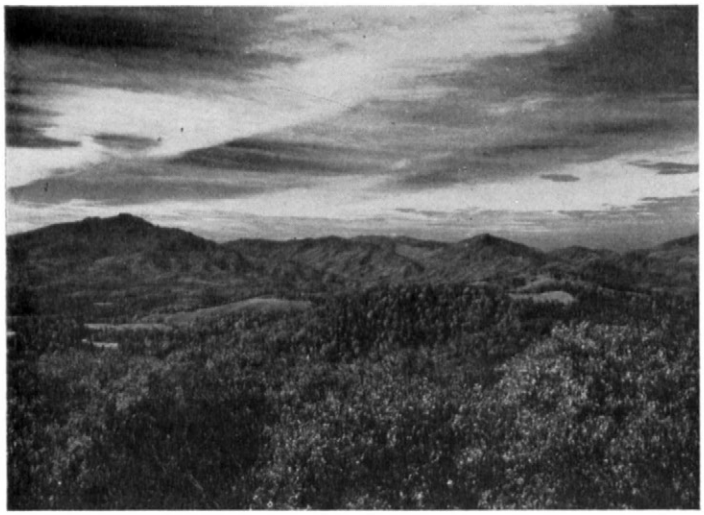

*Figure 16.*—**Looking westward from the summit of Flattop Mountain over the high peaks in the southwestern part of the county. Most of this forest area is on Stony rough land (Ashe and Porters soil materials) and Ramsey stony loam, steep phase.**

*Figure 18.*—**This first bottom, one of the broadest in the county, lies between the Watauga River and Dutch Creek near Valle Crucis. The soil is Congaree loam. Timothy in light-colored foreground; mixed timothy and clover hay and corn in middle. The forest is on Ashe stony loam, steep phase, on hill in left background.**

mountain ridges and narrow, V-shaped ravines having little or no bottom lands.

The streams on the plateau descend very rapidly in their upper courses and then meander somewhat through narrow bottoms. There are places where streams become more rapid and the bottoms become even more narrow or disappear altogether. V-shaped ravines widen until the bottoms form again and broaden out. The widest bottoms are along the tributaries of the South Fork New River near Boone and along the Watauga River near Shulls Mill and Valle Crucis, where they are about 0.3 of a mile across in places (fig. 18). The Watauga River follows a V-shaped ravine most of the way from the mouth of Cove Creek to the Tennessee boundary, and the gradient increases to the extent that the river descends about 120 feet a mile from the mouth of Beech Creek to the state line.

*Figure 17.*—**Top of Big Bald Mountain, altitude about 4,900 feet. Most of bald part is Burton stony loam, hilly phase. The forest is on Ashe stony loam, steep phase, and Wehadkee loam, peaty phase.**

Deep and thorough stream dissection in practically all the county has resulted in hilly, steep, or mountainous relief, mainly in the form of irregular ridges and intervening valleys. Some ridges are broad, rounded, or rolling on top; others are very narrow or sharp. Only a few areas of appreciable size have mildly hilly, rolling, or undulating relief; the larger of these areas are in the vicinity of Bamboo, Boone, Perkinsville, Blowing Rock, Boone Fork Church, Bethany Church, Deep Gap, Laxon, Sands, and Rutherwood.

Elevations [4] above sea level vary widely. The highest point is 5,939 feet on Grandfather Mountain; the lowest, 1,320 feet, at the point where Elk Creek leaves the county. The plateau part of the county has a general elevation of from 2,600 to 4,000 feet. The elevations of some of the higher mountains are Snake, slightly over 5,560 feet; Elk Knob 5,555; Rich Mountain Bald 5,372; Beech 5,020, reaching 5,522 in adjoining Avery county; Hanging Rock 5,237; Potato Hill 5,194; Big Bald 4,939; Sugarloaf 4,705; Stone 4,218 at the Tennessee boundary; Flattop 4,568; and Howard Knob 4,454.

Approximate elevations at points where the principal streams leave the county are as follows: the North Fork New River 3,310 feet; South Fork New River 2,950; Yadkin River 2,350; Watauga River 2,100; Rockhouse Creek 1,895; and Dugger Creek 1,525.

Elevations of other places are as follows: Matney School about 3,625 feet; Blowing Rock post office about 3,575; Boone about 3,220; Zionville about 3,220; Deep Gap (the gap itself) 3,131; Foscoe 2,991; Bethel about 2,720; Sugar Grove post office 2,676; and Valle Crucis 2,676.

Dugger Mountain fire observation tower has an elevation of 3,392 feet, and the bridge for United States Highway No. 421 over the South Fork New River east of Perkinsville has an elevation of 3,099 feet.

[4] Data obtained from topographic maps of U. S. Geological Survey and Tennessee Valley Authority.

## Rock Formations

The parent materials of the soils of Watauga County have formed from three groups of consolidated rocks as follows: (1) Crystalline igneous and metamorphic rocks including gneiss, schist, granite, diabase, diorite, metarhyolite, and metadiabase; (2) volcanic, including rhyolite, basalt or their alteration products; and (3) sedimentary, including conglomerate, sandstone, and shale. In most places these groups are separated from one another by faults. Crystalline igneous rocks underlie most of the soils of the county. The volcanic and sedimentary rocks occur principally in the southwestern part, south of a line from Bowers Gap to Hodges Gap and extending eastward along Hodges Creek and East Fork. Practically all the rocks have been metamorphosed to some degree.

Among the crystalline igneous rocks in decreasing order of age are Carolina gneiss, Roan gneiss, Cranberry granite, Blowing Rock gneiss, and Beech granite. These rocks belong to the Archean period (*9*).

Because of extreme metamorphism, the original nature of the Carolina gneiss is unknown. This formation occurs in the eastern part of the county, mainly southeast of Todd and Sands and northeast of Elk Creek and Rocky Knob and in the southeastern corner near Penley School. It comprises an immense series of interbedded mica schists, mica gneisses, and fine-grained granitoid layers for the most part light gray or dark gray. Layers of white granitic material and veins of pegmatite are not uncommon. The mica schists are mainly fine-grained and are composed of quartz, muscovite, and a little biotite, and a very little feldspar (*9*). These rocks disintegrate deeply in some places. The Chandler and Watauga soils have formed from parent materials weathered from the highly micaceous rocks derived from Carolina gneiss.

The Roan gneiss formation occurs in a large area in the northeastern part of the county west of the Carolina gneiss formation and north of a line extending westward from a point just southeast of Rocky Knob to a point immediately north of Boone and Lovill post office. It extends westward to the lower western slopes of Rich and Snake Mountains. This formation consists of a great series of beds of hornblende schist, hornblende gneiss, massive and schistose diorite, and some interbedded mica schist and mica gneiss and dikes of diabase. The hornblende-like beds are dark green or black. The hornblende schist consists almost entirely of hornblende and very small proportions of biotite, feldspar, and quartz. The hornblende gneiss contains layers of quartz and feldspar interbedded with hornblende schist (*9*). Many of the higher mountains consist of this formation. Some of the Clifton, Porters, and Halewood soils are derived from parent material weathered from the hornblendic rocks.

Cranberry granite is the most extensive formation in the county. With the exception of relatively small areas of Beech granite, metarhyolite, and Unicoi formations, the Cranberry formation occurs throughout the western part of the county north of a line between Bowers Gap and Hodges Gap and west of the lower slopes of Rich and Snake Mountains. A belt about 1.5 miles wide extends eastward from this main body through Boone and Bamboo to the Wilkes County line. This formation is made up of granite of varying texture and color and schists and granitoid gneisses derived from the granite (*9*). Its texture varies from fine- to coarse-grained. Some of the Ashe, Perkinsville, Porters, and Halewood soils are derived from parent material weathered from this formation.

Blowing Rock gneiss occurs throughout much of the area between Blowing Rock, Yarnall Knob, Bamboo, and Cook School. It is dark-gray or blackish-gray gneiss of two varieties. One has large, porphyritic, white orthoclase crystals embedded in a groundmass of feldspar, quartz, biotite, and muscovite; the other has the same minerals in very fine crystals of uniform size and granitoid appearance (*9*). Ashe and Perkinsville soils in some areas are derived from parent material weathered from these rocks.

Beech granite occurs principally on Beech Mountain and adjacent areas to the east and north. This formation is coarse granite, frequently porphyritic and seldom fine-grained (*9*). Ashe soils have formed to some extent from parent material derived from these rocks.

A number of formations probably belong to the Algonkian period (*9*). These include Linville metadiabase, Montezuma schist, Flattop schist, and metarhyolite formations in decreasing order of age.

The Linville metadiabase occurs in several small areas in the southwestern part of the county. It is dull yellowish green, schistose, and massive and consists of plagioclase feldspar with much alteration to chlorite, epidote, quartz, and to hornblende, which in turn is largely altered to chlorite and fibrous hornblende.

Montezuma schist occurs principally in the upper drainage basins of Dutch and Valley Creeks. This schist was originally probably a basalt. It consists of bluish-black, gray, or green, very uniform, fine-grained, epidotic and chloritic schists and some beds of amygdaloid. The schists are composed of chlorite and feldspar in abundance and muscovite, epidote, and quartz in small quantities (*9*).

Clifton, Halewood, and some Porters soils, and in some places Ashe and Perkinsville soils, have developed from parent material weathered from the Linville metadiabase and Montezuma schist formations.

Flattop schist occurs in several areas in the central-southern part of the county, especially on and around Flattop Mountain. This formation consists of black, dark-blue, bluish-green, and greenish-gray, mostly very fine-grained schists. These schists are commonly marked by light-gray bands that are more feldspathic than the rest of the rock, but portions contain porphyritic crystals of feldspar and amygdules. The schist in the Flattop formation is composed of quartz, feldspar, and mica of secondary origin, but parts of it contain porphyritic crystals of feldspar and amygdules. This formation is slightly less basic than Linville metadiabase and Montezuma schist and was probably derived from an andesitic rock (*9*). Principally Ashe and Perkinsville soils are derived from parent material weathered from this rock.

The metarhyolite formation is not extensive and occurs principally as long, narrow areas in the central-southern part. The formation consists mainly of dark-blue, dark-gray, and bluish-black, fine metarhyolite in which there are layers containing porphyritic crystals of feldspar and quartz. It was probably derived from a glassy, highly siliceous rock (*9*). Some areas of Ashe, Porters, and Perkinsville soils have developed from parent materials weathered from this formation.

The sedimentary rocks are those of the Unicoi and Hampton shale formations, and they belong to the Cambrian period. The Unicoi formation occurs mainly on Stone Mountain along the North Carolina-Tennessee

State line and in several areas in the southwestern part of the county. This formation consists of light-gray or white, generally fine-grained and massive sandstone that is feldspathic in places; quartzites; small amounts of interbedded shales and slates; and much conglomerate. The conglomerate is composed of pebbles, and fragments as large as a foot in diameter, with a matrix of white sandstone or siliceous arkose. Most of the fragments and pebbles are white quartz, but some are granite, metarhyolite, schist, epidote, feldspar, and jasper (*9*). This formation contains the hardest rock of the region. Much of the conglomerate is on Grandfather Mountain. The sandstones, quartzites, and conglomerate of this formation weather slowly, and a large part of the area occupied by these rocks is Stony rough land (Ashe and Porters soil materials) or Rock outcrop. The Ramsey and Matney soils are formed from parent material weathered from these rocks.

The Hampton shale is the youngest formation of the county. It occurs along the Watauga River upstream from Shulls Mill, and it consists of bluish-gray or gray, argillaceous and sandy shales banded by thin siliceous layers.

## Climate and Water Supply

Watauga County has a temperate, humid climate modified by the relatively high altitude. During the comparatively short summers, the days are warm and the nights are generally cool. The winters are fairly cold but are broken by many warm spells. The difference between the average January and July temperature is 34° F. at Boone, and 32° at Banner Elk in adjoining Avery County. The average annual maximum temperature is 90°, and the average annual minimum temperature 0° (*8*). A few cold waves with temperature about zero occur, but generally last only for a few days. For about 15 days a year the temperature remains below freezing throughout the day, but about 100 days a year the temperature drops below freezing for a while (*6*).

At Boone, the average number of days without killing frost is 152 (May 6 to October 6), but killing frosts have occurred as late as June 15, and as early as September 18. At Banner Elk the average number of days free of killing frost is 153 (May 9 to October 10), but the latest killing frost in spring occurred June 17, and the earliest in fall, September 6.

At Boone the average annual rainfall is 57.40 inches. It is fairly well distributed throughout the year but is somewhat greater in summer. At Banner Elk the average rainfall is greatest in July and smallest in November. Severe droughts are rare, though periods of deficient rainfall occur, especially in the fall.

Most of the rains are light to medium heavy. A considerable part of the summer rainfall results from afternoon thunderstorms, some of which cause considerable soil erosion. More than 50 days with thunderstorms can be expected a year.

Banner Elk has an average snowfall of 39 inches, which is probably somewhat more than the average for the county. Most of the snows melt in a day or two, but some stay on for a week or more. In protected places on the higher mountains snow sometimes remains for a considerable period. About 1 day with hail can be expected annually.

The climate especially favors a few crops, permits the growth of many, and prohibits the successful growth of some. The comparatively cool summers appear suitable for growing of late potatoes, late cabbage, buckwheat, snap beans, and onions, at all altitudes except possibly the lowest. Apples and cherries do well if located in proper sites, and so do many pasture grasses. Crimson clover and peaches are not suited to the higher elevations. The growing season is too short for cotton and generally for sweetpotatoes, and the winters too cold for winter vegetables. In most years the grazing period extends from about May 1 to October 31.

Late spring frosts injure many crops. Early fall frosts sometimes damage late-maturing corn, tobacco, snap beans, sorghum cane, and apples. Winter heaving of wheat and rye is usually greater on Porters, Ashe, and Burton soils than on the others. Outside farm work can be performed on most days during the winter.

Temperature, frost-free period, fog, cloudiness, wind, and to a less extent, rainfall, snowfall, and humidity vary considerably from place to place, depending on altitude and location. Generally the temperature in free air decreases about 1 degree for each 330 feet of elevation, but this rate is influenced by the season and local topographical and biological conditions (*6*). It is greater in summer than in winter and greatest during the warmer hours of the day. Temperature inversions, which frequently occur during the colder months and especially at night, sometimes give mountain slopes higher temperatures than the nearby lower valleys. Frost is influenced by altitude, soil characteristics, night radiation of heat, air drainage, and imported cool air masses (*8*). The interplay of these forces occasionally gives widely different frost effects in neighboring localities and even in nearby fields. Some mountainsides are freer from frosts and have longer growing seasons than neighboring valleys. Generally, frost occurs most frequently in pockets, flats, or valleys between ridges.

The occurrence of fog and cloudiness is most frequent on the higher mountains and near the crest of the Blue Ridge. Wind is strongest on high mountains and ridges, in mountain gaps, and on western slopes. The local variation in rainfall, snowfall, and humidity is unknown, but precipitation is greatest on the higher mountains.

The relative humidity at noon in January varies between 60 and 65 percent and at noon in July is about 55 percent (*8*). About 30 to 40 days with dense fog can be expected annually. The number of hours of sunshine in winter (December to February) is 4.5 to 5.0 a day, and in summer (June to August), 8.0 to 8.5. The percentage of possible sunshine is 40 to 50 in winter and below 60 in summer.

Prevailing wind is from the southwest. It is sometimes very strong, especially in winter, but blizzards occur infrequently. Tornadoes are very rare.

The normal monthly, seasonal, and annual temperature and precipitation at Boone and at Banner Elk, Avery County, as compiled from United States Weather Bureau records, are given in table 12. These data are probably applicable to most places in Watauga County at elevations similar to that of the Weather Bureau station but local exceptions are likely because of the considerable variation in topography.

The county has a plentiful supply of good water. Springs are the source of practically all the available

TABLE 12.—*Normal monthly, seasonal, and annual temperature and precipitation at Boone, Watauga County, and Banner Elk, Avery County, N. C.*

BOONE, ELEVATION, 3,332 FEET

| Month | Temperature [1] | | | Precipitation [2] | | | |
|---|---|---|---|---|---|---|---|
| | Average | Absolute maximum | Absolute minimum | Average | Total for the driest year | Total for the wettest year | Average snowfall |
| | °F. | °F. | °F. | Inches | Inches | Inches | Inches |
| December | 35. 6 | | | 5. 24 | 1. 56 | 5. 74 | 0 |
| January | 35. 4 | | | 3. 64 | 4. 28 | 5. 88 | 0 |
| February | 36. 0 | | | 3. 15 | 2. 18 | 4. 67 | 0 |
| Winter | 35. 6 | | | 12. 03 | 8. 02 | 16. 29 | 0 |
| March | 42. 2 | | | 5. 03 | 3. 70 | 6. 75 | 0 |
| April | 49. 7 | | | 4. 40 | 4. 47 | 3. 30 | 0 |
| May | 58. 6 | | | 4. 59 | 5. 08 | 5. 47 | 0 |
| Spring | 50. 1 | | | 14. 02 | 13. 25 | 15. 52 | 0 |
| June | 66. 5 | | | 5. 93 | 3. 56 | 6. 35 | 0 |
| July | 69. 4 | | | 6. 05 | 6. 63 | 2. 29 | 0 |
| August | 68. 4 | | | 6. 18 | 1. 46 | 2. 85 | 0 |
| Summer | 68. 1 | | | 18. 16 | 11. 65 | 11. 49 | 0 |
| September | 63. 3 | | | 4. 23 | 2. 75 | 5. 62 | 0 |
| October | 52. 7 | | | 6. 02 | . 93 | 14. 20 | 0 |
| November | 42. 8 | | | 2. 94 | 2. 77 | 5. 11 | 0 |
| Fall | 52. 9 | | | 13. 19 | 6. 45 | 24. 93 | 0 |
| Year | 51. 7 | | | 57. 40 | [3] 39. 37 | [4] 68. 23 | |

BANNER ELK, ELEVATION, 3,710 FEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| December | 34. 4 | 75 | −21 | 3. 72 | 2. 18 | 5. 54 | 7. 4 |
| January | 34. 4 | 67 | −13 | 3. 78 | 3. 37 | 8. 65 | 8. 6 |
| February | 40. 6 | 72 | −11 | 5. 33 | 3. 11 | 4. 86 | 9. 3 |
| Winter | 36. 5 | 75 | −21 | 12. 83 | 8. 66 | 19. 05 | 25. 3 |
| March | 48. 6 | 82 | −7 | 4. 24 | 2. 32 | 5. 11 | 9. 3 |
| April | 56. 3 | 86 | 7 | 4. 85 | 3. 75 | 6. 64 | 1. 0 |
| May | 63. 4 | 85 | 22 | 5. 37 | 1. 41 | 5. 57 | 0 |
| Spring | 56. 1 | 86 | −7 | 14. 46 | 7. 48 | 17. 32 | 10. 3 |
| June | 66. 4 | 88 | 27 | 6. 26 | 6. 62 | 5. 67 | 0 |
| July | 65. 7 | 95 | 35 | 5. 85 | 2. 31 | 7. 60 | 0 |
| August | 61. 4 | 94 | 31 | 4. 43 | . 31 | 8. 24 | 0 |
| Summer | 64. 5 | 95 | 27 | 16. 54 | 9. 24 | 21. 51 | 0 |
| September | 50. 9 | 93 | 28 | 4. 91 | 1. 51 | 1. 30 | 0 |
| October | 41. 0 | 82 | 11 | 2. 60 | 4. 96 | 12. 54 | 1. 0 |
| November | 34. 5 | 75 | −7 | 4. 59 | 4. 20 | 1. 23 | 2. 4 |
| Fall | 42. 1 | 93 | −7 | 12. 10 | 10. 67 | 15. 07 | 3. 4 |
| Year | 49. 8 | 95 | −21 | 55. 93 | [5] 36. 05 | [6] 72. 95 | 39. 0 |

[1] Boone: Average temperature based on a 23-year record, 1929–51. Highest and lowest temperature not reported. Banner Elk: Average temperature based on 44-year record, 1908–51; highest and lowest temperatures from a 24-year record, 1907–30.

[2] Boone: Average precipitation based on a 23-year record, 1929–51; driest and wettest years on a 23-year record, 1929–51. Average snowfall not reported. Banner Elk: Average precipitation based on a 44-year record, 1908–51; driest and wettest years on a 44-year record, 1908–51; snowfall on a 24-year record, 1907–30.

[3] In 1943.

[4] In 1932.

[5] In 1925.

[6] In 1908.

water other than rainfall; almost every farm of appreciable size has one or more springs. Only a very few homes have wells or cisterns. Owing to springs and seepage from hills, most streams of the county have a permanent flow.

There are no natural lakes, but small ones have been made by damming some of the smaller streams, as has been done near Blowing Rock. These lakes are used principally for recreation and water power. The lakes and many of the streams are stocked with fish. On many farms waterwheels are turned by creeks and furnish power for gristmills, sawmills, home electricity, or other farm uses. There are possibilities for considerably more power and recreational development.

## Forests

### *Location and extent*

Forests cover about half the county and are one of its most important natural resources. All the land area except some rock outcrops and a few areas on high mountain meadows, called balds, was originally forested. Most of the forest is privately owned, but Pisgah National Forest occupies some of the western part of the county, and the Federal Government also owns a partly forested strip along the Blue Ridge Parkway.

Forests occupy almost all of the area south and southeast of the Blue Ridge, as well as the higher mountains in other parts of the county such as Grandfather, Beech, Rich, Stone, Pine Orchard, and Snake Mountains; Elk, Harmon, Riddle, Howard, and Rocky Knobs; and Hanging Rock Ridge. The largest forest tracts unbroken by cleared fields lie between Dugger Mountain fire observation tower, the Watauga-Wilkes County boundary, and Elk Creek; on Grandfather and Beech Mountains; and on Elk Knob and adjoining ridges. The southwestern part of the county, south of Bowers Gap and Hodges Gap and west of Blowing Rock and Flattop Mountain, is two-thirds forest. Timber companies or individuals own several large forest tracts southeast of the Blue Ridge and west of Blowing Rock. The rest of the forested land—about one-third of the total—is mainly farm woodland.

In general, forests occupy the steeper, more stony, and less fertile land, or those areas poorly suited or unsuited to crops and pasture. About 23,700 acres with slopes of more than 60 percent and 58,900 acres with slopes of 30 to 60 percent remain in forest. About 19,900 acres with slopes less than about 30 percent remain in forest, and of this about 12,800 acres is suited to crop production.

### *Forest types*

The forest types can be classified as: (1) Upland hardwoods; (2) cove hardwoods; (3) white pine-hardwoods; and (4) fir-spruce.

The upland hardwoods type occupies probably 75 percent of the forested area. It includes the forests growing on the dry slopes and ridges facing south and west and many of the drier north and east slopes (*2*). Chestnut was by far the dominant species, but as a result of chestnut blight practically all the trees have died in the last two decades, though many remain standing. Other important species are chestnut, black, red, white, and Northern red oaks and hickories, in decreasing order of abundance. Associated species are scarlet oak, yellow-poplar, red maple, black locust, dogwood, and sourwood.

The cove hardwoods type occupies about 15 percent of the forested area. It includes the forests on bottoms, terraces, colluvial accumulations, and narrow coves, and the northern hardwoods on the moist slopes (*2*). Dominant species are chestnut (dead but standing) and yellow-poplar. Basswood, white and Northern red oaks, black birch, red and sugar maples, white ash, hemlock, and black locust are important species. Associated species are cucumbertree, buckeye, chestnut, black and red oaks, dogwood, and sycamore.

The white pine-hardwoods type occurs mainly southeast of the Blue Ridge and on the Blue Ridge plateau in the extreme eastern part of the county. It resembles the upland hardwoods type in all respects except it includes considerable white pine. Some areas have an almost pure stand of white pine. These areas usually represent land that has either been clean-cut or cleared and cultivated, and then reforested naturally or by man. Virginia pines grow to some extent on the drier sites at lower altitudes.

The fir-spruce type of forest occurs on only a few acres at or near the top of Grandfather and Bald Mountains. It consists of Fraser fir and red spruce.

### *Forest uses and industry*

The forest areas of Watauga County are important, even though the county is predominantly agricultural. Privately owned forest land is used mainly for timber production or as a source of forest products for personal and industrial uses. Only a few large tracts of old-growth timber are left, and they are mainly properties used for summer camps and other recreational purposes. Most of the smaller tracts are farm woodlots that are grazed to some extent by cattle, sheep, or hogs. Pisgah National Forest produces commercial timber and affords recreation as well. Forest land along the Blue Ridge Parkway is used mainly for recreation. Tracts of forest on Flattop Mountain and near the head of Winkler Creek protect the water supplies of Blowing Rock and Boone. The forests are also of value in the control of stream flow and erosion, and in furnishing food and shelter for wildlife.

The forests are very important in supporting the tourist, vacation, and recreation trade. The cool, wooded mountains with their flowering rhododendron, mountain-laurel, wild azalea, dogwood, and other interesting plants, clear trout streams, and wildlife attract many visitors. All these are seen to good advantage at Blowing Rock, one of the popular summer resorts in western North Carolina. There are several summer resort camps in the southwestern part of the county.

Many rural families, especially in Blowing Rock and Boone, obtain a large part of their income through the sale of farm produce, food, lodging, and mountain handicraft to visitors or summer residents.

During slack seasons, many farm workers cut and split dead chestnut trees into pieces for acidwood; obtain hemlock bark for tannic acid; cut large mountain-laurel and rhododendron burls to be roughly finished for tobacco pipes in a plant in Boone; and cut dogwood for spindles and shuttle blocks. Fuel wood is one of the most important forest products; it is obtained from cull trees, sawmill slabs, tops of trees felled for other purposes, and from sound trees.

Other forest products furnish a considerable income to farmers. A few operate small cabinet-making shops. Native flowering shrubs and conifers are planted to some

extent in landscaping. Galax leaves are gathered from forest and fields for floral decorations. Some gather and sell medicinal as well as other forest herbs.

Commercial timber operations increased greatly during World War II, and at present many sawmills are operating at full capacity. Most of the timber is cut by portable sawmills operated by 4 men and having a daily capacity of less than 10,000 board-feet. The lumber is transported to markets by truck. Some saw logs are trucked to dimension stock mills in or near North Wilkesboro. The chief species used are yellow-poplar, maple, hickory, and white oak for furniture stock, and white pine for crating. Veneer plants at Lenoir use considerable yellow-poplar and some basswood, blackgum, white oak, and hickory. Some trees are cut for posts, crossties, and poles.

### *Growth, protection, and yields*

About two-thirds of the forested area is second-growth trees smaller than saw-log size. Very few large areas of old-growth timber remain. Most of these are near Blowing Rock, but some small patches remain in farm woodlots or in inaccessible locations. Most of this old growth has been gone over, and the best walnut, cherry, yellow-poplar, white pine, basswood, and white oak have been cut.

The forest stands vary greatly in age. Old-growth stands range from 100 to 350 years; second-growth saw timber, from 50 to 100 years; growth not of saw-log size, from 20 to 50 years; and reproduction stands, usually less than 20 years (*2*). Nearly all of the young stands are beyond the reproduction stage. Only a little of the forest land is not restocking because of having been clear-cut.

The densest and best growth of trees is on bottoms, colluvial accumulations, moist lower slopes, and in coves. Dry ridgetops and high, very steep, rocky slopes have open stands of short, poorly formed and often defective trees.

The Fifth-class soils (see the section Soil Use and Management) are poorly suited to crops and pasture, and are best used for timber production or recreation, even though most of them are poor or only fair for forest.

A total area of about 7,000 acres that has been cleared of forest is poorly suited to crops or pasture and can be best used by returning it to forest. This acreage includes Rough gullied land (Chandler and Clifton soil materials); severely eroded land on steep slopes; cleared land on very steep slopes; Chandler stony loam, eroded and severely eroded steep phases; Ramsey stony loam, eroded steep phase; cleared areas of Stony rough land (Ashe and Porters soil materials); and Riverwash. Black locust and white pine are the best species to use in reforesting the upland areas, at least for the first few years. Some of the willows, poplars, or cottonwood can be used on Riverwash.

Forest fires are a serious problem and cause much damage. They kill young trees outright, increase the proportion of sprouts of certain undesirable hardwoods, and often change the stand composition for the worse. Resulting basal fire-scars cause serious losses in volume, because many of them become infected with wood-decaying fungi. Fire-scarred, partly rotten hardwood trees occupy a large part of growing space, and their elimination is one of the difficult problems of management (*2*). For forest protection, the county has a fire control organization with a warden, fire-tower, and patrol system.

Yield from much of the forest is low at present because of the large area stocked with small timber, high proportion of culls, and small amount of growing stock to the acre (*2*). Increasing the yield is mainly a matter of good forestry management, time, and fire protection. It will take many years to restore sustained forest productivity. Utilization of the dead chestnut instead of small growing stock might afford the needed income from some areas for a few years while the growing stock is improving. Farm woodlands can be improved by utilizing the cull trees for fuel wood, posts, and poles. The development of new commercial plants to use cull materials and low-grade hardwood pieces in short lengths and small diameters would aid in improving the quality of the forests (*2*).

## Organization and Population

The Cherokee Indians formerly claimed the area in which Watauga County is situated. They made hunting trips and warlike forays through the county but did not settle there. According to authentic records, Bishop Spangenburg and his party were the first white visitors to the area in 1752. (*1*) The first known white settlers came about the time of the Revolution and settled near Hodges Gap and Valle Crucis. Settlements were later made along Meat Camp and Howard Creeks about 1799 (*1*). Most of the early settlers came from Virginia, Pennsylvania, and eastern North Carolina, and were of Scotch-Irish and English descent.

The county was established in 1849 by subdividing Ashe, Wilkes, Caldwell, and Yancey Counties. The western part was annexed to Mitchell County in 1861, and more of the southwestern part was annexed to Avery County in 1911.[5] Minor changes have been made in parts of the Watauga-Caldwell, Watauga-Wilkes, and Watauga-Ashe County boundaries since the county was formed. The county seat was named in honor of Daniel Boone and was incorporated in 1871–72 (*1*).

The 1950 census reports a total population of 18,342 in Watauga County, of which 2,973 is urban. In 1950, the average density was 57.3 persons a square mile. The population outside the towns is fairly well distributed over the county. It is sparse south of the Blue Ridge and on the higher mountains, such as Grandfather, Beech, Snake, and Rich Mountains and Elk Knob, and is more concentrated than elsewhere around the towns and along the main highways. Boone, with a population of 2,973, is the county seat, largest town, and principal market. Blowing Rock, a summer resort with a population of 647, is the second largest town and market.

## Cultural Development and Improvement

The elementary schools and high schools are consolidated throughout the county and school-bus facilities are provided for all rural communities. The Appalachian State Teachers College is in Boone. Churches are well distributed over the county.

Rural electrification has expanded in recent years. Farms with electricity are more numerous near the towns and along the highways and main public roads. In 1950, 2,032 farmhouses had electricity. Telephones are not

[5] Information from correspondence with D. L. Corbitt, North Carolina Historical Commission, Raleigh, N. C.

numerous and many parts of the county have no telephone service. In 1950, only 211 farms had telephones.

In general, the buildings, improvements, and conveniences fairly closely reflect the topography, quality of soil, and other land conditions. The condition of the farmstead, however, is affected by other factors, such as sources of income from enterprises off the farm. On the better soils with favorable relief, farm buildings normally are a bungalow or 1½-story frame dwelling, a garage, a small to medium-sized stock barn, a small corncrib, a chicken house, and outbuildings. The farmhouse is painted but the other buildings are not. Some of the farmhouses are large. A few farms have silos. Farms are fairly well fenced with barbed or woven wire, although many have some rail fence. On the poorer soils and in the rougher more mountainous districts, the prevailing farm buildings are a small one-story dwelling, a stock barn, and outbuildings, none of which are painted. These farms are not well fenced; such fences as exist are mostly built of rails, log slabs from sawmills, or brush.

## Industries

A sauerkraut factory in Boone normally uses several tons of cabbage from the county and also cans snap beans, blackberries, and pumpkins. It employs a few men. A hosiery mill in Boone employs a few men and several women. A milk-products company collects milk at a plant at Sugar Grove and transports it by motortruck to its factory at North Wilkesboro. This company operates a number of motortrucks. There are tobacco warehouses with auction markets in Boone.

## Transportation and Markets

There are no railroads within the county or near its boundaries. This handicap is partly offset by Federal and State highways that connect Boone with the principal cities in the surrounding counties. Buses and transport trucks use these highways regularly; there is much locally owned short-haul trucking in and out of the county.

The Blue Ridge Parkway will eventually cross the county between Deep Gap and Grandfather Mountain. It is a scenic highway and generally follows the crest of the Blue Ridge.

Public or local roads are adequate in most areas. Many communities have hard-surfaced or good gravel roads. In some outlying areas the roads are few and in poor condition. According to the 1950 Federal Census, the distance to the trading center visited most frequently was under 1 mile for 476 farms; 1 to 4 miles for 1,241; 5 to 9 miles for 490; and 10 miles and over for 376.

There are not many gravel roads south of the Blue Ridge, on the higher mountains, or in districts far from major highways. Some dirt roads are fairly rocky and rough; a few are nearly impassable in winter or early spring; and some cross streams by fords instead of bridges. The roads generally follow the prevailing valley-mountain topography. Some farmers have difficulty in marketing their produce because of road conditions.

The principal feeds purchased are ready-mixed poultry, dairy, and hog feeds, corn, and cottonseed meal. Some hay and straw are bought. A cooperative feed store was started in Boone in 1943.

## Agriculture

In the area that is now Watauga County, there is no record of the Indians having had settlements or agriculture of any sort when the white men came. The earliest records show that white settlers first arrived about the time of the Revolution, and they found the area covered with dense forest.

These first settlers worked hard to make clearings in the forest for cultivation. At first they did not even obtain subsistence from the soil, and hunting provided much of their food. Most of their clothes, tools, and equipment were homemade.

In the newly cleared patches, cabbage and root crops did well from the first. Corn was not grown until larger areas had been cleared and the forest soil prepared by cultivation. Buckwheat and rye did well long before good yields of wheat and oats were obtained. Farm animals were fed on potatoes, buckwheat, and corn, except for the hogs which obtained much of their food from the woods. Honey, maple sirup, and maple sugar were the only sweetening before sorghum came about 1860.

Farm implements were of the simplest kind. Reaping hooks preceded scythes and grain cradles. The grain was threshed on cloth by flails.

Farming remained largely on a subsistence level until recent times, but some cash income was obtained by marketing. Some farmers drove cattle to the Valley of Virginia. Deer-hams and hides, butter, cranberries, dried fruit, beeswax, and tallow were hauled by wagon to Charleston, S. C., or other coastal towns, and provisions brought back.

### *Land use, types of farming, and size of farms*

In 1950 the number of farms was 2,639. The area of the county in farms was 163,426 acres, or 79.8 percent. The average number of acres to the farm was 61.9. Of the area in farms, 57,456 acres, or 35.2 percent, was cropland. Comparative acreages in land and farm areas for stated census years are listed in table 13.

TABLE 13.—*Land and farm areas in Watauga County, N. C., in stated years*

| Farms and acreages | 1930 | 1940 | 1950 |
|---|---|---|---|
| Farms—number | 2,375 | 2,696 | 2,639 |
| Area in farms—acres | 163,163 | 160,798 | 163,426 |
| Proportion of county—percent | 84.1 | 78.5 | 79.8 |
| Average size of farms—acres | 68.7 | 59.6 | 61.9 |
| Cropland in farms—acres | [1] 80,207 | [1] 81,441 | [2] 57,456 |
| Proportion of farmland—percent | 49.1 | 50.6 | 35.2 |
| Average per farm—acres | 33.8 | 30.2 | 21.8 |

[1] Includes cropland harvested, crop failure, cropland lying idle or summer fallow, and plowable pasture.

[2] Includes cropland harvested, cropland used only for pasture, and cropland not harvested and not pastured.

In 1949 farmland was classified according to use as follows: cropland harvested, 24,876 acres; cropland used only for pasture, 29,535; and cropland not harvested and not pastured, 3,045. Other pasture covered a total of 28,071 acres, and woodland, 70,108 acres. All other land occupied a total 7,791 acres; this included all wasteland, house yards, barnyards, feedlots, lanes, roads, and so on.

The remaining 41,374 acres, or 20.2 percent, of the county probably was forest land in Government and individual holdings.

The 1950 Federal Census classifies the farms of the county by type and total number as follows:

| Type of farm: | *Number* |
|---|---|
| Field-crop other than vegetable and fruit-and-nut | 420 |
| General | 322 |
| Primarily crop | 59 |
| Primarily livestock | 39 |
| Crop and livestock | 224 |
| Livestock other than dairy and poultry | 201 |
| Vegetable | 132 |
| Dairy | 107 |
| Poultry | 24 |
| Fruit-and-nut | 10 |
| Miscellaneous and unclassified | 1, 423 |

The farms of Watauga County range from less than 10 acres to more than 1,000 acres in size as shown below. Farms of less than 100 acres were the most numerous; they totaled about 50 percent of the total farm acreage and contained the bulk of the harvested cropland.

| Size of farms in acres: | *Percent of total number of farms* | *Percent of total farm acreage* |
|---|---|---|
| Less than 10 | 11 | 1 |
| 10 to 29 | 28 | 9 |
| 30 to 99 | 46 | 40 |
| 100 to 219 | 12 | 27 |
| 220 to 1,000 | 3 | 23 |

## Crops

A considerable part of the farm acreage of the county is not suited to crops because of hilly to steep relief, stony soil, erosion, and hazard of erosion. Only about 28 percent is in cropland, and only about 36 percent of this is harvested cropland. No one crop is dominant (table 14). Under the present system of agriculture corn, oats, rye, buckwheat, and hay are grown for home use, and potatoes, snap beans, cabbage, and tobacco are grown for sale. Nearly all the farmers grow garden vegetables, potatoes, and orchard fruits for home use.

Systematic crop rotations are practiced on some farms, but on many farms nothing more than a crop sequence is followed. Systematic crop rotation, however, is on the increase. The most common rotation on the imperfectly to well-drained First-class soils of the first bottoms is 2 years of corn followed by 2 years of hay. On some farms, corn is grown on these soils several years in succession, and on a few crimson clover is grown as a cover crop to be plowed under in the spring.

A much wider variety of crops is grown on soils of the stream terraces, local alluvial and colluvial accumulations, and undulating to rolling uplands. On these soils, when a rotation is practiced, the most common is corn, some other intertilled crop, small grain, and 2 years of hay. Red clover and timothy, as a rule, are sown with small grains and buckwheat, and hay usually follows for 2 years. Sometimes the hay mixture is sown in the corn or tobacco.

On hilly land, the most common crop sequence is an intertilled crop, small grain, 2 years of hay, and 1 or 2 years of pasture. On steep land, the usual sequence is an intertilled crop, small grain seeded to pasture mixture, and then 3 to 5 years of pasture.

TABLE 14.—*Acreage of the principal crops and numbers of bearing fruit trees and grapevines in Watauga County, N. C., in stated years*

| Crop | 1929 | 1939 | 1949 |
|---|---|---|---|
| | *Acres* | *Acres* | *Acres* |
| Corn for grain | [1] 8, 895 | 8, 455 | 5, 662 |
| Oats [2] | 567 | 659 | 297 |
| Wheat | 469 | 638 | 273 |
| Rye | 1, 309 | 632 | 354 |
| Buckwheat | 1, 388 | 789 | [3] |
| Hay | 9, 420 | 7, 442 | 10, 498 |
| Clover and timothy, alone or mixed | 5, 937 | 5, 486 | 8, 713 |
| Alfalfa | 44 | 9 | 92 |
| Other hay | 3, 309 | 1, 861 | 1, 567 |
| Wild grasses | 83 | 29 | [3] |
| Grains cut for hay | 47 | 57 | 126 |
| Potatoes | 1, 873 | 2, 552 | 1, 958 |
| Vegetables, all other | 720 | 1, 572 | [4] 1, 645 |
| Tobacco | 20 | 383 | 703 |
| | *Number* [5] | *Number* [5] | *Number* [5] |
| Apple trees | 102, 305 | 82, 612 | 62, 543 |
| Peach trees | 8, 709 | 1, 963 | 1, 007 |
| Pear trees | 610 | 659 | 565 |
| Plum and prune trees | 880 | 1, 315 | 953 |
| Cherry trees | 8, 450 | 8, 906 | 10, 864 |
| Grapevines | 1, 902 | 4, 125 | 3, 176 |

[1] All corn.
[2] Threshed or combined.
[3] Not reported.
[4] Harvested for sale only.
[5] For census years 1930, 1940, 1950.

**Corn.**—Since 1929 this has been one of the most extensively grown crops. Only a small percentage is planted to hybrid varieties, but there is a decided trend in this direction. Most of the corn acreage is on well-drained and imperfectly drained soils of the bottom lands, stream terraces, local alluvial and colluvial accumulations, and rolling to undulating uplands. Some is even grown on hilly and steep uplands.

Cornland is usually plowed with a two-horse walking plow, except on hilly and steep slopes where a hillside plow is used. Planting is done with a one-row planter or by hand about the first of May. On hilly and steep slopes the rows are planted as nearly as possible on the contour. The crop is usually cultivated with one-horse cultivators, or by hand. Corn normally receives some form of complete fertilizer. The estimated average range in 1949 was 300 to 350 pounds an acre, but applications varied from 200 to 450 pounds. Most of the corn is cut close to the ground and shocked for fodder; some is topped, or cut above the ears. A small part is pulled; that is, only the leaves are removed and the stalks are left standing in the field.

Practically all the corn crop is fed to livestock on the farm or ground into meal for household use. In 1949, corn was grown on 69 percent of the farms in the county. The total yield was 212,462 bushels, or an average of 37.5 bushels an acre.

**Small grains.**—Oats are the most extensively grown small grain. The relatively cool, humid climate is fairly well suited to their production. The acreage is well dis-

*Figure 19.*—Cutting oats with a grain cradle on Chewacla cobbly loam along Meat Camp Creek about half a mile southeast of Meat Camp.

*Figure 20.*—Cabbage on Clifton stony loam, rolling phase. This field is at an altitude of about 4,200 feet on Rich Mountain half a mile northwest of Rich Mountain School.

tributed on many kinds of soils. The crop is normally sown by hand about the first of April. Most of it is cut with a cradle (fig. 19), but part, with a binder or mower. Cutting with a grain cradle and tying into bundles by hand is common in harvesting all small grains on all soils. The whole oat crop is fed on the farm. Some of the acreage is cut when ripe or nearly ripe and fed unthreshed. In 1949, oats were grown on 25 percent of the farms in the county. The total yield was 2,776 bushels, or 22.7 bushels an acre. Applications of balanced fertilizer averaged 250 pounds an acre, but ranged from 200 to 400 pounds.

Rye is another small grain that thrives on many different soils and is fed entirely on the farm. The crop is sown and harvested in the same way as wheat. In 1949, rye was grown on 6 percent of the farms in the county. The total production was 4,994 bushels, or an average of 14.1 bushels an acre. Application of fertilizer was about the same as for oats.

Wheat also is grown on many different soils widely distributed over the county, but covers a smaller acreage than either oats or rye. It is sown by hand or with a grain drill, and harvested with a cradle or sometimes with a grain binder. Most of the crop is fed to livestock on the farm or ground into flour for household use, but some is sold to local gristmills. In 1949, wheat was grown on about 4 percent of the farms in the county. The total yield was 4,360 bushels, or an average of 15.8 bushels an acre. Application of fertilizer was about the same as for oats.

Buckwheat is grown to some extent because it is suited to the relatively cool, moist climate, especially the climate at medium high and high elevations. The acreage is distributed over the county, but is relatively small south of the crest of the Blue Ridge. More of this crop is grown north and northeast of Boone than in other parts. Buckwheat is normally sown by hand in June or July. Most of the acreage is harvested with a cradle, but a small part with a mower or grain binder. Application of fertilizer is about the same as for oats. A large part of the crop is fed on the farm; the rest is ground into flour at the local gristmill and either sold or used in the farm home.

**Cabbage.**—This crop is grown mostly on undulating and rolling soils, and to a lesser extent on hilly soils at medium to somewhat high elevations where the climate is better suited for its production (fig. 20). A considerable part is grown on soils of stream terraces and local alluvial and colluvial accumulations, and a small part on well-drained and imperfectly drained soils of bottom lands. Only a little, if any, is grown at the lower elevations south of the crest of the Blue Ridge.

Land is plowed and prepared for cabbage in the same way as for corn. Cabbage seed is sown in coldframes, seedbeds covered with coarse cotton gauze, or in rows in the fields. Field planting eliminates the work of transplanting but necessitates thinning and more weeding when the plants are small. On hilly land, cabbage rows are usually planted as nearly as possible on the contour. The crop is cultivated with a one-horse cultivator and hoe. It is harvested by hand from the middle of August to the first part of November. In 1949, most of the cabbage acreage received 1,100 to 1,200 pounds of fertilizer, but the range was 700 to 1,800 pounds an acre. A few farmers used nitrate of soda as a sidedressing for cabbage.

Cabbage has become an important source of cash income on the farms of this county. Late and medium-late varieties are well suited to the climate, and improved truck transport has helped early marketing. A small or medium-sized type of cabbage is grown to market fresh, and a large high-yielding type for making sauerkraut. A small part of the crop is used for sauerkraut at the factory in Boone. Most of the crop is sold at the field to buyers from southern and eastern markets. Some is sold directly to local dealers and for the auction market in Boone. In 1949, 563 farms, or 21.3 percent, sold cabbage, and the total acreage harvested was 958.

**Potatoes.**—This crop is generally grown on the same soils as corn, although not usually on the bottom lands. Potatoes are planted by hand in March or the first part of April. On hilly and steep land the rows follow the contour as nearly as possible. One-horse cultivators are used, or the work is done by hand. The crop is either dug with hoes or plowed out with a breaking plow and bagged by hand, usually in September or October. In 1949, the average application of fertilizer for potatoes

*Figure 21.*—**Potatoes in bloom on Halewood clay loam, eroded hilly phase, about a mile northwest of Perkinsville. The rows approximately follow the contour of the land.**

was about 1,000 pounds an acre, but the range was from 400 to 1,600 pounds.

The Sequoia is the most common variety of potato grown, but the Essex, an improved blight-resistant, high-yielding variety, is being grown on an increasing acreage. The North Carolina Agricultural Experiment Station has developed another blight-resistant variety—the Kennebec—which gives high yields and is of excellent quality.

Potatoes have become an important source of farm cash income in the last ten years or so (fig. 21), partly because late varieties do so well in this climate. Most of the crop is sold to dealers in Boone or other local towns or country stores, but some is kept on the farm for food and seed. Any surplus is shipped by truck, mainly to eastern and southern markets.

**Beans, and other market vegetables.**—Beans are planted on many different soils, but most of the crop is grown in the northern part of the county, probably because of nearness of an auction market at Mountain City, Tenn., where nearly all the crop is sold. Beans grown in other parts of the county are sold mostly at markets in Boone and West Jefferson, N. C. Beans are an important cash crop on many farms and in recent years their acreage has been on the increase. In 1949, 679 farms, or 25 percent, of those in the county, grew fresh beans for sale. A total of 665 acres was harvested. The Tendergreen variety is the most common. Beans generally received about 850 pounds of fertilizer an acre in 1949, but the range was 400 to 1,200 pounds.

Other vegetables, excluding potatoes and sweetpotatoes, grown in 1949 for sale were: sweet corn, 3 acres; lima beans, 9 acres; and all others not previously mentioned, 10 acres. Pumpkins and green peas sometimes are grown for sale. In some years, a small quantity of pumpkin is canned at the sauerkraut factory in Boone. Onions and other vegetables were fertilized at a rate of 800 to 1,600 pounds an acre, in 1949. In that year vegetables for farm household use were grown on 2,319 farms, or 88 percent of the total.

**Tobacco.**—Most of the tobacco is grown in the northwestern and west-central parts of the county, west of Rich and Snake Mountains, and north of Boone and Valle Crucis, especially in the valley of Cove Creek and its tributaries. Some is grown in the northern tip of the county and in the vicinity of Meat Camp. Probable reasons for growing tobacco in these localities rather than in others are: (1) the soils are better suited to its production, (2) the areas are nearer Tennessee where burley is more extensively grown, and (3) there is less fog. Much of the tobacco is grown on Tusquitee and State soils. Some is produced on Congaree and Tate soils and on areas of rolling and hilly Halewood, Porters, Ashe, and Perkinsville soils of uplands, especially where they occur near the bottom of slopes.

This crop is sown in seedbeds covered with coarse cotton gauze and later transplanted to prepared soil in the fields; this is done about the middle of June. The plants are set fairly close together in rows and are worked with a one-horse cultivator and hoe. When ripe, the plants are cut, pierced near the butt of the stalk with a tobacco stick having a sharp removable spearhead, allowed to wilt for a short time, and then suspended in curing barns that allow free circulation of air (*4*). Artificial heat is rarely applied in the curing process. Highest tobacco yields are obtained on farms where the bottom leaves of the tobacco stalks are primed, tied to sticks, and cured. When cured, stripped, and graded, the tobacco is sold at auction, chiefly in Boone. Tobacco is fertilized with an application (in 1949) of about 1,200 pounds an acre; the range was 800 to 2,000 pounds.

Burley tobacco, U. S. Type 31 (*4*), is the most important cash crop in the county. Tobacco was of only minor importance prior to about 1930. The crop increased in acreage largely because of improved prices, high acre value, soils well suited to its production, and a new auction market in Boone. In 1949, 1,071 farms, or 40 percent, grew tobacco. Total production was 1,050,413 pounds, or an average yield of 1,494 pounds per acre.

**Fruit.**—Apple trees are the most numerous fruit trees, and the climate is fairly well suited to their growth. However, there are only a few trees on most farms, and those farms with a number of trees do not have them planted in orchards. The large commercial orchards are near Blowing Rock, Valle Crucis, Stony Fork post office, Silverstone, Bethel Church, and north of Laxon. In 1949, 1,901 farms, or 72 percent, had at least a few apple trees.

Cherry trees are also numerous, and in 1949 were found on 46.5 percent of the farms. Cherries are not grown on a commercial basis, although some are sold.

Minor fruit crops are plums, peaches, and pears; grapes are the principal small fruit, though wild blackberries are abundant throughout the county. Peach trees are generally at low elevations where winter weather is the mildest in the county. All plums, peaches, and pears are used on the farm. Some of the wild blackberries, however, are picked for sale and for commercial canning at Boone.

**Hay.**—Grass and legumes are grown on all soil types of the county, but not on steep or very steep phases, or where excessive stoniness and bedrock outcrops seriously hinder cultivation. The principal hay crops are red clover, timothy, and orchardgrass (fig. 22). The clover and timothy are usually grown together but are sometimes grown alone or mixed with other hay grasses or legumes. Orchardgrass is grown alone or mixed with other grasses or with clover. Other field crops used to some extent for

*Figure 22.*—**A good growth of red clover and timothy on State loam, undulating phase, about a mile southeast of Vilas. Pasture on the left hill is on Ashe loam, eroded steep phase.**

hay are lespedeza, small grains, wild grasses, soybeans and cowpeas, alfalfa, tall oatgrass, redtop, and crimson clover.

Crimson clover is grown on several farms, especially on bottom land or other land where corn or some other intertilled crop is grown consecutively for 2 years or more. It is usually plowed under for green manure. It does better at the lower altitudes. Tall oatgrass is either grown alone or mixed with other grasses, and it produces well.

Hay is cut with mowers. A large part is stacked in the field, and some is baled. Rainy weather often interferes with harvesting and proper curing.

In 1949, hay was produced on 1,868 farms, or about 70 percent of the total, and yielded 12,063 tons, or approximately 1 ton an acre. In the same year, alfalfa was grown on 92 acres on 35 different farms and yielded an average of 1.9 tons an acre. Practically all the hay is fed on the farm, but some is sold between farms.

### *Permanent pastures*

In 1949 there were 58,606 acres used for permanent pasture, exclusive of pastured woodland. This was over a third of the total farming area of the county. Permanent pasture is found on almost all soil types, but the largest areas are in the northwestern and extreme northern parts of the county where Ashe and Porters soils predominate. There is much less permanent pasture south of the crest of the Blue Ridge; in the extreme southwestern part of the county; and in areas on Rich, Snake, Stone, and Beech Mountains and Elk Knob. The quality of pasture varies from farm to farm and field to field; a large acreage is fairly good.

The quality of pasture improves following applications of lime and phosphate, as there is a decrease in broomsedge and an increase in Kentucky bluegrass and white clover, which are the principal pasture plants. Use of superphosphate on pastures has greatly increased in the past few years. The county agricultural agent estimates that four-fifths of the farmers have treated a part or all of their pasture since 1935 with an application of 45-percent superphosphate. The application ranges from 100 to 150 pounds an acre. Many farmers apply phosphate to their pastures every third or fourth year, but some have done so only once.

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### *Livestock and livestock products*

Livestock is important to the agriculture of the county. Horses, cattle, sheep, swine, and chickens are the principal animals. The county has a good number of livestock, dairy, and poultry farms, and nearly every well-established farm has a few cattle and hogs and one, two, or more work animals. A large number of chickens are raised, and many eggs are produced.

The number of cattle, horses, and chickens increased between 1930 and 1950 but the number of sheep dropped to nearly half. Livestock sold or butchered on farms in 1949 was as follows: Cattle and calves, 5,941 sold and 102 butchered; hogs and pigs, 3,521 sold and 3,644 butchered; and sheep and lambs, 3,761 sold and none butchered. All cows, including heifers that had calved, numbered 7,201 in 1950, and of this total, 6,386 were kept for milk production. The number of livestock on farms is given in table 15 for stated census years.

TABLE 15.—*Livestock on farms in Watauga County, N. C., in stated years*

| Livestock | 1930 | 1940 | 1950 |
|---|---|---|---|
| | *Number* | *Number* | *Number* |
| Horses and colts | 1, 629 | [1] 1, 769 | 2, 255 |
| Mules and mule colts | 298 | [1] 192 | 161 |
| Cattle and calves | 10, 765 | [1] 10, 387 | 15, 091 |
| Hogs and pigs | 3, 587 | [2] 2, 973 | 3, 990 |
| Sheep and lambs | 16, 670 | [3] 5, 544 | 8, 854 |
| Chickens | [1] 50, 208 | [2] 54, 255 | [2] 59, 972 |

[1] More than 3 months old.
[2] More than 4 months old.
[3] More than 6 months old.

In 1949 a total of 887,061 gallons of whole milk was sold from 703 farms; and 711 pounds of cream (butterfat) from 7 farms. There are some dairies, most of them near Boone and Blowing Rock. Whole milk and cream from the dairies are retailed in these towns.

A first-class milk-processing plant was established at Sugar Grove in 1941. Milk trucks travel over most of the gravel, crushed-rock, and paved roads to collect milk from farms. Between 400 and 700 farmers sell whole milk to the milk-processing plant. The greatest quantity is sold during the peak pasture season extending from mid-May to late in August. A daily receipt of 54,000 pounds of milk was reached in midsummer of 1949.[6]

Grade Jerseys are the most common milk cow, but there are milking Shorthorns and other beef cattle, some Guernseys, and a few Holsteins. Only a few farms have purebred registered dairy cattle.

Beef cattle are fairly numerous in the northwestern, northern, and west-central parts of the county, where there is a relatively large acreage of permanent pasture. The Hereford is the principal breed, and a considerable number are registered purebred. Most of the cattle are grass-fed. Through the winter they subsist on hay plus a little grain feed. Some are sold at occasional auction

[6] Information from manager of the milk-processing plant.

sales in Perkinsville. Many are sold to dealers and hauled by motortruck to Tennessee, Virginia, or West Virginia. A few go to eastern North Carolina. Some purebred Herefords are sold in Tennessee, southwestern Virginia, and eastern North Carolina for breeding stock.

Hogs are not produced as a livestock specialty; they are raised to a large extent to meet home needs for pork and lard. Most of the hogs are grade Poland China. There are two breeders of purebred hogs in the county.[7]

Sheep are most numerous in the northern half of the county, especially where there is much permanent pasture. A few large flocks are kept north of and on Snake and Rich Mountains and on and near Big Bald Mountain. Wool and lambs are sold mostly through cooperative pools. Most lambs are shipped to Jersey City, N. J., and other eastern markets. In 1949, 22,532 pounds of wool were shorn on 334 farms. Almost all the sheep are Hampshire. In recent years, a few Hampshire-Rambouillet crossbred lambs have been shipped into the county from the West.

Chicken production is not specialized. In 1949, 34,487 chickens were sold from 756 farms. A total of 205,326 dozens of chicken eggs were sold from 1,132 farms in the same year. Goats, turkeys, ducks, geese, guineas, and bees are minor livestock produced on some farms.

### *Farm power and mechanical equipment*

Work animals supply the principal farm power. In 1950, 1,396 farms had horses and colts, and 98 had mules and mule colts. About 93.3 percent of the work animals are horses. Grade Percherons are the chief work horses. Most of them are fairly heavy and of medium to good quality. Steers are used as work animals on a few farms. Most of the replacements for workstock are raised in the county, but a few western horses are bought. Some of the mules raised in the county are sold in the eastern part of the State.

Most of the farms have simple machinery such as two-horse walking plows, spike-toothed harrows, one-horse cultivators, grain cradles, fertilizer distributors, and sleds. The larger farms have a mowing machine, hayrake, small two-horse disk harrow, and wagon. Only a few farms have heavier machinery such as grain drills, two-horse cultivators, grain binders, threshing machines, hay balers, ensilage cutters, manure spreaders, potato planters, potato diggers, and two-row corn planters. According to the 1950 Census, 575 farms had 630 automobiles; 631 farms had 672 motortrucks; and 80 farms had 90 tractors.

### *Farm tenure and labor supply*

The farms of Watauga County are operated almost entirely by owners or part owners. In 1950, 2,478 farms, or 94 percent of the total, were operated by owners or part owners. Farm tenancy is insignificant in the county. In 1950, 295 hired workers were employed on 185 farms.

## *Soil Survey Methods and Definitions*

Soil surveying consists of the examination, classification, and mapping of soils in the field. The soil scientist walks over the area at intervals not more than one-quarter mile apart and bores into the soil with an auger or digs holes with a spade. The material extracted from such borings or holes show that a soil consists of several distinctly different layers, called horizons, which collectively are known as the soil profile. All the soil-auger samples for a given area are carefully compared and modal profiles selected as representative of significantly different soils.

Having classified the different soils of the area by their modal profiles, each of the layers of these profiles is then carefully studied to determine how its properties will affect plant growth, erosion, and agricultural practices.

The color of each layer is noted. The darkness of the surface horizon is usually related to its content of organic matter; streaks and spots of gray, yellow, and brown in lower horizons generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay in each horizon, is determined by the way the soil feels when rubbed between the fingers, and is later checked by mechanical analysis in the laboratory. Texture has much to do with the quantity of moisture the soil will hold available to plants; whether plant nutrients or fertilizers will be held by the soil in forms available to plants or will be leached out; and how hard the soil may be to cultivate.

Structure, or the way the soil granulates, and the amount of pore or open space between particles indicates 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.

Parent material, or the kind of rock material from which the soil has been developed, affects 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 that are much alike in the kind, thickness, and arrangement of their horizons are mapped as one soil type. Some soil types are separated into two or more phases. A soil type is broken into phases primarily because of differences in the soil type other than those of kind, thickness, and arrangement of horizons. 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. 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.

Two or more soil types may have similar profiles; that is, the soil horizons may be nearly the same, except that the texture, especially the texture 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 are about the same in kind, thickness,

[7] Information from Harry Hamilton, former county agricultural agent of Watauga County.

and arrangement of horizons, except for texture, particularly texture of the surface horizon, whether the number of such soil types be only one or several.

A place-name near the spot where the soil was first identified is usually chosen as the name of the series. Thus, Ashe is the name of a soil series first mapped in Ashe County, N. C. Two types of this series are found in Watauga County; namely, Ashe loam and Ashe stony loam. These types differ in the texture of the surface soil, as their names show. The Ashe series is divided into seven phases because of differences in slope and erosion.

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.

Areas such as bare rocky mountainsides, coastal beach, or dune sand 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 rough land, coastal beach, dune sand, tidal marsh, riverwash, gravel pits, and so on. In Watauga County, Stony hilly land (Ashe and Porters soil materials) is a land type, mainly a mixture of Ashe and Porters soils.

This 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 it than for broader groups of soils that contain more variation. One can say, for example, that soils of the Tusquitee series need lime for alfalfa. But for Tusquitee loam, undulating phase, more specific information can be given. It has relatively mild slopes and, in addition to needing lime, is suited to row crops grown in a rotation with small grains and hay. Similarly, Tusquitee stony loam, eroded hilly phase, has strong slopes of as much as 30 percent, is difficult to work with heavy machinery, erodes fairly easily, and should be used principally for long-term hay or pasture. Both of these phases are included in the Tusquitee series.

In Watauga County, the types of relief and percentage range of slope are as follows:

| Slope: | *Percent* |
|---|---|
| Level or nearly level | 0 to 2 |
| Undulating | 2 to 7 |
| Rolling | 7 to 15 |
| Hilly | 15 to 30 |
| Steep | 30 to 60 |
| Very steep | 60+ |

The classification followed in defining, naming, and mapping erosion phases is as follows:

1. Eroded. Soils eroded to the extent that subsoil material is within plow depth over half or more of the delineated area are classified and mapped as "eroded." Ordinarily, tillage of this land will bring part of the upper subsoil to the surface and alter the original surface soil by mixing some subsoil material with it. There may be a limited number of short, shallow gullies. From 25 to 75 percent of the original surface soil has been lost.

2. Severely eroded. Soils eroded to the extent that all or practically all the original surface soil has been lost are classified as "severely eroded." In places, some of the subsoil also has been lost. Tillage of severely eroded soils is almost entirely in subsoil material. Small, short gullies are common, and a few of them are too deep to be obliterated by tillage.

Definitions of other key soil terms used in the report are given in the glossary.

## Glossary

**Acidity.** The degree of acidity of the soil mass expressed in pH values or in words as follows:

| | |
|---|---|
| Extremely acid---below 4.5 | Slightly acid--------6.1–6.5 |
| Very strongly acid--4.5–5.0 | Neutral-------------6.6–7.3 |
| Strongly acid-------5.1–5.5 | Mildly alkaline-----7.4–8.0 |
| Medium acid--------5.6–6.0 | |

**Alluvial soils.** An azonal group of soils developed from transported and relatively recently deposited material (alluvium) characterized by a weak modification (or none) of the original material by soil-forming processes.

**Alluvium.** Fine material such as sand, mud, or other sediments deposited on land by streams.

**Bedrock.** The solid rock underlying soils.

**Colluvium.** Deposits of rock fragments and soil material accumulated at the base of slopes through the influence of gravity. It includes creep and local wash and in many areas is of mixed character.

**Consistence.** A soil term expressing degree of cohesion and the resistance to forces tending to deform or rupture the aggregate. The relative mutual attraction of the particles in the whole mass or their resistance to separation. Terms commonly used to describe consistence include brittle, compact, firm, friable, plastic, sticky, and stiff.

*Brittle.*—Term used to describe a soil that when dry will break with a sharp, clean fracture or, if struck a sharp blow, shatters into cleanly broken, hard fragments.

*Compact.*—Dense and firm but without any cementation.

*Firm.*—Resistant to forces tending to produce rupture or deformation.

*Friable.*—Readily ruptured and crushed with application of moderate force.

*Plastic.*—Readily deformed without rupture; friable but cohesive; can be readily molded; puttylike.

*Sticky.*—Adhesive rather than cohesive when wet but usually very cohesive when dry. When wet, soil shows a decided tendency to adhere to other material and objects.

*Stiff.*—Resistant to deformation or rupture; firm and tenacious and tending toward imperviousness. Usually applied to condition of the soil in place and moderately wet.

**Contour tillage.** Furrow plowed at right angles to the direction of slope at the same level throughout and ordinarily at comparatively close intervals.

**Erosion.** The wearing away or removal of soil material by water or wind.

**Fertility.** The inherent quality of a soil as measured by the quantity of plant nutrients available for balanced plant growth.

**First bottom.** The normal flood plain of a stream; land along the stream subject to overflow.

**Internal drainage.** Refers to the movement of water through the soil profile.[8] This rate is affected by the texture of the surface soil and subsoil and by the height of the ground water table, either permanent or perched. Relative terms for expressing internal drainage are the following: very rapid, rapid, moderate, slow, very slow, and none.

**Mottled (mottling).** Containing irregular spots of different colors.

**Natural drainage.** Refers to those conditions which existed during the development of the soil[9] as opposed to altered drainage which is commonly the result of artificial drainage or irrigation but may be due to other causes such as sudden deepening of channels or sudden blocking of drainage outlets. The following relative terms are used to express natural drainage: excessively drained, somewhat excessively drained, well drained, moderately well drained, imperfectly or somewhat poorly drained, poorly drained, and very poorly drained.

**Normal soil.** A soil having a profile in equilibrium with the two principal forces of the environment—native vegetation and climate—usually developed on the gently undulating (but not strictly level) upland, with good drainage, from any parent material, not of extreme texture or chemical composition, that has been in place long enough for biological forces to exert their full effect.

**Permeable.** Easily penetrated, as by water.

**Phase.** A subdivision of the soil type covering variations within the type that are insufficient to justify the establishment of a new type, yet are worthy of recognition; a mapping unit. The variations are chiefly in such external characteristics as relief, stoniness, or erosion. (Example: Porters loam, eroded steep phase.)

**Productivity.** The capability of a soil to produce a specified plant or plants under a given system of management.

**Profile, soil.** A vertical section of the soil from the surface down to the parent material.

**Reaction.** See Acidity.

**Series, soil.** A group of soils having the same profile characteristics—same general range in color, structure, consistence, and sequence of horizons—the same general conditions of relief and drainage, and usually a common or similar origin and mode of formation. A group of soil types closely similar in all respects except the texture of the surface soil.

**Soil.** An organized natural body occurring on the surface of the earth characterized by conformable layers resulting from modification of parent material by physical, chemical, and biological forces through various periods of time.

**Structure, soil.** The morphological aggregates in which the individual soil particles are arranged. It may refer to their natural arrangement in the soil when in place and undisturbed or at any degree of disturbance. Soil structure is classified according to grade, class, and type.[10]

*Grade.* Degree of distinctness of aggregation; also expresses the differential between cohesion within aggregates and adhesion between aggregates. Terms: structureless (single grain or massive), weak, moderate, and strong.

*Class.* Size of soil aggregates. Terms: very fine or very thin, fine or thin, medium, coarse or thick, and very coarse or very thick.

*Type.* Shapes for soil aggregates. Terms: platy, prismatic, columnar, blocky, nuciform or nutlike, granular (nonporous), and crumb (porous). (Example of soil-structure grade, class, and type: Moderate coarse nuciform.)

**Subsoil.** Technically, the B horizon; roughly, that part of the profile below plow depth.

**Substratum.** Material underlying the subsoil.

**Surface runoff.** This term refers to the amount of water removed by flow over the surface of the soil.[11] The amount and rapidity of surface runoff are affected by factors such as texture, structure, and porosity of the surface soil; the vegetative covering; the prevailing climate; and the slope. Relative degrees of surface runoff are expressed in 6 classes as follows: very high, high, medium, low, very low, and ponded.

**Surface soil.** Technically, the A horizon; commonly, the part of the upper profile usually stirred by plowing.

**Terrace (geologic).** An old alluvial plain, usually flat or smooth, bordering a stream; frequently called second bottoms as contrasted to the flood plain; seldom subject to overflow.

**Texture.** Size of individual particles making up the soil mass. The various soil separates are the size groups such as sand, silt, and clay. A coarse-textured soil is one high in sand; a fine-textured soil has a large proportion of clay.

**Type.** A group of soils having similar genetic horizons including texture and arrangement in the soil profile, and developed from a particular type of parent material.

**Upland (geologic).** Land consisting of material unworked by water in recent geologic time and lying in general at higher elevations than the alluvial plain or stream terrace.

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*Watauga County, N. C., Soils:*

| Soil | Map symbol | Parent material | Physiographic position | Slope | Natural drainage [1] | Surface soil [2] |
|---|---|---|---|---|---|---|
| | | | | *Percent* | | |
| Ashe loam: | | | | | | |
| Eroded steep phase | Aa | Residual material mainly from weathered granite, gneiss, and schist. | Hillsides and mountainsides | 30–60 | Somewhat excessive to excessive. | Moderate to dark yellowish-brown friable loam. |
| Steep phase | Ab | Same | Hillsides and mountainsides | 30–60 | Somewhat excessive | Dark yellowish-brown, friable loam. |
| Ashe stony loam: | | | | | | |
| Eroded hilly phase | Ac | Same | Rounded tops of ridges or mountains, mountainsides, and hilly areas. | 15–30 | Good | Moderate to dark yellowish-brown, friable stony loam. |
| Eroded steep phase | Ad | Same | Hillsides and mountainsides | 30–60 | Somewhat excessive to excessive. | Same |
| Hilly phase | Ae | Same | Rounded tops of ridges or mountains, mountainsides, and hilly areas. | 15–30 | Good | Dark yellowish-brown, friable stony loam. |
| Steep phase | Af | Same | Hillsides and mountainsides | 30–60 | Somewhat excessive | Same |
| Very steep phase | Ag | Same | Hillsides and mountainsides | 60+ | Somewhat excessive to excessive. | Same |
| Augusta loam | Ah | Alluvium originating chiefly from granite, schist, and gneiss. | Low stream terraces | 0–2 | Poor | Brownish-gray to dark olive-brown, friable loam or silt loam. |
| Buncombe loamy fine sand | Ba | Alluvium originating mainly from granite, schist, and gneiss; in places mixed with material from sandstone, conglomerate and shale. | First bottoms | 0–2 | Excessive; soil subject to overflow. | Dark yellowish-brown to weak-brown loose loamy fine sand. |
| Burton stony loam, hilly phase. | Bb | Residual material mainly from weathered gneiss and schist; in places from weathered sandstone or other sedimentary rock. | Rounded tops of high mountains and in mountain gaps. | 15–30 | Good | Black to brownish-black loose stony loam underlain by brownish-black to dusky-brown friable loam to clay loam; large quantity of well-decomposed organic matter. |
| Chandler loam: | | | | | | |
| Eroded steep phase | Ca | Residual material chiefly from weathered mica schist, mica gneiss, and granitoid. | Hills and mountainsides | 30–60 | Somewhat excessive to excessive. | Moderate yellowish-brown friable loam or heavy loam; large quantity of mica flakes. |
| Steep phase | Cb | Same | Hills and mountainsides | 30–60 | Same | Dark yellowish-brown friable loam; large quantity of mica flakes. |
| Chandler stony loam: | | | | | | |
| Eroded steep phase | Cc | Same | Hills and mountainsides | 30–60 | Same | Moderate yellowish-brown, friable stony loam or heavy loam; large quantity of mica flakes. |
| Severely eroded steep phase. | Cd | Same | Hills and mountainsides | 30–60 | Excessive | Same |
| Steep phase | Ce | Same | Hills and mountainsides | 30–60 | Somewhat excessive to excessive. | Dark yellowish-brown friable stony loam; large quantities of mica flakes. |
| Very steep phase | Cf | Same | Hills and mountainsides | 60+ | Same | Same |
| Chewacla cobbly loam | Cg | Alluvium originating mainly from gneiss, schist, and granite; in some areas from sandstone, shale, or other sedimentary rocks. | First bottoms | 0–2 | Imperfect; soil subject to overflow. | Dark yellowish-brown, friable cobbly loam. |
| Chewacla loam | Ch | Same | First bottoms | 0–2 | Same | Dark yellowish-brown, friable loam. |
| Clifton clay loam: | | | | | | |
| Eroded hilly phase | Ck | Residual material chiefly from weathered hornblende schist, hornblende gneiss, and diorite. | Rounded mountain ridges or knobs, mountain slopes, and hillsides. | 15–30 | Good to somewhat excessive. | Light-brown, or strong-brown to moderate-brown, friable light to heavy clay loam. |
| Eroded steep phase | Cl | Same | Same | 30–60 | Same | Same |
| Clifton stony clay loam: | | | | | | |
| Eroded hilly phase | Cm | Same | Same | 15–30 | Somewhat excessive | Light-brown or strong-brown to moderate-brown, friable stony clay loam. |
| Eroded steep phase | Cn | Same | Hillsides and mountain slopes | 30–60 | Somewhat excessive to excessive. | Same |
| Clifton stony loam: | | | | | | |
| Hilly phase | Co | Same | Rounded mountain ridges or knobs, mountain slopes, and hillsides. | 15–30 | Good to somewhat excessive. | Moderate-brown to light-brown, friable stony loam or heavy loam. |
| Rolling phase | Cp | Same | Relatively broad ridges and mountain tops. | 7–15 | Good | Same |
| Steep phase | Cr | Same | Hillsides and mountain slopes | 30–60 | Somewhat excessive to excessive. | Same |
| Congaree cobbly fine sandy loam. | Cs | Alluvium originating mainly from gneiss, schist, and granite; in some areas admixture largely from sandstone, conglomerate, and shale. | First bottoms | 0–2 | Somewhat excessive; soil subject to overflow. | Dark yellowish-brown to weak-brown, very friable cobbly fine sandy loam. |
| Congaree fine sandy loam | Ct | Same | First bottoms | 0–2 | Good; soil subject to overflow. | Dark yellowish-brown to weak-brown, friable or very friable fine sandy loam. |
| Congaree loam | Cu | Same | First bottoms | 0–2 | Same | Dark yellowish-brown very friable loam. |
| Gullied land (Chandler and Clifton soil materials). | Ga | Residual material chiefly from weathered mica schist or hornblende schist, hornblende gneiss, or diorite. | Mountain ridges and knobs, mountainsides and hillsides. | 7–60+ | Somewhat excessive to excessive. | |

See footnotes at end of table.

*Summary of important characteristics*

| Subsoil | Natural fertility | Erosion hazard | Workability[1] | Conservability[4] | Range of suitability | Principal use at present | Use class[5] | Management group |
|---|---|---|---|---|---|---|---|---|
| Strong yellowish-brown to moderate yellowish-brown friable loam or heavy loam. | Low to medium | Moderate | Poor | Poor | Narrow | Open pasture, crops, and idle cropland. | Fourth | 4-C |
| Same | Low to medium | Moderate | Poor | Poor | Narrow | Forest | Fourth | 4-D |
| Same | Low to medium | Little to medium. | Fair | Fair | Medium | Open pasture, crops, and idle cropland. | Third | 3-D |
| Same | Low to medium | Moderate | Very poor | Poor | Narrow | Open pasture and idle cropland. | Fourth | 4-C |
| Same | Low to medium | Little to moderate. | Poor | Fair | Medium | Forest | Third | 3-E |
| Same | Low to medium | Moderate | Very poor | Poor | Narrow | Forest | Fourth | 4-D |
| Same | Low to medium | Moderate to great. | Very poor | Very poor | Very narrow | Forest and open pasture. | Fifth | 5 |
| Weak-yellow or pale-olive, mottled with moderate yellowish-brown, friable to firm clay loam or clay. | Low | None to very little. | Very good | Very good | Medium | Crops and open pasture. | Third | 3-C |
| Moderate, dark, or strong yellowish-brown, loose loamy fine sand, fine sand, or fine sandy loam. | Low | None | Very good | Fair | Medium | Same | Third | 3-A |
| Dark yellowish-brown, friable light clay loam, heavy loam, or clayey fine sandy loam; many rock fragments. | High | Little | Fair | Good | Medium | Open pasture | Third | 3-E |
| Moderate yellowish-brown friable loam or heavy loam; large to very large mica content; many micaceous rock fragments. | Low | Very great | Poor | Very poor | Narrow | Open pasture, idle cropland, crops, and forest. | Fourth | 4-C |
| Same | Low | Very great | Poor | Very poor | Narrow | Forest | Fourth | 4-D |
| Same | Low | Very great | Very poor | Very poor | Very narrow | Open pasture, idle cropland, forest. | Fifth | 5 |
| Same | Low | Very great | Very poor | Very poor | Very narrow | Idle cropland and open pasture. | Fifth | 5 |
| Same | Low | Very great | Very poor | Very poor | Very narrow | Forest | Fifth | 5 |
| Same | Low | Very great | Very poor | Very poor | Very narrow | Forest and idle cropland. | Fifth | 5 |
| Mottled light olive-gray, pale-olive, and moderate yellowish-brown cobbly very friable loam. | Medium | None | Good | Good | Medium | Crops and open pasture. | Third | 3-B |
| Mottled light olive-gray, pale-olive, and moderate yellowish-brown, very friable loam. | High | None | Very good | Very good | Medium | Same | Second | 2-A |
| Strong-brown or dark-orange, friable to firm clay loam or heavy clay loam; plastic and sticky when wet. | Medium | Moderate | Good | Fair | Medium | Same | Third | 3-D |
| Same | Medium | Great | Poor | Poor | Narrow | Open pasture, crops, and idle cropland. | Fourth | 4-C |
| Strong-brown or dark-orange, friable to firm stony clay loam or heavy clay loam; plastic and sticky when wet. | Medium | Moderate | Fair | Poor | Medium | Crops, open pasture, and idle cropland. | Third | 3-D |
| Same | Medium | Very great | Very poor | Very poor | Narrow | Open pasture and idle cropland. | Fourth | 4-C |
| Same | Medium | Moderate | Poor | Fair | Medium | Forest | Third | 3-E |
| Same | Medium | Little to moderate. | Good | Good | Wide | Crops and open pasture. | Second | 2-B |
| Same | Medium | Very great | Very poor | Poor | Narrow | Forest | Fourth | 4-D |
| Moderate, dark, or strong yellowish-brown, friable cobbly fine sandy loam, loam, or loamy fine sand. | Low | None | Good | Very good | Medium | Crops and open pasture. | Third | 3-A |
| Moderate yellowish-brown to dark yellowish-brown very friable fine sandy loam, heavy fine sandy loam, or loam to loamy fine sand or light fine sandy loam. | Medium | None | Excellent | Excellent | Wide | Crops | First | 1-A |
| Dark yellowish-brown, very friable loam to friable or very friable fine sandy loam or loamy fine sand. | Medium | None | Excellent | Excellent | Wide | Crops | First | 1-A |
| | Medium to low | Great to extremely great. | Very poor | Very poor | Very narrow | Idle cropland and forest. | Fifth | 5 |

*Watauga County, N. C., Soils: Summary*

| Soil | Map symbol | Parent material | Physiographic position | Slope | Natural drainage [1] | Surface soil [2] |
|---|---|---|---|---|---|---|
| Halewood clay loam: | | | | *Percent* | | |
| Eroded hilly phase | Ha | Residual material mainly from weathered granite, schist, and gneiss. | Mountain peaks or ridges, mountainsides, and hillsides. | 15–30 | Good to somewhat excessive. | Moderate-brown, friable heavy loam light clay loam, or clay loam. |
| Eroded steep phase | Hb | Same | Hillsides and mountain slopes | 30–60 | Somewhat excessive to excessive. | Same |
| Halewood loam: | | | | | | |
| Hilly phase | Hc | Same | Mountain peaks or ridges, mountainsides and hillsides. | 15–30 | Good | Moderate- to weak-brown friable loam to moderate-brown heavy loam. |
| Rolling phase | Hd | Same | Broad tops of ridges and mountains in most places. | 7–15 | Good | Same |
| Steep phase | He | Same | Hillsides or mountain slopes | 30–60 | Somewhat excessive to excessive. | Same |
| Halewood stony clay loam: | | | | | | |
| Eroded hilly phase | Hf | Same | Mountain peaks or ridges, mountainsides, and hillsides. | 15–30 | Good to somewhat excessive. | Moderate-brown friable stony heavy loam, light clay loam, or clay loam. |
| Eroded steep phase | Hg | Same | Hillsides and mountain slopes | 30–60 | Somewhat excessive to excessive. | Same |
| Halewood stony loam: | | | | | | |
| Hilly phase | Hh | Same | Mountain peaks or ridges, mountainsides, and hillsides. | 15–30 | Good | Moderate to weak-brown friable stony loam to moderate-brown, friable stony heavy loam. |
| Steep phase | Hk | Same | Hillsides and mountain slopes | 30–60 | Somewhat excessive to excessive. | Same |
| Hayesville clay loam: | | | | | | |
| Eroded hilly phase | Hl | Residual material from weathered granite, gneiss, and schist. | Rounded mountain ridges and hillsides. | 15–30 | Good to somewhat excessive. | Light-brown, moderate-brown, or weak-orange, friable clay loam, light clay loam, or heavy loam. |
| Eroded steep phase | Hm | Same | Hillsides and mountainsides | 30–60 | Somewhat excessive to excessive. | Same |
| Hayesville loam, hilly phase | Hn | Same | Rounded mountain ridges and hillsides. | 15–30 | Good | Moderate to light yellowish-brown friable loam or light loam to strong yellowish-brown or moderate-brown friable loam. |
| Hayesville stony loam, steep phase. | Ho | Same | Hillsides and mountainsides | 30–60 | Somewhat excessive to excessive. | Moderate to light yellowish-brown, friable stony loam or light loam to strong yellowish-brown or moderate-brown, friable stony loam. |
| Matney loam: | | | | | | |
| Eroded hilly phase | Ma | Residual material from weathered, noncalcareous sandstone, conglomerate, quartzite, and shale. | Rounded tops of ridges and mountains, mountain slopes, and hillsides. | 15–30 | Good to somewhat excessive. | Moderate yellowish-brown, friable heavy loam to light clay loam. |
| Hilly phase | Mb | Same | Same | 15–30 | Good to somewhat excessive. | Dark yellowish-brown very friable loam. |
| Rolling phase | Mc | Same | Same | 7–15 | Good | Same |
| Matney stony loam: | | | | | | |
| Eroded hilly phase | Md | Same | Same | 15–30 | Good to somewhat excessive. | Moderate yellowish-brown stony friable heavy loam to light clay loam. |
| Hilly phase | Me | Same | Same | 15–30 | Good to somewhat excessive. | Dark yellowish-brown, very friable stony loam. |
| Perkinsville loam: | | | | | | |
| Eroded hilly phase | Pa | Residual material chiefly from weathered granite, schist, and gneiss. | Same | 15–30 | Same | Moderate yellowish-brown, friable heavy loam, light clay loam, or clay loam. |
| Hilly phase | Pb | Same | Same | 15–30 | Same | Dark yellowish-brown very friable loam. |
| Rolling phase | Pc | Same | Rounded tops of mountains, ridges, and hills and other smooth places in mountain uplands. | 7–15 | Good | Same |
| Undulating phase | Pd | Same | Smooth mountain uplands | 2–7 | Good | Same |
| Perkinsville stony loam: | | | | | | |
| Eroded hilly phase | Pe | Same | Rounded mountain peaks, ridge tops, mountain slopes, and hillsides. | 15–30 | Good to somewhat excessive. | Moderate yellowish-brown friable stony heavy loam, light clay loam, or clay loam. |
| Rolling phase | Pf | Same | Tops of mountains, ridges, or hills and hillsides. | 7–15 | Good | Dark yellowish-brown, very friable stony loam. |
| Porters loam: | | | | | | |
| Eroded hilly phase | Pg | Same | Rounded tops of mountains and ridges, mountain slopes, and hillsides. | 15–30 | Good | Moderate-brown, dark yellowish-brown or weak-brown, very friable loam to heavy loam. |
| Eroded steep phase | Ph | Same | Hillsides and mountainsides | 30–60 | Somewhat excessive | Same |
| Hilly phase | Pk | Same | Rounded tops of mountains and ridges, mountain slopes, and hillsides. | 15–30 | Good | Moderate-brown very friable loam. |
| Steep phase | Pl | Same | Hillsides and mountainsides | 30–60 | Somewhat excessive | Same |

See footnotes at end of table.

*of important characteristics*—Continued

| Subsoil | Natural fertility | Erosion hazard | Workability [3] | Conservability [4] | Range of suitability | Principal use at present | Use class [5] | Management group |
|---|---|---|---|---|---|---|---|---|
| Moderate-brown to moderate yellowish-brown, friable to firm clay loam or heavy clay loam. | Medium | Moderate | Fair | Poor | Medium | Crops and open pasture. | Third | 3-D |
| Same | Medium | Very great | Poor | Poor | Narrow | Open pasture, crops, and idle cropland. | Fourth | 4-C |
| Same | Medium | Moderate | Good | Fair | Medium | Forest | Third | 3-E |
| Same | Medium | Little to moderate. | Very good | Good | Wide | Crops and open pasture. | Second | 2-B |
| Same | Medium | Very great | Poor | Poor | Narrow | Forest | Fourth | 4-D |
| Same | Medium | Moderate | Poor | Fair | Medium | Crops, open pasture, and idle cropland. | Third | 3-D |
| Same | Medium | Very great | Very poor | Poor | Narrow | Open pasture and idle cropland. | Fourth | 4-C |
| Same | Medium | Moderate | Poor | Fair | Medium | Forest | Third | 3-E |
| Same | Medium | Very great | Very poor | Poor | Narrow | Forest | Fourth | 4-D |
| Strong-brown friable clay loam underlain by moderate reddish-brown to strong-brown firm clay, light clay loam or heavy clay loam; plastic and sticky when wet. | Low | Moderate to great. | Fair | Poor | Medium | Crops, open pasture, and idle cropland. | Third | 3-D |
| Same | Low | Very great | Poor | Poor | Narrow | Open pasture and idle cropland. | Fourth | 4-C |
| Same | Low | Moderate to great. | Good | Fair | Medium | Forest | Third | 3-E |
| Same | Low | Very great | Very poor | Poor | Narrow | Forest | Fourth | 4-D |
| Moderate to strong yellowish-brown friable clay loam or fine sandy clay loam. | Low | Moderate to very great. | Good | Fair | Medium | Crops and open pasture. | Third | 3-D |
| Same | Low | Same | Good | Good | Medium | Forest | Third | 3-E |
| Same | Low | Little | Very good | Very good | Wide | Crops and open pasture. | Second | 2-B |
| Moderate to strong yellowish-brown friable clay loam or fine sandy clay loam; moderately stony. | Low | Moderate to very great. | Fair | Fair | Medium | Open pasture, crops, and idle cropland. | Third | 3-D |
| Same | Low | Same | Fair | Good | Medium | Forest | Third | 3-E |
| Strong to moderate yellowish-brown friable to firm clay loam or heavy clay loam. | Low to medium | Moderate | Good | Fair | Medium | Crops, open pasture, and idle cropland. | Third | 3-D |
| Same | Low to medium | Moderate | Good | Good | Medium | Forest | Third | 3-E |
| Same | Low to medium | Little | Very good | Very good | Wide | Crops and open pasture. | Second | 2-B |
| Same | Low to medium | Very little | Excellent | Very good | Very wide | Crops | First | 1-B |
| Same | Low to medium | Moderate | Fair | Fair | Medium | Open pasture, crops, and idle cropland. | Third | 3-D |
| Same | Low to medium | Little | Good | Very good | Wide | Crops, open pasture, and forest. | Second | 2-B |
| Moderate-brown very friable loam or heavy loam. | Medium | Moderate to little. | Good | Fair | Medium | Crops and open pasture. | Third | 3-D |
| Same | Medium | Moderate to great. | Poor | Poor | Narrow | Open pasture and crops. | Fourth | 4-C |
| Same | Medium | Moderate to little. | Good | Good | Medium | Crops, open pasture, and forest. | Third | 3-E |
| Same | Medium | Moderate to great. | Poor | Poor | Narrow | Forest | Fourth | 4-D |

*Watauga County, N. C., Soils: Summary*

| Soil | Map symbol | Parent material | Physiographic position | Slope | Natural drainage [1] | Surface soil [2] |
|---|---|---|---|---|---|---|
| | | | | *Percent* | | |
| Porters stony loam: | | | | | | |
| Eroded hilly phase | Pm | Same | Rounded tops of mountains and ridges, mountain slopes, and hillsides. | 15–30 | Good | Moderate-brown to dark yellowish-brown or weak-brown, very friable stony loam or heavy loam. |
| Eroded steep phase | Pn | Same | Hillsides and mountainsides | 30–60 | Somewhat excessive | Same |
| Eroded very steep phase. | Po | Same | Hillsides and mountainsides | 60+ | Excessive | Same |
| Hilly phase | Pp | Same | Rounded tops of mountains and ridges, mountain slopes, and hillsides. | 15–30 | Good | Moderate-brown very friable stony loam. |
| Steep phase | Pr | Same | Hillsides and mountainsides | 30–60 | Somewhat excessive | Same |
| Very steep phase | Ps | Same | Hillsides and mountainsides | 60+ | Excessive | Same |
| Ramsey stony loam: | | | | | | |
| Eroded steep phase | Ra | Residual material mainly from weathered noncalcareous or only slightly calcareous conglomerate, sandstone, quartzite, and shale. | Hillsides, mountainsides, and sharp mountain ridges and peaks. | 30–60 | Somewhat excessive to excessive. | Moderate yellowish-brown, very friable stony loam. |
| Steep phase | Rb | Same | Same | 30–60 | Same | Dark yellowish-brown, very friable stony loam. |
| Very steep phase | Rc | Same | Mountain slopes and hillsides | 60+ | Excessive | Same |
| Riverwash | Rd | Recent alluvium | First bottoms | 0– 2 | Poor; soil subject to overflow. | Loose sandy, gravelly, cobbly, or stony material. |
| Rock outcrop | Re | | Grandfather and Beech Mountains and along Howard Creek. | 60+ | | |
| State loam, undulating phase. | Sa | Moderately to slightly old alluvium originating chiefly in granite, gneiss, schist, and other igneous and metamorphic rocks. | Low stream terraces | 2– 7 | Good | Dark yellowish-brown to weak-brown, friable or very friable loam. |
| Stony colluvium (Tusquitee and Tate soil materials). | Sb | Local alluvial and colluvial accumulations. | Foot slopes of mountains and hills; alluvial and colluvial fans. | 2–30 | Good | Dark yellowish-brown to weak-brown, friable or very friable loam; many stones. |
| Stony hilly land (Ashe and Porters soil materials). | Sc | Residual material chiefly from weathered granite, gneiss, and schist. | Tops of ridges and mountains mainly. | 15–30 | Good | |
| Stony rough land (Ashe and Porters soil materials). | Sd | Same | Rough mountainsides mainly | 30–60 | Somewhat excessive to excessive. | |
| Tate loam: | | | | | | |
| Hilly phase | Ta | Old alluvial or colluvial accumulations of soil and rock material from adjacent or nearby slopes. | Foot slopes of mountains and hills; alluvial or colluvial fans. | 15–30 | Good | Dark yellowish-brown, friable or very friable loam. |
| Rolling phase | Tb | Same | Same | 7–15 | Good | Same |
| Undulating phase | Tc | Same | Same | 2– 7 | Good | Same |
| Tate stony loam: | | | | | | |
| Hilly phase | Td | Same | Same | 15–30 | Good | Dark yellowish-brown, friable or very friable stony loam. |
| Rolling phase | Te | Same | Same | 7–15 | Good | Same |
| Toxaway loam | Tf | Young alluvium originating mainly from gneiss, schist, granite, and diorite. | First bottoms | 0– 2 | Poor; soil subject to overflow. | Brownish-black or black, friable or very friable loam or silt loam; much well-decomposed organic matter. |
| Tusquitee loam: | | | | | | |
| Hilly phase | Tg | Moderately old alluvial or colluvial accumulations of soil and rock material from adjacent or nearby slopes. | Foot slopes of mountains and hills; alluvial or colluvial fans. | 15–30 | Good | Dark yellowish-brown to weak-brown, friable or very friable loam. |
| Rolling phase | Th | Same | Same | 7–15 | Good | Same |
| Undulating phase | Tk | Same | Same | 2– 7 | Good | Same |
| Tusquitee stony loam: | | | | | | |
| Eroded hilly phase | Tl | Same | Same | 15–30 | Good | Moderate yellowish-brown, friable stony loam. |
| Hilly phase | Tm | Same | Same | 15–30 | Good | Dark yellowish-brown to weak-brown, friable or very friable stony loam. |
| Rolling phase | Tn | Same | Same | 7–15 | Good | Same |
| Undulating phase | To | Same | Same | 2– 7 | Good | Same |
| Watauga loam: | | | | | | |
| Eroded hilly phase | Wa | Residual material mainly from weathered mica schist, mica gneiss, and granitoid. | Hillsides in less mountainous areas and rounded tops of mountain ridges. | 15–30 | Good | Moderate yellowish-brown, friable loam or heavy loam; many small mica flakes. |
| Eroded rolling phase | Wb | Same | Rounded tops of hills, ridges, or mountains, or other smooth mountain uplands. | 7–15 | Good | Same |
| Hilly phase | Wc | Same | Same | 15–30 | Good | Dark yellowish-brown to weak-brown, friable loam; many small mica flakes. |
| Rolling phase | Wd | Same | Same | 7–15 | Good | Same |
| Undulating phase | We | Same | Same | 2–7 | Good | Same |

See footnotes at end of table.

*of important characteristics*—Continued

| Subsoil | Natural fertility | Erosion hazard | Workability [3] | Conservability [4] | Range of suitability | Principal use at present | Use class [5] | Management group |
|---|---|---|---|---|---|---|---|---|
| Moderate-brown very friable loam or heavy loam; some rock fragments. | Medium | Moderate to little. | Fair | Fair | Medium | Open pasture and crops. | Third | 3-D |
| Same | Medium | Moderate to great. | Very poor | Very poor | Narrow | Open pasture and idle cropland. | Fourth | 4-C |
| Same | Medium | Very great | Very poor | Very poor | Very narrow | Open pasture and idle cropland. | Fifth | 5 |
| Same | Medium | Moderate to little. | Fair | Good | Medium | Forest | Third | 3-E |
| Same | Medium | Moderate to great. | Very poor | Poor | Narrow | Forest | Fourth | 4-D |
| Same | Medium | Great | Very poor | Very poor | Very narrow | Forest | Fifth | 5 |
| Moderate to light yellowish-brown, very friable gritty loam, light loam, or fine sandy clay; many soft rock fragments. | Low to very low | Very great | Very poor | Very poor | Very narrow | Open pasture, idle cropland, forest, and crops. | Fifth | 5 |
| Same | Same | Very great | Very poor | Very poor | Very narrow | Forest | Fifth | 5 |
| Same | Same | Extremely great. | Very poor | Very poor | Very narrow | Forest | Fifth | 5 |
| Loose sandy gravelly, cobbly, or stony material. | Low | None; stream erosion may occur. | Very poor | Very poor | Very narrow | | Fifth | 5 |
| | | | | | | | Fifth | 5 |
| Moderate-brown to moderate yellowish-brown friable clay loam or light clay loam. | Medium to high | Very little | Excellent | Excellent | Very wide | Crops | First | 1-B |
| Moderate-brown to light yellowish-brown firm or friable light clay loam to heavy clay loam, or light fine sandy clay; many stones. | Medium | Very little to moderate. | Poor | Fair | Narrow | Forest and open pasture. | Fourth | 4-B |
| | Low to medium | Moderate | Very poor | Fair | Narrow | Same | Fourth | 4-B |
| | Low to medium | Moderate to great. | Very poor | Very poor | Very narrow | Forest | Fifth | 5 |
| Moderate or light yellowish-brown, friable clay loam to light clay loam. | Medium | Moderate | Good | Fair | Medium | Crops and open pasture. | Third | 3-E |
| Same | Medium | Little | Very good | Very good | Wide | Same | Second | 2-B |
| Same | Medium | Very little | Excellent | Very good | Very wide | Crops | First | 1-B |
| Moderate or light yellowish-brown, friable stony clay loam to light clay loam. | Medium | Moderate | Fair | Fair | Medium | Crops, open pasture, and forest. | Third | 3-E |
| Same | Medium | Little | Good | Good | Medium | Same | Second | 2-B |
| Brownish-black, brownish-gray or black, slightly to moderately compact clay loam to silty clay loam; plastic and sticky when wet; fairly high organic-matter content. | Very high | None | Good; very good when soil is adequately drained. | Excellent | Narrow; wide, in drained areas. | Crops and open pasture. | Second | 2-A |
| Moderate-brown to moderate yellowish-brown, firm to friable clay loam, heavy clay loam or light fine sandy clay. | Medium to high | Moderate | Good | Good | Medium | Crops, open pasture, and forest. | Third | 3-E |
| Same | Medium to high | Little | Very good | Very good | Wide | Crops | Second | 2-B |
| Same | Medium to high | Very little | Excellent | Very good | Very wide | Crops | First | 1-B |
| Moderate-brown to moderate yellowish-brown firm to friable clay loam, heavy clay loam, or light fine sandy clay; somewhat stony. | Medium to high | Moderate | Fair | Poor | Medium | Open pasture and crops. | Third | 3-D |
| Same | Medium to high | Moderate | Fair | Fair | Medium | Crops, open pasture, and forest. | Third | 3-E |
| Same | Medium to high | Little | Good | Good | Wide | Same | Second | 2-B |
| Same | Medium to high | Little | Very good | Very good | Wide | Crops | Second | 2-B |
| Moderate yellowish-brown to moderate-brown, friable heavy loam or light clay loam grading into moderate to strong yellowish-brown friable clay loam; many small mica flakes. | Low | Moderate | Good | Fair | Medium | Crops and open pasture. | Third | 3-D |
| Same | Low | Little to moderate. | Very good | Good | Wide | Same | Second | 2-B |
| Same | Low | Moderate | Good | Good | Medium | Forest | Third | 3-E |
| Same | Low | Little | Very good | Good | Wide | Crops, open pasture, and forest. | Second | 2-B |
| Same | Low | Very little | Excellent | Very good | Very wide | Crops | First | 1-B |

*Watauga County, N. C., Soils: Summary*

| Soil | Map symbol | Parent material | Physiographic position | Slope | Natural drainage [1] | Surface soil [2] |
|---|---|---|---|---|---|---|
| Watauga stony loam: | | | | *Percent* | | |
| Eroded hilly phase | Wf | Same | Same | 15–30 | Good | Moderate yellowish-brown, friable stony loam or heavy loam; many small mica flakes. |
| Hilly phase | Wg | Same | Same | 15–30 | Good | Dark yellowish-brown to weak-brown friable stony loam; many small mica flakes. |
| Rolling phase | Wh | Same | Same | 7–15 | Good | Same |
| Wehadkee loam | Wk | Young alluvium | First bottoms | 0–2 | Poor to very poor; soil subject to overflow. | When wet, medium olive-gray or brownish-gray slightly plastic loam; some moderate-brown mottlings. |
| Peaty phase | Wl | Young alluvium | First bottoms and basinlike places near source of streams. | 0–2 | Very poor; soil subject to overflow. | Black peat or muck |
| Worsham loam | Wm | Old alluvial and colluvial accumulations of soil and rock material from adjacent and nearby slopes. | Alluvial or colluvial fans and foot slopes of mountains or hills. | 2–7 | Imperfect to poor | Brownish-gray or dusky-brown, friable or very friable loam; a few mottlings. |

[1] As usual in this report, the adjective "good" and the adverb "well" are used interchangeably to describe drainage. See Glossary for relative terms used to express natural drainage.

[2] In most of the forested soil, the color of a thin upper layer is generally darker than that of the immediately underlying layer because of an accumulation of organic matter derived from leaves and other decayed vegetable matter.

[3] Workability refers to ease of tillage, harvesting, and other field operations. Relative descriptive terms are in decreasing order from excellent to very poor.

[4] Conservability refers to the ease with which productivity and workability can be maintained or improved. It includes as major considerations ease of conservation of soil material and plant nutrients and maintenance of good tilth. Relative descriptive terms are in decreasing order from excellent to very poor.

[5] Soils classified according to their suitability for agricultural use as First, Second, Third, Fourth, and Fifth.

*of important characteristics*—Continued

| Subsoil | Natural fertility | Erosion hazard | Workability [3] | Conservability [4] | Range of suitability | Principal use at present | Use class [5] | Management group |
|---|---|---|---|---|---|---|---|---|
| Moderate yellowish-brown to moderate-brown friable heavy loam or light clay loam grading into moderate to strong yellowish-brown friable clay loam; many small mica flakes; some stones. | Low | Moderate | Fair | Fair | Medium | Open pasture, crops, and idle cropland. | Third | 3-D |
| Same | Low | Little | Good | Good | Wide | Crops and open pasture. | Third | 3-E |
| Same | Low | Little | Good | Good | Wide | Same | Second | 2-B |
| When wet, brownish-gray or light brownish-gray slightly plastic loam or fine sandy loam; a few moderate yellowish-brown mottlings. | High | None | Fair | Excellent | Narrow | Open pasture and forest. | Fourth | 4-A |
| Mottled brownish-gray and medium olive-gray, slightly plastic loam. | High | None | Very poor | Poor | Narrow | Forest and marshy land. | Fourth | 4-A |
| When wet, brownish-gray or light brownish-gray, slightly plastic, light to heavy clay loam; some mottlings. | Low | None to little | Very good when drained. | Good | Medium | Open pasture and crops. | Third | 3-C |

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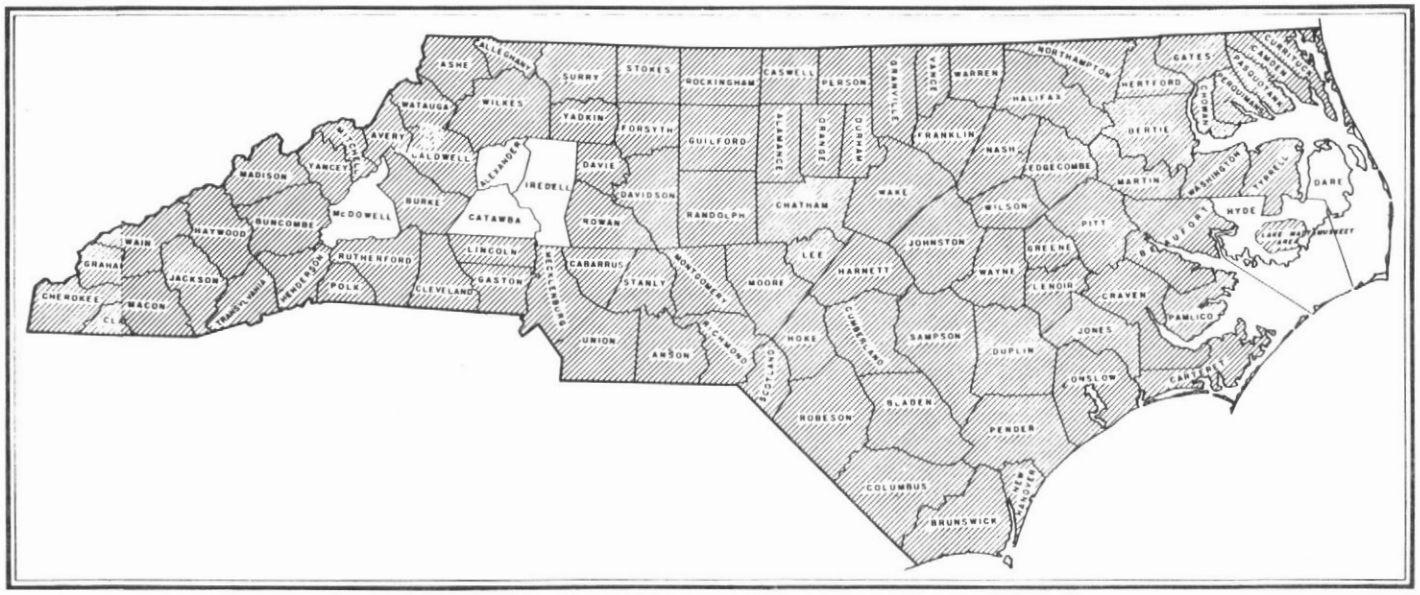


**Areas surveyed in North Carolina shown by shading.**

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