SOIL SURVEY

Sevier County Tennessee

Series 1945, No. 1

Issued August 1956

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

How to Use THE SOIL SURVEY REPORT

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

Soils of a Particular Farm

All the soils of Sevier County are shown on the soil map accompanying this report. To find what soils are on any farm or other land, it is necessary first to locate this land on the map. This is easily done by using landmarks such as roads, streams, villages, dwellings, and other features to locate the boundaries.

Each kind of soil mapped within the farm or tract is marked on the map with a symbol. For example, all the areas marked Dr are Dewey silty clay loam, eroded rolling phase. The color in which the soil area is shown on the map will be the same as the color indicated in the legend for the particular type of soil. If you want information on the Dewey soil, turn to the section, Descriptions of the Soils, and find Dewey silty clay loam, eroded rolling phase. Under this heading you will find a statement of what the characteristics of this soil are, what the soil is mainly used for, and some of the uses to which it is suited.

Suppose, for instance, you wish to know how productive Dewey silty clay loam, eroded rolling phase, is. You will find the soil listed in the left-hand column of table 24. Opposite the name you can read the yields for the different crops grown on it. This table also gives estimated yields for all the other soils mapped in the county.

If, in addition, you wish to know what uses and management practices are recommended for Dewey silty clay loam, eroded rolling phase, read what is said about this soil in the section, Descriptions of the Soils. Refer also to the section, Use and Management of Important Groups of Soils, where the soils suited to the same uses and management practices are grouped together.

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

Soils of the County as a Whole

A newcomer to the county, especially if he considers purchasing a farm, will want to know about the climate; the types and sizes of farms; the principal farm products and how they are marketed; the kind and conditions of farm tenure, including tenancy; availability of roads, railroads, electric services, and water supplies; the industries of the county; and cities, villages, and population characteristics. Information about all these will be found in the section, General Nature of the Area, and in the section, Additional Facts About Sevier County.

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

This publication of the soil survey of Sevier County, Tenn., is a cooperative contribution from the—

SOIL CONSERVATION SERVICE
the
TENNESSEE AGRICULTURAL EXPERIMENT STATION
and the
TENNESSEE VALLEY AUTHORITY

Series 1945, No. 1 Issued August 195

SOIL SURVEY OF SEVIER COUNTY, TENNESSEE

By E. H. HUBBARD, in Charge,[1] M. E. AUSTIN, C. B. BEADLES, W. E. CARTWRIGHT, J. A. ELDER, and E. P. WHITESIDE, Tennessee Agricultural Experiment Station,[2] and M. M. STRIKER, Soil Survey,[3] United States Department of Agriculture

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

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

CONTENTS

[1] W. E. Cartwright, E. P. Whiteside, and M. E. Austin in charge part time.

[2] L. E. Odom, Tennessee Agricultural Experiment Station, is author of the report.

[3] Field work was done while Soil Survey was part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service November 15, 1952.

ABOUT one-third of Sevier County is in the Great Valley of East Tennessee; the rest is in the Great Smoky Mountains. The county is mainly agricultural. Nearly half the farms produce crops mainly for use of the farm household. The principal crops are corn, wheat, oats, hay, tobacco, and market vegetables. Forests cover about 62 percent of the county. Much of their area is in the Great Smoky Mountains National Park. Milling, canning, and furniture and hosiery manufacturing are the most important industries besides agriculture. Sevierville, the county seat, is the principal market and shipping point for agricultural products. Knoxville is also an important market and trading center. To provide a basis for the best agricultural uses of the land, this cooperative survey was made by the United States Department of Agriculture, the Tennessee Agricultural Experiment Station, and the Tennessee Valley Authority. Field work was completed in 1945, and unless otherwise specifically mentioned, all statements in this report refer to conditions in the county at that time.

GENERAL NATURE OF THE AREA

LOCATION AND EXTENT

Sevier County is on the eastern border of Tennessee about midway between the northeastern and southeastern corners of the State (fig. 1). The county seat, Sevierville, is situated on the Little Pigeon River at its junction with the West Fork of the Little Pigeon River. This town is approximately 25 miles southeast of Knoxville.

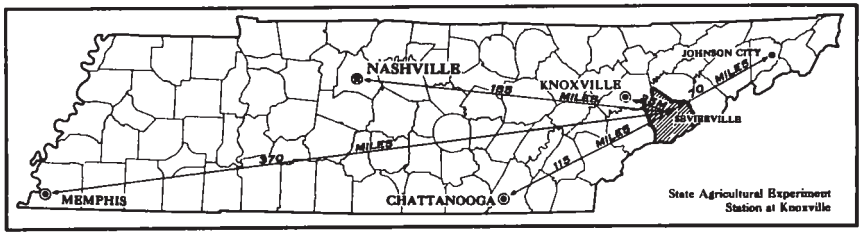


FIGURE 1.—Location of Sevier County in Tennessee.

ORGANIZATION AND POPULATION

Before the arrival of the first white settlers, the Cherokee Indians held the territory that is now Sevier County (*9*)[4]. By 1784, however, the frontier inhabitants were clearing fields and building cabins along the Big (West Fork) and Little Pigeon Rivers. A few adventurers were also on Boyds Creek south of the French Broad River. Most of the early settlers were from North Carolina but a smaller number were from Virginia and South Carolina. They were mainly of English descent but some were Scotch or Irish. The present population consists largely of descendants of these early settlers.

Sevier County was formed by an act of the territorial legislature in 1794 from a part of Greene County (*8*). It was named in honor

[4] Italic numbers in parentheses refer to Literature cited, page 202.

of Gov. Sevier. The first court was held in the home of Isaac Thomas, believed to be the first settler in the county. His home was about one-half mile west of the present site of Sevierville, near the Little Pigeon River.

According to United States Census, Sevier County had a population of 23,375 in 1950, 59.4 percent of which was rural-farm. Sevierville, the principal town, had a population of 1,620 in 1950.

PHYSIOGRAPHY, RELIEF, AND DRAINAGE

The great diversity of relief, parent rock, climate, and natural vegetation found within the borders of Sevier County is probably equaled in few counties of the Eastern United States. These variations of the natural geography of the county are reflected in the properties and distribution of the soils.

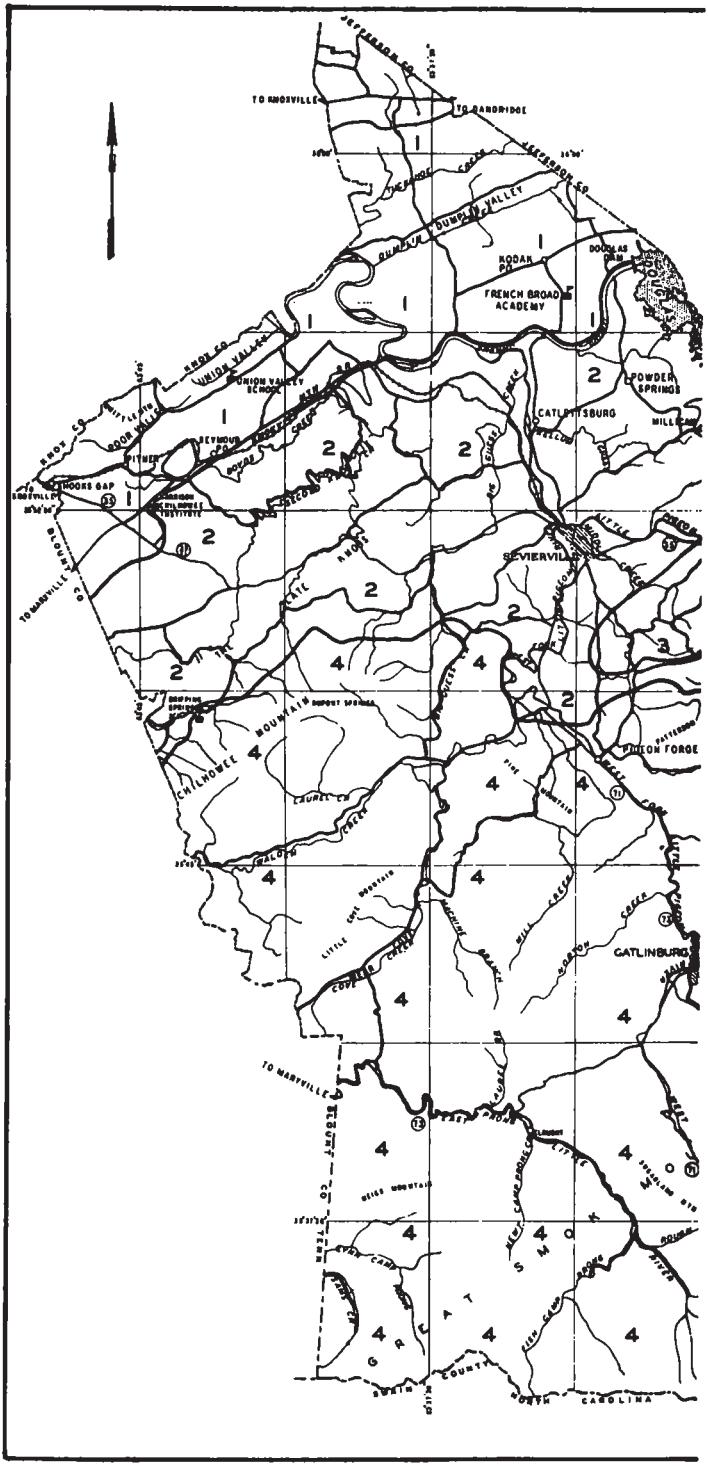
The surface rocks underlying the entire county were deposited as sediments in an ancient sea. These sedimentary conglomerates, sandstones, shales, and limestone rocks, were later elevated and folded by movements of the earth's surface. Through countless ages since that time, these distorted rocks have been gradually carved and dissected by corrosion, erosion, and weathering. At times they were almost leveled in places and then warped and uplifted again so that the existing streams cut new and deeper channels. These processes have produced the complex geology of the present area. The distribution of the different parent rocks from which the soils of Sevier County were formed is discussed in greater detail in the section, Morphology and Genesis of Soils.

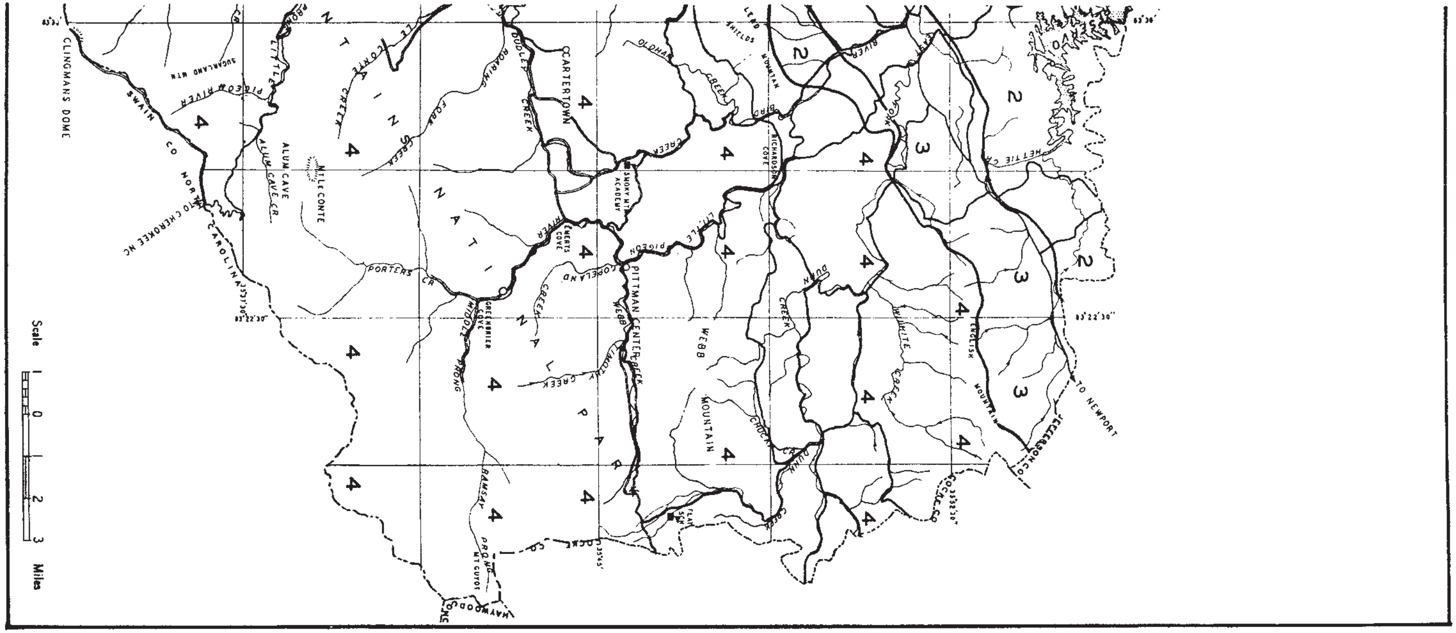
The county is in two major physiographic divisions: The Ridge and Valley province and the Blue Ridge province. The northern one-third of Sevier County is in the Great Valley of East Tennessee in the Ridge and Valley province. The southern part of the county rises to the crest of the Great Smoky Mountains in the Blue Ridge province (*3*).

In that part of the county in the Ridge and Valley province, there are three easily discernible physiographic subdivisions (fig. 2): (1) The limestone and shale ridge and valley area, (2) the shale hills, and (3) the limestone valley area.

The first of the subdivisions of the Ridge and Valley province—the limestone and shale ridge and valley area—is in the northwestern part of the county, north and west of a boundary roughly outlined by Boyds Creek and the French Broad River. It consists of a series of parallel low ridges and broad valleys and is underlain by folded interbedded shale, sandstone, and limestone that are exposed at the surface in bands. The ridges, major streams (trellised pattern), and many of the roads follow the same general directions as the rock outcrops. Many ridgetops and stony or steeper slopes are forested, but most are used for crops. In the areas underlain by limestone, the streams frequently disappear into sinks or ponds and a connected surface drainage pattern is lacking. The areas underlain by shale and sandstone more closely resemble the shale hills subdivision. The higher ridges of this subdivision are usually capped with sandstone or impure cherty limestone, and the valleys and low ridges are underlain by purer limestone and soft shale.

The relief between the valleys and cherty or sandy ridges may reach 300 feet or more, but in areas underlain by purer limestone and


TO KNOXVILLE
TO SANDRIDGE
DUNLAP VALLEY
RODAR GAP
FRENCH BROAD ACADEMY
UNION VALLEY
UNION VALLEY SCHOOL
POWDER SPRINGS
GATLINBURG
SEVIERVILLE
PIGEON FORGE
MOOSES GAP
TO MARYVILLE
CHILHOWEE MOUNTAIN
GREAT SMOKY MOUNTAINS
NORTH CAROLINA



Explanation of figure 2.

Physiographic divisions and subdivisions of Sevier County, Tenn.
Major physiographic divisions:
Ridge and Valley province:
1. Limestone and shale ridge and valley area.
2. The shale hills.
3. Limestone valley area.
Blue Ridge province:
4. The mountain area.

softer clay shales it is usually less than 100 feet. The Union Mountains, which form part of the Sevier-Knox County Boundary, range in elevation from about 1,380 feet to more than 1,500 feet. The French Broad River leaves the county at an elevation of approximately 850 feet, the lowest part of the county.

The main part of the limestone and shale ridge and valley area drains into the French Broad River and its tributaries. The extreme northern tip, however, drains into the Holston River, and a small part in the southwest drains into the Little River.

The second physiographic subdivision of the Ridge and Valley province—the shale hills—is a large area underlain by calcareous sandstone and shale. It occurs southeast of the ridge and valley area, and roughly parallels it. It extends to a line running from the northern base of Chilhowee Mountain to where State Highway 35 leaves the eastern edge of the county. In this subdivision the short tributary streams have cut deep narrow V-shaped valleys, and this intricately dissected terrain is called the Slate Knobs. The difference in elevation between ridge crests and valleys is usually 150 to 300 feet. Ridgetops throughout this area range from 1,100 to 1,300 feet in elevation. The eastern part of this subdivision is somewhat less rugged and the drainage pattern is definitely dendritic. Except for a small part of the Little River Basin at the western edge, the area drains into the French Broad River or its main tributary in the county, the Little Pigeon River. Timber has been cleared from most of the shale hills subdivision, but there are still many patches on the hills or ridgetops and on steeper slopes. The acreage in pasture is much greater than that in cultivated fields.

The third subdivision of the Ridge and Valley province—the limestone valley area—is a strip 2 to 3 miles wide underlain by limestone. It occurs east of Sevierville and southeast of and paralleling the shale hills subdivision. The drainage pattern of the western part of this area is in many places disconnected—streams disappear into sinks or ponds. The eastern part, however, has a well-developed dendritic drainage pattern, probably largely because of the greater relief of Little Mountain and the proximity to English Mountain. Little Mountain, just south of Fair Garden, rises to 2,000 feet above sea level. Its height above Hettie Creek at its northern base is about 900 feet. Little Mountain is chiefly rough stony land with many limestone rock outcrops and is covered by forest. The rest of this area is mostly cleared for cultivation and pastures, although ridgetops and steep or rocky slopes are forested in many places.

The rest of the county, which includes approximately the southern two-thirds, is in the mountain area of the Blue Ridge province (fig. 2). It is underlain by noncalcareous sedimentary rocks, chiefly sandstone, slate, shale, and conglomerate. The irregular drainage patterns thoroughly dissect the rough hilly to mountainous terrain. Approximately all of the southern half of this area is now in the Great Smoky Mountains National Park. Outside of the park area, the narrow valleys, lower mountain slopes, and colluvial deposits have been cleared in many places for agricultural use, but most of the land is still in forest. Much of the forest land is owned and operated in large tracts by companies interested in the lumber resources.

Chilhowee, Cove, Webb, and English Mountains are some of the most prominent ridges and peaks in the mountain area. They range from 3,000 to 4,100 feet in elevation. A number of other moun-

tains are about 2,000 feet in elevation. Most of the mountains stand 1,000 to 2,000 feet above the main stream channels. The relief in the national park is even more rugged, and the area in general rises to the crest of the Great Smoky Mountains at the North Carolina-Tennessee State line. Here a number of peaks are more than 6,000 feet in elevation. Mount Le Conte (*10*) rises from an elevation of 1,280 feet at Gatlinburg to 6,593 feet within a distance of 5 miles. Clingmans Dome, 6,642 feet in elevation, is exceeded in height east of the Mississippi River only by Mount Mitchell in North Carolina.

Newfound Gap, 5,045 feet in elevation, is the lowest notch in the range along the eastern four-fifths of the southern county line. At the southwestern corner of the county, Sugartree Gap (elevation 4,435 feet) is the lowest point on the southern county line. This lower western edge of the park is less rugged than the eastern part and drains into Little River. Waters from the rest of the park in Sevier County drain into the Little Pigeon River and its tributaries. In the mountainous areas of the county the streams have steeper gradients and frequent rock ledges and waterfalls. Some of the more level areas along streams and on colluvial or lower mountain slopes had been cleared for agricultural use but are now reverting to forest. Only one main highway crosses the mountains, State Highway 71, at Newfound Gap. The 7.5 miles of road west from Newfound Gap to the Clingmans Dome parking area is the highest highway in the eastern United States.

Alluvial flood plains and benches occur at various heights along the French Broad River and the lower parts of Little Pigeon River, West Fork Little Pigeon River, East Fork, Walden, Flat Branch, and Middle Creeks. Most of these areas are in the Ridge and Valley province. The benches are old alluvial flood plains and are commonly called stream terraces. The flood plains and terraces are usually ⅛ to 1 mile in width. In some places, however, they narrow to mere ribbons along the smaller streams or through steep topography. In others they are 2 to 3 miles wide. The topography is generally nearly level to rolling. These areas constitute some of the most productive farmlands in the county and are now nearly all in cultivated fields or pasture. Forest is usually still found only along the streams in poorly drained areas or on short steep slopes between different benches. Less extensive alluvial deposits similar to those of the flood plains and terraces are along the smaller streams throughout the county.

At the heads of the streams in mountainous or in isolated places along the streams, the alluvial and colluvial areas are almost entirely surrounded by hills or mountains. They are commonly called coves. Wear Cove is the largest of these areas in Sevier County, but Emerts Cove, Richardson Cove, and Jones Cove are others well known in the county. Near Gatlinburg, near Elkmont, and at the heads of Webb and Dunn Creeks are four similar areas. Wear Cove differs somewhat from the other coves in the parent rock underlying it. Here the older acid slate, sandstone, and conglomerate are believed to have been thrust out over the limestone and shale that underlie the Great Valley. These rocks have been exposed to weathering in the cove; geologically they may be considered a part of the Great Appalachian Valley (*3*).

CLIMATE

Associated in a general way with the marked variations in relief of Sevier County are considerable variations in climate. The Great Valley section of the county has a humid temperate climate with hot summers, whereas the mountain area has a humid temperate climate with cool summers.[5] The higher mountain districts receive greater rainfall and have cooler temperatures and a shorter growing season. A trip to the mountains in summer offers relief from the heat at lower elevations. The equivalent temperature effect of moving many miles northward in summer can be attained within a few miles in Sevier County.

The mild winters and long growing seasons in the agricultural parts of the county make possible almost year-round pasturing of livestock and growth of more than one crop each year on much of the cultivated land. The high rainfall and lack of frozen subsoils cause runoff and leaching losses throughout the year. Continuous maintenance of a vigorous vegetative cover on the land is therefore an important farm-management practice.

The United States Weather Bureau has maintained a weather station at Gatlinburg for a number of years. Temperature and precipitation records from this station are summarized in table 1.

The temperatures decrease in general with increasing elevation. This difference in temperatures caused by elevation is greatest during summer. At the lower elevations, temperatures above 100° are uncommon and temperatures below 0 occur on the average only about once a year (*14*). At the higher elevations, lower temperatures are to be expected. At lower altitudes fall-sown grains, grasses, and legumes make some growth throughout the winter because of the mild winter temperatures. These crops are used to supplement the permanent pastures for livestock.

The length of growing season at Gatlinburg is 192 days. The average date of the last killing frost in spring is April 20, and of the first in the fall, October 19. The latest frost reported in spring was on May 14, and the earliest in fall was on September 29. The peach crop is frequently reduced by late frosts, but the apple crop is only occasionally injured. Winter grain crops including suitable varieties of winter oats, are seldom damaged by cold weather.

During the last 6 or 8 years the annual precipitation in Sevier County has ranged from about 40 inches in the extreme northern end to about 80 inches on some of the higher peaks at the southern edge. The rainfall in the county is rather evenly distributed throughout winter, spring, and summer but is less in fall. In each of the summer months at Sevierville, from 3 to 4 inches of rainfall in a single 24-hour period have been recorded; during the rest of the year the greatest 24-hour rainfalls have varied from 2 to 3 inches. There are also occasional droughts, usually in late summer and in fall, that last from 20 to 30 days. Floods generally occur several times annually along the major streams, but they are mainly of short duration and most frequently affect the lower lying bottom lands.

Snowfall in the Great Valley section of the county averages only about 8 inches annually. The greatest snowfall occurs during Febru-

[5] This classification of climate is according to W. Koppen (*12*).

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Gatlinburg, Sevier County, Tenn.*

[ELEVATION, 1,400 feet]

Month	Temperature,[1] average	Precipitation [2]		
		Average	Total for the driest year	Total for the wettest year
	° *F.*	*Inches*	*Inches*	*Inches*
December	40. 6	4. 54	1. 99	6. 66
January	39. 7	4. 81	3. 09	3. 98
February	41. 4	4. 68	2. 50	4. 32
Winter	40. 5	14. 03	7. 58	14. 96
March	48. 5	5. 54	2. 30	9. 76
April	57. 2	4. 10	3. 06	5. 25
May	64. 7	4. 89	3. 08	2. 49
Spring	56. 8	14. 53	8. 44	17. 50
June	72. 4	4. 87	2. 95	10. 97
July	74. 4	5. 91	2. 25	4. 91
August	73. 5	5. 74	1. 80	4. 21
Summer	73. 4	16. 52	7. 00	20. 09
September	69. 1	3. 03	1. 24	4. 69
October	58. 2	3. 24	8. 38	1. 42
November	47. 3	2. 99	3. 10	6. 89
Fall	58. 2	9. 26	12. 72	13. 00
Year	57. 2	54. 34	[3] 35. 74	[4] 65. 55

[1] Average temperature based on 29-year record, 1925–53.
[2] Average precipitation based on 28-year record, 1926–53; wettest and driest years based on 32-year record, 1922–53.
[3] In 1925.
[4] In 1951.

ary and March. One or more inches of snow cover the ground in agricultural sections about 10 to 20 days annually. Hail falls on an average of 2 days annually. Local variations in climate are caused by direction of slope and the effect of elevation and surface contour on air drainage. Frosts frequently occur in valleys and depressions when vegetation on the higher ridges is unaffected. Damage to fruit trees from frost is less frequent on low ridgetops and north-facing slopes, where spring growth is somewhat retarded, than on south-facing slopes.

Wind directions in the mountainous areas of Sevier County are predominantly southwest, west, or northwest (*19*). The prevailing direction in the Great Valley section of the county is from the southwest, or paralleling the ridges and mountainous areas. Wind velocities vary greatly with altitude, exposure, and ground cover. In general, however, wind velocities are greater at higher altitudes. Tornadoes rarely occur in this county.

WATER SUPPLY

Unfailing springs and streams fed by rainfall provide water throughout most of the county. In the less mountainous sections, wells are used extensively to supply water for man and livestock, and in places cisterns are built to catch water for household uses. In some of the areas underlain by limestone, the karst topography furnishes natural basins that hold water throughout the year; in other places ponds have been constructed for the use of livestock. Douglas Lake was formed when Douglas Dam was recently built across the French Broad River about 1 mile inside of the northeastern border of Sevier County. This lake covers about 2,500 acres within the county and has a very irregular shore line (see accompanying soil map). The lake and the streams are used for boating, swimming, and fishing. The trout streams in the Great Smoky Mountains National Park are restocked annually.

A number of the streams are being used to drive power machinery, chiefly grist and flour mills. A small hydroelectric plant is located on the West Fork of Little Pigeon River above Sevierville, and a new hydroelectric plant is at Douglas Dam on the French Broad River.

VEGETATION

Sevier County was originally almost entirely covered by forest. The present forests are mainly of mixed coniferous and hardwood species, but areas predominantly of hardwoods are scattered over the county. Spruce-fir forests occupy the highest peaks and ridges. Some parts of the Great Smoky Mountain National Park are still in virgin forests. A few of the high ridges and mountaintops are covered with grasses and low shrubs instead of forest. Some of these areas were formerly used for grazing and are commonly called balds.

LAND USE

According to the 1950 Federal census, 205,290 acres, or 53.2 percent of the county was in farms. Of the land in farms 50,448 acres was cropland harvested; 53,829 acres, cropland used only for pasture; 12,282 acres, cropland not harvested and not pastured; and 10,471 acres was other pasture (not cropland and not woodland). The number of acres in woodland was 69,108. All other land (house lots, roads, wasteland, etc.) covered 9,152 acres.

THE SOILS OF SEVIER COUNTY, THEIR USE AND MANAGEMENT

The soils of Sevier County have developed in an environment of moderately high temperature, moderately heavy and well-distributed rainfall, and forest vegetation. Consequently, the soils, particularly those of the uplands, have been severely leached and are acid in reaction and low in fertility and organic matter. They differ one from another in fertility and in content of organic matter, even in the virgin state. Such differences have been further widened by cropping, erosion, and other impoverishing practices. In contrast to the soils of the uplands and high terraces (high benches), many of the soils of the bottoms and low terraces (second bottoms) are high in natural fertility, moderately well supplied with bases, especially lime, and fairly well supplied with organic matter.

The soils of the county differ greatly in color, texture, consistence, fertility, reaction, relief, stoniness, depth to underlying material, permeability, and drainage. All these characteristics affect productivity, workability, and conservability, and, accordingly, the agricultural uses to which the soils are suited.

The color range of the soils is from nearly white through gray, yellow, and brown to red. Colors intermediate between brown and light gray predominate in the surface soils, whereas red and yellow predominate in the subsoils. In texture and consistence the soils vary from loose incoherent sand to tough tenacious clay. The surface soils are predominantly silt loam and silty clay loam. They are, for the most part, mellow and friable. The subsoils are mainly silty clay loam, clay loam, or clay; they range from friable to very strongly plastic. In fertility and reaction the soils vary greatly. The greater proportion of them are strongly to very strongly acid; a significant proportion are only slightly to medium acid. Some of the soils are very low in natural fertility; and others are relatively high; most are intermediate between these two extremes. The amount of organic matter in the soils differs considerably but is generally not high.

Relief is prevailingly hilly to steep, but ranges from nearly level to very steep. The degree of erosion varies greatly. Some of the soils are uneroded or only slightly eroded, some moderately eroded, and some severely eroded. A small number are mapped as rough gullied land. Loose fragments of chert, cobbles, gravel, or stones that interfere materially with cultivation are common in many of the soils. Numerous outcrops of limestone are mapped as Stony hilly land (Dunmore and Talbott soil materials) and Stony steep land (Dunmore and Talbott soil materials).

Chiefly because of their different characteristics, the soils have different use suitabilities in the present agriculture. Some are highly productive, easy to work, and easy to conserve and are therefore physically very well suited to agricultural uses. Others are low in productivity, difficult to work, and difficult to conserve and are unsuited or very poorly suited to agricultural uses. Most of the soils, however, are between these two extremes. On the basis of differences in productivity, workability, and conservability, the soils are grouped into five classes. Under systems of management common to the area, the First-, Second-, and Third-class soils are considered physically suited to crops requiring tillage, the Fourth-class unsuited or very poorly suited to crops requiring tillage but suited to permanent pasture, and the Fifth-class unsuited or very poorly suited to either crops or permanent pasture but suited to forestry.

SOIL SERIES AND THEIR RELATIONS

The fact that soils differ widely in color, consistence, drainage, parent material, relief, and erosion has already been brought out. On the basis of such characteristics the soils have been classified into 37 series. The relationships of the soil series to one another are more easily seen if the soils are placed in groups based on their position in the landscape and on the source of their parent materials. The soils of Sevier County are placed in 4 main groups on this basis: (1) Soils of the uplands, (2) soils of the terraces, (3) soils of the colluvial lands, and (4) soils of the bottom lands.

The grouping of the soil series in table 2 will aid in the identification of the soils and show how they are related.

TABLE 2.—*A grouping of the soil series of Sevier County, Tenn., to show their relation to topographic position, parent material, and drainage*

Parent material	Excessively drained [1] (rolling to very steep)	Well drained [2] (undulating to steep)	Imperfectly drained [3] (nearly level to rolling)	Poorly drained [4] (nearly level)
SOILS OF THE UPLANDS				
Residual material from weathering of—				
High-grade limestone or high-grade dolomitic limestone.		Decatur		
High-grade dolomitic limestone		Dewey		
Cherty dolomitic limestone		Fullerton [5]		
Limestone containing thin shale layers		Farragut		
Dolomitic limestone		Dunmore [6]		
Interbedded shale and limestone	Armuchee [5]	Sequoia [6]		
Calcareous shale	Dandridge [5]	Sequoia [6]		
Purplish acid shale and sandstone	Lehew [5]			
Acid shale with limestone lenses	Litz [5]			
Acid sandstone and shale	Muskingum [5]			
Quartzite, sandstone, and conglomerate, or slate and fine-grained quartzite.	Ramsey			
SOILS OF THE TERRACES				
Old general alluvium from—				
Chiefly limestone		Cumberland		
Mainly sandstone, quartzite, slate, and shale		Waynesboro		
Mainly sandstone, quartzite, slate, and shale and a small admixture of materials from granite, gneiss, and limestone in most places.		Nolichucky		
Quartzite, sandstone, slate and shale		Holston [6]	Monongahela	Tyler.[7]
Quartzite, sandstone, and shale, with some limestone (low terrace).		Sequatchie		
Chiefly granite and gneiss (low terrace)		State		Roanoke.

Soils of the Colluvial Lands				
Local alluvium (local wash and some colluvial material) from—				
Chiefly high-grade limestone	----------	Emory [6]	----------	
Cherty limestone	----------	Greendale [6 8]	----------	
Cherty limestone	----------	Pace [6]	----------	
Quartzite and slate; some limestone	----------	Allen	----------	
Sandstone, quartzite, shale, and slate	----------	Barbourville [8]	Cotaco [8]	
Sandstone, quartzite, shale, and slate	----------	Jefferson [6]	----------	
Chiefly slate and fine-grained quartzite but some limestone or other calcareous source.	----------	Hayter	----------	
Calcareous shale	----------	----------	Whitesburg [6 8]	
Highly calcareous shale	----------	----------	----------	Hollywood.[7 9]
Soils of the Bottom Lands				
General alluvium from—				
Sandstone shale, slate, and quartzite; some limestone.	----------	Staser	Hamblen	Prader.
Granite and gneiss	Buncombe [5 10]	Congaree	----------	
Chiefly limestone	----------	----------	Lindside	

[1] Indistinct profile due to rapid geological erosion; runoff rapid to very rapid; internal drainage slow to very rapid; color varies with parent material.

[2] Brown or reddish-brown to yellowish-brown soils, free of mottlings to a depth of about 30 inches.

[3] Pale-yellow soils (alluvial soils, grayish-brown or yellowish-gray) mottled below about 12 inches.

[4] Brownish-gray to light-gray soils, mottled below 6 to 8 inches.

[5] Ranges from excessively drained to well drained.

[6] Ranges from well drained to imperfectly drained.

[7] Ranges from imperfectly drained to poorly drained.

[8] These soils do not have distinct textural horizons, mainly because of the short time their parent materials have been in place.

[9] Nearly level to undulating.

[10] Nearly level.

SOILS OF THE UPLANDS

The soils of the uplands are on higher areas above the stream valleys. They have developed from materials weathered from the underlying rocks and their properties generally reflect the character of these rocks. In Sevier County there are five major classes of rocks: (1) Limestone, (2) shale, (3) sandstone, (4) quartzite, and (5) slate. On the basis of differences in the kind of underlying material, soils of the uplands are placed in the following subgroups: (1) Soils derived from limestone, (2) soils derived chiefly from calcareous shale or acid shale interbedded with limestone, (3) soils derived chiefly from quartzite or slate, and (4) soils derived from sandstone or interbedded sandstone and acid shale.

The above groups include all the named soils of the uplands. Some upland areas having soils too steep, stony, or shallow to warrant their being classified into named soil series were mapped as miscellaneous land types. They are: (1) Rough gullied land (Ramsey and Litz soil materials); (2) Rough gullied land (Dandridge soil material); (3) Rough gullied land (limestone material); (4) Rough mountainous land (Ramsey soil material); (5) Stony hilly land (Dunmore and Talbott soil materials); and (6) Stony steep land (Dunmore and Talbott soil materials).

Soils derived from limestone.—This group includes soils of the Decatur, Dewey, Dunmore, and Fullerton series. Although all are derived from limestone residuum, the character of the parent rock varies from the high-grade limestone or high-grade dolomitic limestone under the Decatur soils to the cherty dolomitic limestone under the Fullerton soils. The Dunmore soils are derived from dolomitic limestone. The soils of this group are differentiated in the field largely by the color and texture of the surface soils and subsoils, although other significant differences exist. Both the Decatur and Dewey soils have formed from high-grade limestone materials and have brown surface soils and red subsoils. The Decatur soils, however, have a darker brown surface soil and a redder more plastic subsoil than the Dewey. Both soils have deeper more friable subsoils and contain more chert than the Dunmore soils. The Dunmore soils have lighter colored surface soils than either the Decatur or the Dewey and are shallower over bedrock in most places. The Fullerton soils have brownish-gray surface soils and yellowish-red or reddish-yellow subsoils.

Soils derived chiefly from calcareous shale or acid shale interbedded with limestone.—This group includes soils of the Dandridge, Armuchee, Litz, Sequoia, and Farragut series. The Dandridge, Armuchee, and Litz soils of this group are characterized by numerous shale particles throughout the profile and the shallow depth to bedrock. Although these soils are derived chiefly from shale, there is considerable difference in their parent rocks. The Dandridge soils are derived from the residuum of calcareous shale, whereas the Litz and Armuchee are derived from the residuum of interbedded shale and limestone. Limestone constitutes 30 to 60 percent of the rock beds underlying the Armuchee, but only a very small part of the beds underlying the Litz soils. The Armuchee soils have brownish-gray surface soils and reddish-yellow subsoils, the Litz grayish-yellow surface soils and light brownish-yellow subsoils, and the Dandridge medium- or dark-gray surface soils and grayish-yellow to brownish-yellow subsoils.

The Sequoia and Farragut soils are deeper over bedrock than the Dandridge, Armuchee, and Litz and differ further in having distinct surface soil and subsoil layers. The Farragut are deeper over bedrock and have a browner surface soil and a redder subsoil than the Sequoia soils. They have brown surface soils and reddish-brown to light-red subsoils, whereas the Sequoia soils have brownish-gray surface soils and reddish-yellow subsoils.

Soils derived chiefly from quartzite or slate.—This group includes only members of the Ramsey series. These soils have developed on mountain slopes and ridge crests from the residuum of quartzite, sandstone, and conglomerate, or slate and fine-grained conglomerate. In general the slate and fine-grained conglomerate give rise to the shaly silt loam type of the series and the quartzite, sandstone, and conglomerate give rise to the stony fine sandy loam type.

Ramsey soils are light brown, yellowish brown, brownish yellow, or yellowish gray throughout or have pale-brown to light yellowish-brown surface soils and brownish-yellow to pale-yellow subsoils. They are chiefly on steep slopes and have shallow weakly developed profile layers. They vary considerably in depth and in degree of distinction between profile layers.

Soils derived from sandstone or interbedded sandstone and acid shale.—This group includes soils of the Muskingum and Lehew series. These are shallow soils that occur chiefly on steep ridges. The Muskingum soils are underlain by light-colored acid sandstone and shale. They are more uniformly coarse textured than the Ramsey soils and somewhat lighter colored and shallower over bedrock. They have yellowish-gray surface soils and light brownish-yellow or light yellowish-brown subsoils. The Lehew soils are derived from purplish acid shale and sandstone. They differ from the Muskingum soils chiefly in being purplish and somewhat finer textured.

SOILS OF THE TERRACES

In the geologic past, the rivers and streams of the county flowed at considerably higher levels; and at these levels they deposited gravel, sand, and clay on their flood plains. During the progress of stream cutting over a great number of years, the channels were gradually deepened and new flood plains were formed at the lower levels. But remnants of the older high-lying flood plains were left, and these areas consist of general stream alluvium that now lies above the overflow stage of the present streams. They are referred to as terraces, or as second bottoms or benches.

Soils of the terraces include members of the Cumberland, Waynesboro, Nolichucky, Sequatchie, Holston, Monongahela, Tyler, State, and Roanoke series. These soils differ principally in source of parent materials and in color, texture, consistence, and drainage. The Cumberland soils are derived from old mixed alluvium greatly influenced by limestone materials; the Waynesboro, Nolichucky, and Sequatchie from old alluvium washed chiefly from sandstone and shale with an admixture of material from limestone; the Holston, Monongahela, and Tyler from old alluvium washed chiefly from sandstone and shale; and the State and Roanoke from materials washed chiefly from granite and gneiss.

The Cumberland and Waynesboro have brown surface soils and red subsoils. The Cumberland have browner surface soils and darker red and less friable subsoils than the Waynesboro soils. The Noli-

chucky soils have light red subsoils and considerably lighter colored thicker surface soils than the Waynesboro. The Holston are the moderately well drained or well drained yellow soils, the Monongahela the imperfectly drained pale-yellow soils, and the Tyler the poorly drained gray soils of this group. The Sequatchie, State, and Roanoke soils are on low terraces and differ chiefly in drainage or source of parent material. The Sequatchie and State are well-drained brown soils, whereas the Roanoke are gray poorly drained soils.

SOILS OF THE COLLUVIAL LANDS

The soils of the colluvial lands occur along small drainageways, at the base of upland slopes, and on small sloping alluvial-colluvial fans where the small streams have made deposits over the broad flood plains of larger streams. Their parent materials are derived from soil materials and rock fragments washed and rolled from the adjacent slopes. The soils of this group are placed into four subgroups on the basis of differences in origin of parent materials. These are: (1) Soils derived from local alluvium or colluvium chiefly from limestone, (2) soils derived from local alluvium or colluvium chiefly from quartzite, sandstone, shale, and slate, (3) soils derived from local alluvium or colluvium chiefly from quartzite and slate, and (4) soils derived from local alluvium or colluvium chiefly from calcareous shale.

Soils derived from local alluvium or colluvium chiefly from limestone.—This group includes members of the Emory, Greendale, and Pace series. The Emory soils are well drained, predominantly brown throughout, and relatively free of chert, gravel, or stone. The materials from which the Emory soils are derived have washed chiefly from Decatur and Dewey soils. The Greendale soils are derived chiefly from materials washed from the lighter colored soils such as Fullerton and Dunmore. They have grayish-brown to brownish-gray surface soils and brownish-yellow subsoils. In most places the material is mottled at a depth of 20 to 30 inches. The Pace soils were formed from parent material similar to that of the Greendale soils. They differ from these soils in having distinct surface soil and subsoil layers.

Soils derived from local alluvium or colluvium chiefly from sandstone, quartzite, shale, and slate.—Soils of the Hayter, Jefferson, Barbourville, and Cotaco series are included in this group. The parent materials of the Hayter soils are influenced to some extent by limestone material in most places. The Hayter soils have grayish-brown surface soils and yellowish-brown to light reddish-brown subsoils. The Jefferson soils have yellowish-gray surface soils and brownish-yellow or yellow subsoils. The Barbourville and Cotaco soils consist of recent alluvium, and they differ from the Hayter and Jefferson soils in not having distinct surface soil and subsoil layers. The Barbourville soils are brown and well drained; the Cotaco soils are imperfectly drained, much lighter colored, and mottled at a depth of about 12 to 16 inches. In some places the Cotaco soils are derived from materials washed entirely from acid shale and in others from interbedded acid shale and limestone. The soils of this group contain varying amounts of gravel or cobbles and in many places the plow layer has enough to interfere materially with tillage.

Soils derived from local alluvium or colluvium chiefly from quartzite and slate.—This group includes only soils of the Allen series. The parent materials of the Allen soils were washed largely from uplands

underlain by quartzite and slate but include a slight admixture of limestone material. The Allen soils are well drained.

Soils derived from local alluvium or colluvium chiefly from calcareous shale.—Soils of the Whitesburg and Hollywood series make up this group. The Whitesburg soil consists of recent local alluvium or colluvium and is generally only slightly acid. Its parent materials washed chiefly from Dandridge soils of the uplands. This soil differs from the Cotaco soil in being less acid and in having a generally darker surface layer. It is characterized by numerous shale fragments throughout the profile.

The Hollywood soil was derived from material washed chiefly from highly calcareous shale. The surface soil is very dark gray to dark brownish gray, and the subsoil is dark grayish brown to olive gray, splotched to strongly mottled with yellow, brown, and gray. Drainage is imperfect to poor.

SOILS OF THE BOTTOM LANDS

The bottom lands consist of flood plains, or those nearly level areas along the streams that are subject to floods. The material giving rise to the soils of the bottom lands has been carried there by the streams. Its character depends largely upon the source in the higher lying lands and the rate of water movement when the material was deposited. The material from which the soils of the bottom lands are developing has not lain in place long enough for well-defined surface soil and subsoil layers to develop, such as those found in most of the soils of the uplands and terraces. This group includes soils of the Staser, Hamblen, Prader, Buncombe, Congaree, and Lindside series.

The alluvium from which the Staser, Hamblen, and Prader soils are formed has washed from soils of the uplands such as the Ramsey, Dandridge, Muskingum, and Litz; but it is influenced in many places by limestone materials. The differences among these soils are caused chiefly by differences in drainage. The Staser soils are well drained and predominantly brown throughout the profile; the Hamblen soils imperfectly drained and brownish gray to grayish brown splotched with gray, brown, and yellow below 12 to 20 inches; and the Prader soils poorly drained and gray or light gray throughout.

The Congaree and Buncombe soil materials have washed from soils of the uplands, such as Porters and Ashe, that have developed from granites and gneisses. The Buncombe soils are excessively drained and light brown or yellowish brown throughout; the Congaree soils are well drained and predominantly brown throughout.

The Lindside soil has formed from imperfectly drained general stream alluvium washed chiefly from soils of the upland, such as the Decatur, Dewey, Dunmore, and Fullerton. Locally the alluvium may contain some sandstone or shale material. The Lindside soil is light brown or grayish brown to a depth of 12 to 18 inches. The lower layers are highly mottled with gray and brown.

DESCRIPTIONS OF THE SOILS

In the following pages the soils of Sevier County are described in detail and their present use and management, use suitability, and management requirements are set forth to the extent that present knowledge permits. The acreage and proportionate extent of each are listed in table 3, and their locations and distribution are represented graphically on the accompanying map.

TABLE 3.—*Acreage and proportionate extent of soils mapped in Sevier County, Tenn.*[1]

Map symbol	Soil	Acres	Percent
	Allen stony fine sandy loam:		
Aa	Eroded hilly phase	377	0.10
Ab	Eroded rolling phase	352	.09
Ac	Armuchee silt loam, steep phase	170	.04
	Armuchee silty clay loam:		
Ad	Eroded hilly phase	187	.05
Ae	Severely eroded hilly phase	276	.07
Af	Severely eroded steep phase	179	.05
Ba	Barbourville-Cotaco fine sandy loams	2,492	.65
	Barbourville silt loam:		
Bb	Rolling phase	480	.12
Bc	Undulating phase	672	.17
Bd	Barbourville stony fine sandy loam, rolling phase	1,269	.33
Be	Buncombe loamy fine sand	237	.06
Ca	Congaree loam	962	.25
	Cotaco silt loam:		
Cb	Rolling phase	270	.07
Cc	Undulating phase	4,307	1.12
	Cumberland silt loam:		
Cd	Hilly phase	108	.03
Ce	Undulating phase	436	.11
	Cumberland silty clay loam:		
Cf	Eroded hilly phase	659	.17
Cg	Eroded rolling phase	1,955	.51
Ch	Severely eroded hilly phase	383	.10
Ck	Severely eroded rolling phase	217	.06
	Dandridge and Litz shaly silt loams:		
D	Eroded hilly phases	5,078	1.32
Da	Eroded rolling phases	151	.04
Db	Eroded steep phases	24,737	6.43
	Dandridge and Litz silt loams:		
Dc	Hilly phases	795	.21
Dd	Steep phases	9,569	2.49
	Dandridge shaly silt loam:		
De	Eroded hilly phase	2,796	.73
Df	Eroded rolling phase	228	.06
Dg	Eroded steep phase	7,040	1.83
	Dandridge silt loam:		
Dh	Hilly phase	217	.06
Di	Steep phase	1,577	.41
	Decatur silty clay loam:		
Dj	Eroded hilly phase	283	.07
Dk	Eroded rolling phase	765	.20
Dl	Eroded steep phase	247	.06
Dm	Eroded undulating phase	133	.03
Dn	Severely eroded hilly phase	582	.15
Do	Severely eroded rolling phase	530	.14
Dp	Dewey silt loam, rolling phase	80	.02
	Dewey silty clay loam:		
Dq	Eroded hilly phase	371	.10
Dr	Eroded rolling phase	1,943	.50
Ds	Eroded undulating phase	181	.05
Dt	Severely eroded hilly phase	436	.11
Du	Severely eroded rolling phase	579	.15
	Dunmore silt loam:		
Dv	Hilly phase	1,069	.28
Dw	Rolling phase	266	.07

[1] Acreages were obtained by measurement on field sheets.

TABLE 3.—*Acreage and proportionate extent of soils mapped in Sevier County, Tenn.*—Continued

Map symbol	Soil	Acres	Percent
	Dunmore silty clay loam:		
Dx	Eroded hilly phase	1,666	0.43
Dy	Eroded rolling phase	1,736	.45
Dz	Eroded steep phase	388	.10
D2	Severely eroded hilly phase	1,344	.35
D3	Severely eroded rolling phase	386	.10
	Emory silty loam:		
Ea	Rolling phase	672	.17
Eb	Undulating phase	1,823	.47
	Farragut silty clay loam:		
Fa	Eroded rolling phase	434	.11
Fb	Eroded undulating phase	177	.05
Fc	Severely eroded hilly phase	209	.05
Fd	Severely eroded rolling phase	454	.12
	Fullerton cherty silt loam:		
Fe	Eroded hilly phase	1,045	.27
Ff	Eroded rolling phase	762	.20
Fg	Eroded steep phase	260	.07
Fh	Hilly phase	906	.24
Fk	Rolling phase	223	.06
Fl	Steep phase	397	.10
	Fullerton cherty silty clay loam:		
Fm	Severely eroded hilly phase	273	.07
Fn	Severely eroded steep phase	202	.05
	Fullerton silt loam:		
Fo	Eroded hilly phase	1,350	.35
Fp	Eroded rolling phase	2,796	.73
Fr	Hilly phase	794	.21
Fs	Rolling phase	539	.14
	Fullerton silty clay loam:		
Ft	Severely eroded hilly phase	1,582	.41
Fu	Severely eroded rolling phase	391	.10
	Greendale and Pace silt loams:		
Ga	Rolling phases	686	.18
Gb	Undulating phases	1,381	.36
Ha	Hamblen fine sandy loam	914	.24
Hb	Hamblen silt loam	5,483	1.42
	Hayter silt loam:		
Hc	Eroded hilly phase	498	.13
Hd	Eroded rolling phase	864	.22
He	Undulating phase	307	.08
Hf	Hollywood silty clay loam	408	.11
	Holston loam:		
Hg	Eroded hilly phase	241	.06
Hh	Eroded rolling phase	1,536	.40
Hk	Rolling phase	328	.09
Hl	Undulating phase	1,278	.33
	Jefferson fine sandy loam:		
Ja	Eroded hilly phase	72	.02
Jb	Eroded rolling phase	420	.11
	Jefferson silt loam:		
Jc	Eroded hilly phase	243	.06
Jd	Eroded rolling phase	755	.20
Je	Hilly phase	114	.03
Jf	Rolling phase	217	.06
Jg	Undulating phase	394	.10
	Jefferson silty clay loam:		
Jh	Severely eroded hilly phase	234	.06
Jk	Severely eroded rolling phase	394	.10

TABLE 3.—*Acreage and proportionate extent of soils mapped in Sevier County, Tenn.*—Continued

Map symbol	Soil	Acres	Percent
	Jefferson stony fine sandy loam:		
Jl	Eroded hilly phase	3, 254	0. 85
Jm	Eroded rolling phase	3, 031	. 79
Jn	Hilly phase	1, 315	. 34
Jo	Rolling phase	362	. 09
Jp	Severely eroded hilly phase	265	. 07
Jr	Undulating phase	133	. 03
	Jefferson very stony fine sandy loam:		
Js	Eroded hilly phase	433	. 11
Jt	Eroded rolling phase	454	. 12
Ju	Hilly phase	2, 998	. 78
Jv	Rolling phase	425	. 11
La	Lindside silt loam	1, 088	. 28
	Litz shaly silt loam:		
Lb	Eroded hilly phase	507	. 13
Lc	Eroded rolling phase	596	. 15
Ld	Litz silt loam, hilly phase	115	. 03
Ma	Monongahela silt loam	486	. 13
Mb	Muskingum-Lehew loams, steep phases	1, 321	. 34
	Nolichucky loam:		
Na	Eroded hilly phase	502	. 13
Nb	Eroded rolling phase	1, 475	. 38
Nc	Hilly phase	135	. 04
Nd	Rolling phase	290	. 08
Ne	Undulating phase	235	. 06
Pa	Prader silt loam	695	. 18
	Ramsey shaly silt loam:		
Ra	Eroded hilly phase	1, 116	. 29
Rb	Eroded steep phase	22, 224	5. 77
Rc	Hilly phase	335	. 09
Rd	Steep phase	31, 442	8. 17
Re	Very steep phase	42, 578	11. 06
	Ramsey stony fine sandy loam:		
Rf	Eroded steep phase	517	. 13
Rg	Hilly phase	227	. 06
Rh	Steep phase	18, 094	4. 70
Rk	Very steep phase	23, 069	5. 99
Rl	Roanoke silt loam	115	. 03
	Rough gullied land:		
Rm	(Dandridge soil material)	325	. 08
Rn	(Limestone material)	293	. 08
Ro	(Ramsey and Litz soil materials)	313	. 08
Rp	Rough mountainous land (Ramsey soil material)	77, 211	20. 05
Sa	Sequatchie fine sandy loam	872	. 23
Sb	Sequatchie silt loam	1, 307	. 34
Sc	Sequoia silt loam, rolling phase	815	. 21
	Sequoia silty clay loam:		
Sd	Eroded rolling phase	2, 624	. 68
Se	Eroded undulating phase	653	. 17
Sf	Severely eroded rolling phase	459	. 12
Sg	Staser fine sandy loam	2, 746	. 71
Sh	Staser silt loam	1, 312	. 34
Sk	State silt loam	577	. 15
Sl	Stony colluvium (Jefferson soil material)	2, 360	. 61
Sm	Stony hilly land (Dunmore and Talbott soil materials)	3, 228	. 84
Sn	Stony steep land (Dunmore and Talbott soil materials)	2, 274	. 59

TABLE 3.—*Acreage and proportionate extent of soils mapped in Sevier County, Tenn.*—Continued

Map symbol	Soil	Acres	Percent
Ta	Tyler silt loam	948	0. 25
Wa	Waynesboro clay loam, severely eroded hilly phase	356	. 09
	Waynesboro loam:		
Wb	Eroded hilly phase	635	. 16
Wc	Eroded rolling phase	1, 694	. 44
Wd	Rolling phase	142	. 04
We	Undulating phase	483	. 13
Wf	Whitesburg silt loam	5, 949	1. 55
	Total land area	380, 625	98. 87
	Water area [2]	4, 405	1. 13
	Total area	385, 030	100. 00

[2] Includes land below 1,000 feet elevation flooded by Douglas Reservoir and old river channels.

Allen stony fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (Ab).—This well-drained stony soil of the colluvial lands is characterized by a grayish-brown to brownish-yellow surface soil and a red subsoil. It occupies areas extending from the steep mountain slopes underlain by quartzite and slate. The colluvial deposits that make up this soil are at the base of the slopes from which they were washed, or they are spread over the adjacent valley floor. The parent materials are largely from uplands underlain by quartzite and slate but include a slight admixture of limestone material. The deposits are underlain largely by limestone or calcareous shale at a depth of 3 feet or more. This soil is widely distributed in small areas associated with Jefferson, Sequatchie, Hayter, and Dunmore soils.

Profile description:

0 to 6 inches, grayish-brown to brownish-yellow friable stony fine sandy loam; virgin areas have a thin surface layer stained dark with organic matter.

6 to 14 inches, yellowish-red or yellowish-brown friable stony light sandy clay loam.

14 to 36 inches, red to brownish-red friable sandy clay or sandy clay loam; moderate medium blocky structure.

36 inches +, light-red to yellowish-red friable stony sandy clay loam, streaked and splotched with yellow and gray in some places.

As a result of erosion, the present surface layer is highly variable in thickness, color, and texture. The layer may be absent or up to 10 inches thick. Mixing of the remnants of the original surface layer and the subsoil in the plow layer has resulted in a heavier texture in many places. Small severely eroded spots are common. These are conspicuous because the red subsoil is exposed. As mapped, this soil includes areas in which there is a gradual transition from shallow colluvial material over limestone residuum to deep colluvial material that gives rise to the typical Allen soils. The soil is also

quite variable in stoniness and degree of erosion. Most of the soil is moderately eroded, but a few uneroded and severely eroded areas are included.

The soil is medium to strongly acid and appears to contain a moderate amount of organic matter and plant nutrients. It has a few to many 2- to 8-inch semiangular sandstone or quartzite fragments on the surface and throughout the soil. The soil is sufficiently permeable for easy plant root penetration and normal circulation of air and moisture. Rainfall is readily absorbed and well retained.

Use and management.—An estimated 90 percent of this soil has been cleared and cultivated. On the cultivated areas erosion has removed from about 25 to 75 percent of the original surface soil, and in a few places practically all of it. With the loss of surface soil there has been a loss of organic matter and plant nutrients and a decrease of productivity. In addition droughtiness and susceptibility to further erosion have increased. It is estimated that about 30 percent of the cleared land is in crops, 50 percent in hay or pasture, and the rest in miscellaneous crops or idle.

Four-year rotations of corn, small grains, hay, and pasture are commonly used by the better farmers. On a large part of this soil, however, crops are not systematically rotated or fertilized.

The soil is only moderately well suited to crops that require tillage. The problem of conservation is moderately difficult, and the numerous stones in the plow layer materially interfere with tillage and make it infeasible in places. The soil is deficient in lime, nitrogen, phosphate, and possibly potash for most crops.

Any improved management program would include an increased use of lime and phosphate or high analysis fertilizers, the growing of winter cover crops, use of longer rotations, and an increased acreage of legume hay crops and legume-grass pasture mixtures. This Third-class soil is in management group 9.

Allen stony fine sandy loam, eroded hilly phase (12 to 25 percent slopes) (Aa).—This well-drained stony soil of the colluvial lands has a grayish-brown to brownish-yellow surface soil and a red subsoil. It occurs on areas extending from the steep mountain slopes underlain by quartzite and slate. The soil materials are partly colluvial and partly alluvial. In most areas about 25 to 75 percent of the original surface soil has been lost by erosion; in some areas practically all has been lost. This phase differs from Allen stony fine sandy loam, eroded rolling phase, chiefly in having a steeper slope, but it is also more variable in depth of colluvial material. The colluvial material is underlain in practically all places by limestone or calcareous shale. This soil is closely associated with Ramsey, Jefferson, Hayter, Barbourville, Dunmore, and other Allen soils.

The soil varies greatly in the depth to underlying material. Where shallow over limestone, it is generally darker and heavier than elsewhere. Depths of this shallow soil range from 18 to 42 inches. However, along sharp breaks in this soil, Dunmore soil derived from limestone soil material occurs. This included Dunmore soil has been eroded to the extent that the subsoil is exposed in most places. Also included are small areas that are uneroded and have a thin dark surface layer high in organic matter. Severely eroded areas that have lost practically all of the original surface layers are included. Gullies are common in these severely eroded areas.

Use and management.—Most of this soil has been cleared and cultivated. It is estimated that about 25 percent is in crops, 20 percent in hay, and 35 percent in pasture, and that 20 percent is idle.

No definite system of crop rotation is consistently followed. The soil may remain in hay 1 to 2 years, and in pasture 1 to 5. On most farms corn and small grains receive about 200 pounds per acre of a 0–10–4 [6] mixture or 16-percent superphosphate.

This soil is not considered physically suited to crops that require tillage but is fairly well suited to permanent pasture. Permanent pastures without amendments can be expected to produce low yields of low-quality pasture plants. To insure a satisfactory pasture stand and high yields, lime and phosphate are generally required. Under a high level of management, it may be feasible to use the less sloping areas for such close-growing crops as small grains and hay. Management of such areas would include, among other things, adequate liming and fertilization, contour tillage, and the use of winter cover crops. This Fourth-class soil is in management group 14.

Armuchee silty clay loam, eroded hilly phase (12 to 25 percent slopes) (Ad).—This is a hilly shallow soil of the uplands. It is differentiated from Dandridge and Litz soils that have comparable slope and erosion chiefly by the character of its parent rocks. Nevertheless, other differences exist. The parent rock of this soil consists of interbedded shale and limestone that is about 30 to 60 percent limestone. In contrast, the parent rock of the Litz soils is interbedded shale and limestone containing a very small proportion of limestone, and the parent rock of the Dandridge soils is calcareous shale.

This eroded hilly phase is on ridge slopes throughout the Armuchee-Litz-Farragut soil association. It is closely associated with Sequoia, Farragut, and other Armuchee soils and with Stony hilly land (Dunmore and Talbott soil materials) and Stony steep land (Dunmore and Talbott soil materials).

Although this soil is thought to have had very indistinct surface soil and subsoil layers, cultivation and erosion have tended to obliterate whatever differences formerly existed between these layers. In most places the soil consists of reddish-yellow moderately friable silty clay loam extending to bedrock, which generally is at depths between 6 and 24 inches. In places where the surface soil and subsoil layers are discernible, the surface soil is brownish-gray friable silt loam and the subsoil is reddish-yellow to yellowish-red firm silty clay, splotched with red, yellow, gray, and brown in many places. Fragments of shale are distributed throughout the soil mass in most places. In many places the limestone has been dissolved and leached out of the upper 1 to 2 feet of the underlying rocks, but in other places limestone outcrops with the shale.

This soil is quite variable in many profile characteristics, such as depth to bedrock, texture, and color. As mapped it includes numerous small areas that are similar to the Litz or Dandridge soils in profile characteristics. Most of the soil is moderately eroded, but a few small uneroded areas are included. Some tracts of this soil are sandy.

Use and management.—Nearly all of this soil is cleared and is used chiefly for pasture and crops. It is not well suited to crops, especially

[6] Percentages of nitrogen, phosphorous, and potash respectively.

row crops. It is highly susceptible to erosion, and the slope impairs tillage. Furthermore, crops are highly sensitive to adverse moisture conditions on this very shallow soil. On the other hand the soil is well suited to pasture. Good pastures can be established and maintained with relative ease. Phosphate and a little lime are ordinarily required for pastures. This Fourth-class soil is in management group 15.

Armuchee silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Ae).—This shallow soil of the uplands was developed from materials weathered from interbedded limestone and shale. It differs from the eroded hilly phase of Armuchee silty clay loam chiefly in being severely eroded. Practically none of the thin layer of original surface soil remains, and the heavy reddish-yellow to yellowish-red soil material is exposed in most places. This subsoil material is splotched with red, yellow, gray, and brown in many places. Many areas of this soil are shaly. Outcrops of shale and in some places outcrops of limestone and shale together are rather common. Gullies from 1 to 2 feet deep occur in some areas. The depth of the silty clay loam or silty clay material ranges from about 1 to 15 inches. This soil occurs in the same general localities as the other Armuchee soils, chiefly in the Armuchee-Litz-Farragut soil association area. It is associated with Sequoia, Litz, and Dandridge soils and with Stony hilly land (Dunmore and Talbott soil materials) and Stony steep land (Dunmore and Talbott soil materials).

Use and management.—All this land has been cleared. Much of the cleared land is idle. A large part is used for pasture that is generally low in quality. A very small part is used for crops, but yields are usually very low.

Owing chiefly to its severe erosion, this soil is physically less suited to crops and to pasture than the other hilly Armuchee soil. In its present condition it is probably better suited to forestry than to pasture on many farms. Fairly good pastures can be established and maintained. For the successful establishment of pastures, phosphate and lime and drought-resistant plants are needed and check dams or diversion ditches may be necessary. This Fourth-class soil is in management group 15.

Armuchee silt loam, steep phase (25 to 60 percent slopes) (Ac).—This steep shallow soil of the uplands has developed from materials weathered from interbedded shale and limestone. It differs from Armuchee silty clay loam, eroded hilly phase, in having stronger slopes and less erosion. In most areas the soil has not been plowed and surface soil and subsoil layers are barely discernible. The surface soil is brownish-gray friable silt loam; the subsoil is reddish-yellow to yellowish-red firm silty clay loam or silty clay. Most cleared areas are moderately eroded and the differences between the surface soil and subsoil layers have been largely obliterated. A few areas are coarser textured than described. Bedrock is at depths of 6 to 24 inches in most places and outcrops are common. Fragments of shale are scattered throughout the profile. This soil is confined mainly to steep ridge slopes in the Armuchee-Litz-Farragut soil association area. It is closely associated with Sequoia, Litz, and Dandridge soils and with the stony land types.

Use and management.—About half of this soil is in forest, and the rest has been cleared and cultivated. The cleared areas are now largely in pasture or idle, although a small acreage is used for crops.

Steep slopes, low water-supplying capacity, and susceptibility to erosion make this soil unsuitable for crops. It is suitable for pastures, but careful management is required to maintain them. Phosphate and lime are ordinarily required, and regulated grazing is needed to maintain a good sod at all times. This Fourth-class soil is in management group 19.

Armuchee silty clay loam, severely eroded steep phase (25 to 60 percent slopes) (Af).—This steep shallow soil of the uplands has formed from materials weathered from interbedded shale and limestone. It differs from the severely eroded hilly phase of Armuchee silty clay loam chiefly in having steeper slopes. It further differs in being somewhat shallower over bedrock and in having more bedrock outcrops. Practically none of the original surface soil remains. In most areas the heavy reddish-yellow to yellowish-red soil material is exposed. This exposed material is splotched with red, yellow, gray, and brown in most places. Shallow gullies are common. This soil is on steep ridge slopes, mainly in the Armuchee-Litz-Farragut soil association area. It is closely associated with Sequoia, Litz, Dandridge, and other Armuchee soils.

Use and management.—All of this soil has been cleared and used for crops or pasture. Much of it is now in unimproved pasture, but a large part is idle land or wasteland.

The soil is not suitable for either crops or pasture because it has steep slopes, low water-supplying capacity, low plant-nutrient supply, and extreme susceptibility to further erosion. It is probably best used for forests on most farms, although the need for land on some farms may require its use for pasture. If the soil is used for pasture, phosphate and lime will generally be required, and drought-resistant plants and careful grazing control will be needed. In addition, diversion ditches and check dams in gullies may be necessary. This Fifth-class soil is in management group 19.

Barbourville silt loam, undulating phase (2 to 7 percent slopes) (Bc).—This is a brown well-drained soil of the colluvial lands. It has formed at the base of slopes in small fanlike positions where small lateral drains empty onto larger flood plains and also along narrow intermittent drainageways. The colluvium or local alluvium from which this soil has formed was washed mainly from Ramsey shaly silt loams. The soil occurs in small irregularly shaped areas widely distributed throughout the southeastern part of the county. It is closely associated with Hayter, Cotaco, Jefferson, Allen, Sequatchie, Staser, Hamblen, and other Barbourville soils.

Profile description:

0 to 10 inches, brown to grayish-brown friable silt loam.
10 to 40 inches, light-brown or yellowish-brown friable heavy silt loam or silty clay loam.
40 inches +, brownish-yellow friable silty clay loam splotched with yellow, brown, and gray; thin bands and beds of waterworn slate fragments are common.

This soil is medium to strongly acid and is apparently well supplied with organic matter. It is relatively stone-free but contains a variable quantity of small shale or slate fragments throughout the soil mass.

It is sufficiently permeable for easy penetration of plant roots and normal circulation of air and moisture. Water is readily absorbed and well retained.

Use and management.—The soil is practically all cleared and farmed intensively; tobacco, corn, beans, wheat, and hay are the principal crops. No systematic rotation is followed, but these crops are usually alternated somewhat. Fertilizers of a 0–10–4 mixture or 16-percent superphosphate are applied for corn and small grains at the rate of 125 to 250 pounds per acre. Tobacco receives 400 to 1,000 pounds per acre of a 3–8–6 mixture, and beans receive 250 to 500 pounds of a 4–12–4 mixture on most farms. Nitrate of soda is used by some farmers on the truck and tobacco crop.

This soil is well suited to intensive use for crops, particularly intertilled crops, if it is adequately fertilized and organic matter is maintained by crop residues, green manure, or barnyard manure. Although fair crop yields can be obtained without fertilization, moderate to heavy fertilization is required for continued high production. The soil is moderately deficient in lime, nitrogen, and phosphate for many crops. A short rotation including a legume is desirable. The soil is not susceptible to erosion but is injured in some places by deposition of material from the adjacent slopes. Diversion ditches may be helpful in such places. This Second-class soil is in management group 2.

Barbourville silt loam, rolling phase (7 to 15 percent slopes) (Bb).—This brown well-drained soil of the colluvial lands has developed from local alluvium or colluvium that washed mainly from Ramsey shaly silt loam soils. It differs from the undulating phase chiefly in degree of slope. In addition, the colluvial accumulation is thinner, but still 3 feet or more deep in most places. The surface layer is brown to grayish-brown friable silt loam; the subsoil is light-brown or yellowish-brown friable heavy silt loam or light silty clay loam. In many places erosion has removed some soil material. Where this has happened, the surface soil is slightly heavier and the quantity of organic matter and plant nutrients is slightly less than for the undulating phase. This soil is in small irregularly shaped areas widely distributed throughout the southeastern part of the county. It is closely associated with Hayter, Jefferson, Ramsey, Staser, Hamblen, Cotaco, and other Barbourville soils.

Use and management.—Practically all of this soil has been cleared and used for crops and pasture. It is used less intensively than the undulating phase of Barbourville silt loam; more hay crops are grown and more of the soil is idle. Corn, tobacco, beans, and hay are the most commonly grown crops. These crops are alternated somewhat but they are not systematically rotated. Fertilization is light except for the tobacco and vegetable crops.

This soil is well suited to crops that require tillage, particularly if it is adequately fertilized. Owing to the stronger slopes, it is more susceptible to erosion than the undulating phase. Some water-control measures may be needed. These measures include the use of a larger proportion of grasses or other close-growing crops such as small grains, contour tillage, and diversions where possible.

Improved management practices include use of more lime and phosphate and planting a greater acreage to close-growing crops or to red

clover and other legumes. This Second-class soil is in management group 2.

Barbourville stony fine sandy loam, rolling phase (2 to 15 percent slopes) (Bd).—This brown well-drained soil consists of recent colluvial or local alluvial material washed or rolled from Ramsey or Jefferson soils or from Muskingum-Lehew loams, steep phases. It usually occurs in fanlike positions at the base of slopes or in narrow bands along intermittent drainageways. Although the maximum slope range of this soil is from 2 to 15 percent, most slopes range from about 5 to 10 percent. This soil is in small areas widely distributed throughout the southeastern part of the county. It is closely associated with Jefferson, Hayter, Cotaco, Ramsey, and Muskingum soils.

Profile description:

0 to 10 inches, light-brown, grayish-brown, or yellowish-brown very friable stony fine sandy loam.
10 to 36 inches, light-brown to brownish-yellow friable stony fine sandy loam or light clay loam.
36 inches +, brownish-yellow friable stony clay loam or fine sandy loam splotched with gray, yellow, and rust brown.

This soil is medium to strongly acid and apparently relatively high in organic matter. It is also moderately well supplied with plant nutrients. Runoff is moderate and internal drainage is medium. The soil is very permeable to air, roots, and water. Stones up to 12 inches across are on the surface and throughout the soil mass in quantities sufficient to interfere materially with tillage. In some places the stones almost prevent tillage. Some boulders up to 36 inches across are on the soil, but they are not numerous (pl. 1, *A*). Water is readily absorbed and moderately well retained.

Use and management.—Probably as much as one-third of this soil is still in hardwood forest. Most of the cleared areas are used rather intensively for crops but some are in pasture. Fair crop and pasture yields are obtained without the use of amendments.

This soil is suitable for crops; but because of stoniness, it is much less desirable for them than Barbourville silt loam, undulating phase. Although fair crop yields are obtained without amendments, they are required to increase or even maintain yields over a long period. Lime, phosphate, and possibly potash are necessary for continued high yields of most crops and are essential for such crops as alfalfa and red clover. On most areas nitrogen is needed for all except legume crops and those immediately following. The soil is not normally susceptible to erosion and does not need special engineering measures for water control. Although this soil is suited to intensive use, a short rotation that includes a deep-rooted legume is desirable. Removal of stones will greatly improve workability but may be economically feasible only for very small areas. This Third-class soil is in management group 2.

Barbourville-Cotaco fine sandy loams (2 to 15 percent slopes) (Ba).—This complex consists of well-drained and imperfectly drained soils formed from local alluvium or colluvium washed chiefly from Ramsey, Jefferson, and Allen soils. It occurs in small fanlike areas at the base of slopes and in long narrow areas along intermittent drainageways. It is characterized by two soils—Barbourville fine sandy loam and Cotaco fine sandy loam—so intricately associated

geographically that it was impractical to show each soil separately on the soil map. Although slopes range from about 2 to 15 percent, most areas have slopes of less than 5 percent. This complex is widely distributed, generally in very small areas, throughout the southeastern part of the county. It is closely associated with Jefferson, Hayter, Ramsey. Hamblen, and Staser soils.

Profile descriptions:

Barbourville fine sandy loam—
0 to 10 inches, light-brown, yellowish-brown, or grayish-brown, very friable fine sandy loam.
10 to 36 inches, light-brown to brownish-yellow friable fine sandy loam or light clay loam.
36 inches +, brownish-yellow friable clay loam or fine sandy loam splotched with gray, yellow, and rust brown.
Cotaco fine sandy loam—
0 to 15 inches, brownish-gray very friable fine sandy loam.
15 inches +, brownish-gray to light yellowish-brown friable fine sandy loam or clay loam mottled with gray, yellow, and rust brown; this layer becomes more highly mottled with depth.

The soils of this complex are medium to strongly acid and apparently well supplied with organic matter. They are moderately well supplied with most plant nutrients. The soils are very permeable to air, roots, and water and are high in water-supplying capacity. Rainfall is readily absorbed and well retained. Runoff and internal drainage are medium in the Barbourville soil but slow in the Cotaco soils. The few stones on the surface and throughout the profile do not interfere materially with cultivation.

Use and management.—Practically all areas of this complex have been cleared and are being used intensively for crop production. Some are in permanent pasture and very few are idle.

The soils of this complex are well suited to most of the common crops, particularly to truck crops. The Cotaco soil, however, is somewhat restricted in use suitability because of imperfect drainage. Although fairly productive, the soils of this complex respond readily to good management, especially to the application of needed amendments. They can be tilled over a fairly wide range of moisture conditions, and good tilth is easily maintained. All common types of farm machinery can be used, although the soil areas are generally small and irregularly shaped. The soils are not normally susceptible to erosion, and generally receive some addition of sediment, which aids in the maintenance of fertility.

The soils are well suited to intensive use, but a short rotation is desirable on most farms. Lime phosphate and possibly potash is required for continued high yields of most crops and are essential for crops such as alfalfa and red clover. Nitrogen is needed for all except legume crops and those that immediately follow. This Second-class soil is in management group 2.

Buncombe loamy fine sand (0 to 3 percent slopes) (Be).—This is an excessively drained yellowish-brown soil of the bottom lands. The alluvium from which it was formed has washed from uplands underlain chiefly by granite and gneiss. The soil is similar to Congaree loam in location, parent material, geographic distribution, and soil associates. It differs in texture, color, stoniness, productivity, and use suitability.

This soil consists of a loose light-brown or yellowish-brown loamy fine sand throughout. In many places the top 3 or 4 inches is stained a somewhat darker color than the rest of the profile. Local areas may be gravelly or cobbly or both. The subsoil is typically stratified with coarse-textured materials ranging from fine sand to fine gravel. The soil occupies almost level flood plains along the Little Pigeon and French Broad Rivers. It occurs in small areas in association with Congaree, Staser, Sequatchie, Hamblen, and Prader soils.

About 50 acres of this soil on the flood plains of the Little Pigeon River are similar to the soil described in color and texture, but differ mainly in source of parent material. Most of the material has washed from uplands underlain mainly by quartzite but some of it came from areas underlain by shale, slate, and limestone.

Buncombe loamy fine sand is naturally medium or strongly acid, although much of it has been limed recently and is less acid. The supply of organic matter and plant nutrients is rather low. Because of the coarse soil texture, the water-supplying capacity is low. The soil contains some gravel and cobbles, which interfere with cultivation in only a few places.

Use and management.—Practically all of this soil has been cleared and cultivated. At present most of it is in pasture or is idle. Only a small part is used for crops.

Susceptibility to flooding, droughtiness, and low fertility limit the use of this soil. Yields of corn, small grains, and most of the hay crops are very low. The soil is probably best suited to early maturing crops such as early potatoes and early garden vegetables. On many farms it is probably best used for pasture, although it is relatively unproductive of most pasture plants. The soil is deficient in lime, nitrogen, and phosphate. Applications of these amendments are needed to obtain even fair yields of the better suited crops. This Third-class soil is in management group 1.

Congaree loam (0 to 3 percent slopes) (Ca).—Congaree loam is a brown well-drained soil of the first bottoms. It consists of general alluvium washed from areas underlain by granite, and gneiss, together with slight admixtures of materials washed from areas underlain by quartzite and shale. It occurs in narrow elongated tracts in close association with Buncombe, State, Staser, Hamblen, and Sequatchie soils.

Profile description:

0 to 14 inches, light-brown to brown friable loam.
14 to 30 inches, light brown to brownish-yellow friable loam; this layer is stony in many places.
30 inches+, brownish-yellow heavy sandy loam; the alluvial deposit is 6 to 15 feet or more thick.

This soil includes small areas of State silt loam, and of Congaree fine sandy loam which is not mapped separately in this county. It also includes some areas of dark-colored soil and areas of soil with a dark compact subsoil. Apparently there is not a significant agricultural difference between these dark-colored variations and the soil described.

The soil is slightly to medium acid and appears to be well supplied with organic matter and plant nutrients. It is virtually free of gravel

and cobbles in the plow layer. The open friable character of this soil permits easy penetration of plant roots and free circulation of soil air. Rainfall is readily absorbed and well retained. Runoff is slow but internal drainage is medium to rapid. In most places the soil is subject to periodic stream overflow. A few mica flakes occur throughout the profile.

Use and management.—All of this soil has been cleared and cultivated. It is used intensively for crop production. Corn is the chief crop, but small grains, tobacco, and vegetables are also important. Crops are not generally systematically rotated. Some farmers follow a 3-year rotation of corn, small grains, and hay. The use of commercial fertilizers is limited. When they are used, corn, small grains, and soybeans receive moderately light applications of a 0–10–4 mixture or 16-percent superphosphate. Tobacco receives 400 to 700 pounds of a 3–8–5, and potatoes 200 to 400 pounds of a 4–8–4 mixture.

Congaree loam is probably better suited to intensive cropping than any other soil in the county. Moderate to high yields may be expected under continuous cropping without the use of amendments. A very good response may be expected, however, from the use of a short crop rotation that includes a legume and from the use of lime and phosphate. Under continuous cropping, profitable increases in yields may be obtained by using nitrogen fertilizers. The periodic flooding somewhat limits the use suitability but it replenishes the plant-nutrient and organic-matter supplies (pl. 1, *B*). This First-class soil is in management group 1.

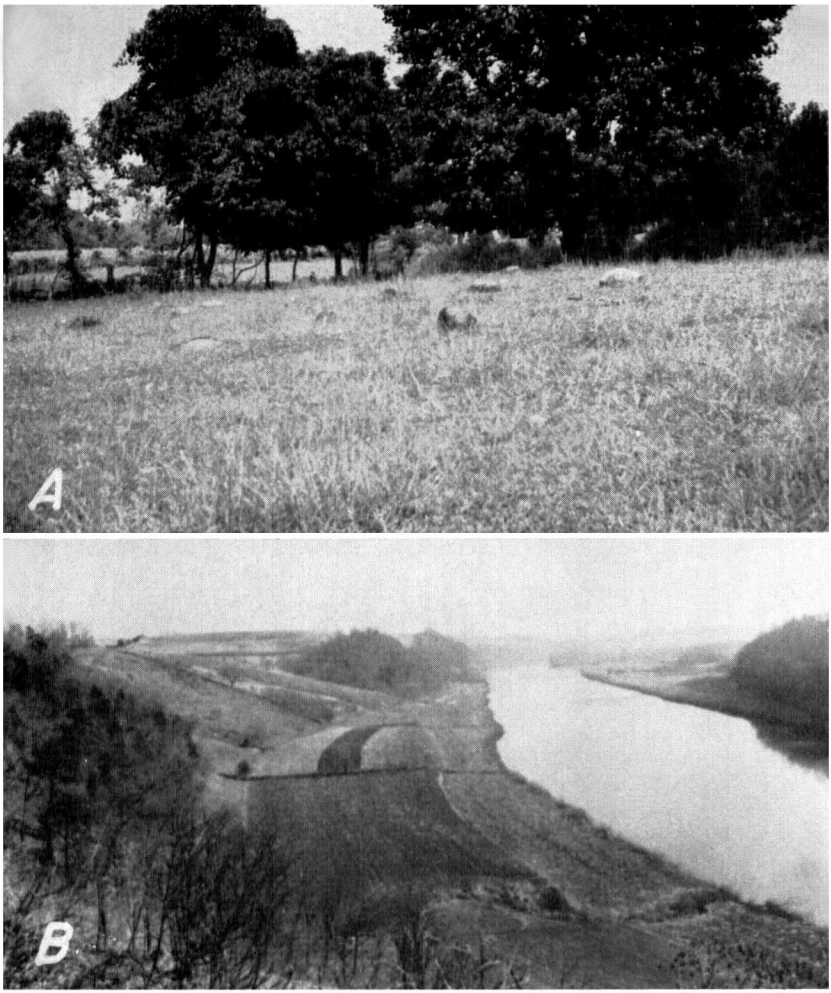
Cotaco silt loam, undulating phase (2 to 7 percent slopes) (Cc).—This is an imperfectly drained soil of the colluvial lands. It has formed from local alluvium washed or rolled from such soils as Ramsey, Jefferson, Litz, Armuchee, and Sequoia. It differs from the Barbourville soils chiefly in being not as well drained, lighter in color, and finer textured throughout the profile. The soil is mainly in narrow bands along intermittent drainageways. It is widely distributed in all those parts of the county underlain by sandstone, quartzite, shale, and slate.

Profile description:

0 to 15 inches, grayish-brown to brownish-gray friable silt loam.
15 inches+, brownish-gray to light yellowish-brown friable silt loam or light silty clay loam mottled with gray, yellow, and rust brown; becomes more highly mottled with depth.

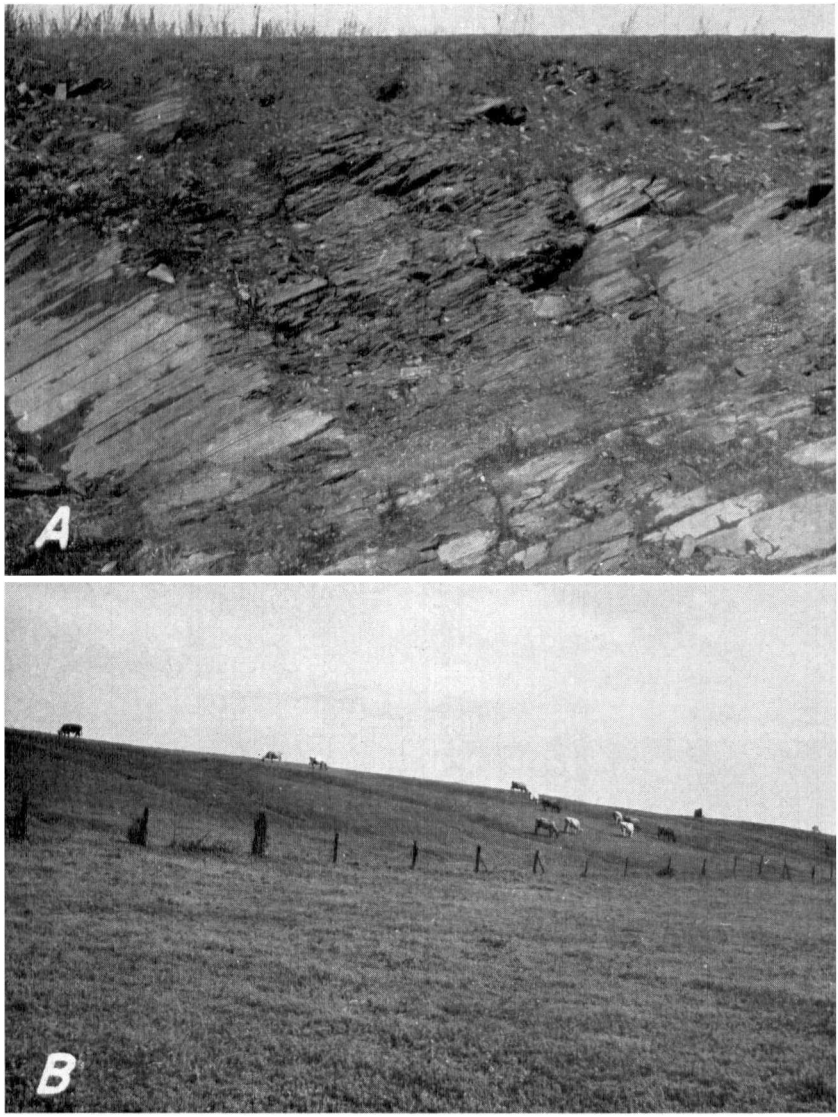
This soil is quite variable in source of parent material, texture, drainage, and age. Most of the material has washed from uplands underlain by shale or slate. Some, however, has washed from quartzite or sandstone and is generally coarser textured than described. Although drainage is predominantly imperfect, it is poor in some areas and moderately good in others. Most of the soil is from recent local alluvium; but a few areas are from older deposits.

This soil is medium to strongly acid and moderately well supplied with plant nutrients and organic matter. Runoff is medium but internal drainage is slow. The soil is relatively stone free, but shale particles occur throughout the profile in many places. The soil absorbs and retains moisture well, but it tends to become saturated with water during and following heavy rains.



A, Area of Barbourville stony fine sandy loam, rolling phase, which is generally more rolling than this picture indicates.
B, Congaree loam on flood plain of the French Broad River.

A, Pasture on Dandridge shaly silt loam, eroded steep phase.
B, Pasture on Dandridge shaly silt loam, eroded steep phase, showing "cat walks" that form, particularly in overgrazed areas.



A, Profile of Dandridge shaly silt loam, eroded hilly phase, showing calcareous shale from which the Dandridge soils were derived. This shale is partially weathered to a depth of 2 or 3 feet in most places and can be torn up and mixed with the soil by deep subsoiling.

B, Fairly good pasture (above the fence) on Dewey silty clay loam, severely eroded hilly phase. The good sod below the fence is on Emory silt loam, undulating phase.

A, Very good pasture on Emory silt loam, undulating phase.
B, Excellent crop of tobacco on Emory silt loam, undulating phase.

Use and management.—Most areas of this soil have been cleared and used for corn, small grains, hay, and pasture. Crops are not systematically rotated.

Imperfect drainage somewhat limits the use suitability of this soil. It is well suited to many summer annual crops such as corn and many of the vegetable crops. It is not so well suited to crops such as the small grains, tobacco, and alfalfa. Fair yields of suited crops are obtained without the use of amendments or systematic crop rotations. The soil responds readily to the application of needed amendments, however. Lime, phosphate, and possibly potash are required for continued high yields of most crops. Nitrogen is needed for all except legumes and the crops that immediately follow them. A short rotation that includes a legume is desirable. The soil is easily tilled under the proper moisture conditions but is saturated with water much of the time during wet seasons. The irregular shape of tracts of this soil increases difficulties of cultivation, especially cultivation with heavy machinery. This Third-class soil is in management group 2.

Cotaco silt loam, rolling phase (7 to 15 percent slopes) (Cb).—This is an imperfectly drained soil of the colluvial lands. It has formed at the base of upland slopes from recent local alluvium or colluvium washed from soils such as the Sequoia, Litz, Armuchee, Jefferson, and Ramsey. It differs from Cotaco silt loam, undulating phase, chiefly in having a stronger slope.

The surface soil is a grayish-brown to brownish-gray friable silt loam, and the subsoil is a brownish-gray to light yellowish-brown friable silt loam or light silty clay loam mottled with gray, yellow, and rust brown. This soil is in small areas widely distributed in all parts of the country underlain by sandstone, quartzite, shale, and slate. It is closely associated with Barbourville, Hayter, Hamblen, and Jefferson soils, as well as with the soils from which the parent materials have washed.

Use and management.—Practically all of this soil has been cleared and used chiefly for the production of corn, hay, small grains, and pasture. It is managed much like the undulating phase of Cotaco silt loam, but the crop yields average somewhat lower.

This soil is well suited to rather intensive use for many of the common crops of the county. Its use is limited somewhat by imperfect drainage, but not so much as the undulating phase. Practically all the common crops, with the possible exception of the deep-rooted legumes, can be successfully grown. This soil is similar to Cotaco silt loam, undulating phase, in management requirements except that a longer rotation is needed. It is generally associated with that soil and managed similarly in associated areas. This Third-class soil is in management group 2.

Cumberland silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Cg).—This is a well-drained fertile red soil. It has a browner surface soil and a darker red somewhat less friable subsoil than the Waynesboro soils. Its parent material consists of old alluvium washed chiefly from limestone materials. The Waynesboro soil, in contrast, contains considerable shale and sandstone material. The native vegetation was chiefly deciduous hardwoods, mainly oak, hickory, chestnut, yellow-poplar, and maple. This soil occurs on high

349399—56——3

terraces of many of the major streams. It is closely associated with Waynesboro, Nolichucky, Dunmore, Dewey, and Decatur soils.

Profile description:

0 to 8 inches, brown to reddish-brown friable silt loam to silty clay loam.
8 to 48 inches, dark-red or reddish-brown friable to firm silty clay or heavy silty clay loam.
48 inches +, red or yellowish-red firm silty clay splotched with yellow and gray.

The thickness of the surface layer varies according to degree of erosion. In some places it is less than 6 inches thick and some subsoil has been mixed with it in tillage. Some gravel and cobbles are on the surface and throughout the profile. Very small dark-brown or nearly black concretions are in the subsoil and substratum. The terrace deposit is variable in thickness; generally it is more than 3 feet, and in a few places it is as much as 15 feet thick. Where the terrace deposit is less than 3 feet thick, the subsoil is not so deep or friable as described. The entire profile is medium to strongly acid.

Use and management.—Practically all of this soil has been cleared and used for crops and pasture. Many different crops are grown but not commonly in a systematic rotation.

This soil is suited to a wide variety of crops and pasture plants, including alfalfa and red clover. Control of runoff and maintenance of fertility are important. A crop rotation of moderate length that includes a deep-rooted legume is desirable on most farms. All tillage should be on the contour, and contour stripcropping may be advisable on the longer slopes. Lime is required for such crops as alfalfa and red clover but is less likely to be limiting for other crops. Most crops respond readily to phosphorus. Some crops, such as alfalfa and tobacco, may need potash. This Second-class soil is in management group 7.

Cumberland silty clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Ck).—This is a red well-drained soil. The old alluvium from which it has formed was washed chiefly from uplands underlain by limestone. Included, however, is some material from a variety of rocks. The soil differs from the eroded rolling phase of Cumberland silty clay loam chiefly in being more eroded. Most of the original surface soil has been lost. The present surface layer consists of the remnants of the original surface layer mixed with the upper part of the subsoil. This layer is brown to reddish-brown friable silty clay loam. The subsoil is dark red or reddish-brown friable to firm silty clay or heavy silty clay loam.

This soil is mostly on high terraces of the French Broad River. It is closely associated with Waynesboro, Nolichucky, Dunmore, Dewey, and Decatur soils.

Use and management.—All of this soil has been cleared and used for crops and pasture. An appreciable part is now idle or abandoned.

This soil is suited to a wide variety of crops, including alfalfa, but it has been seriously injured by erosion. It is inferior to Cumberland silty clay loam, eroded rolling phase, because of the greater loss from erosion and susceptibility to further erosion. It is lower in organic matter and plant nutrients and cannot be worked over so wide a range in moisture conditions. Water is absorbed more slowly, and runoff and erosion are more rapid. To maintain or increase produc-

tivity will require a longer rotation than those now used. The rotation will need to include more close-growing crops and probably will need somewhat heavier fertilization. Special engineering devices such as terraces may be needed if many row crops are to be grown in the rotation. Terraces should be effective if properly laid out and constructed. Contour tillage should be used wherever feasible, and may be the only water-control practice necessary if the soil is properly rotated and fertilized. This Third-class soil is in management group 10.

Cumberland silt loam, undulating phase (2 to 5 percent slopes) (Ce).—This is a red well-drained soil of the old high stream terraces. Most of the terraces are 50 to 150 feet above the present flood plains. The parent material has washed largely from uplands underlain by limestone. Generally this material includes an admixture of material from a variety of rocks, among which are shale, slate, sandstone, quartzite, and granite. Most of these terrace deposits are underlain by limestone or calcareous shale at depths of about 5 to 20 feet. Practically all of this soil is on terraces of the French Broad River in the Cumberland-Waynesboro-Congaree soil association area. It is closely associated with Nolichucky, Waynesboro, Decatur, Dewey, and Dunmore soils.

Profile description:

0 to 8 inches, brown to reddish-brown friable silt loam.
8 to 60 inches, dark-red or reddish-brown friable to firm silty clay or heavy silty clay loam.
60 inches +, red to yellowish-red firm silty clay splotched with yellow and gray.

In some places a considerable part of the original surface layer has eroded away. Because some subsoil has been mixed with the surface soil, the present surface layer varies greatly in color and texture within short distances. The color ranges from brown to reddish brown, and the texture from silt loam to silty clay loam. Small severely eroded spots are common and conspicuous because the subsoil is exposed. Almost one-third of the total area is uneroded, and some of this is not cleared. These uneroded areas differ from the profile described in having a deeper surface soil that is higher in organic matter and more uniform in color and texture.

The soil is medium to strongly acid. The supply of organic matter appears to be moderate, and that of plant nutrients is moderately high. A few small cobbles are on the surface and throughout the profile in places. Small dark-brown concretions are common in the lower part of the soil. Moisture and air permeate the soil easily, and roots penetrate it rather freely. Rainfall is readily absorbed and very well retained. The water-supplying capacity is high.

Use and management.—Most of this soil has been cleared and is being used for crops and pasture. Little of the cleared land is idle. This soil is easy to work and conserve and is productive of the crops commonly grown. It is well suited to all the common field crops, including alfalfa. It has favorable slopes, is fertile, and has a high water-supplying capacity; consequently, it is suited to rather intensive use for crops. It is slightly deficient in lime, phosphate, and nitrogen for maximum production of some crops. Lime and phosphate are generally considered essential for such crops as red clover and alfalfa. This First-class soil is in management group 3.

Cumberland silt loam, hilly phase (12 to 25 percent slopes) (Cd) — This is a well-drained red soil. Its parent materials, although washed chiefly from uplands underlain by limestone, were mixed with materials from a wide variety of rocks.

This soil has developed under deciduous forest. It occurs on high terraces of the French Broad River in close association with Waynesboro, Nolichucky, Decatur, Dewey, and Dunmore soils.

Profile description:

0 to 12 inches, brown friable silt loam; in wooded areas the upper 2 inches is stained dark grayish brown with organic matter.
12 to 45 inches, dark-red or reddish-brown friable to firm silty clay or heavy silty clay loam.
45 inches +, red to yellowish-red firm silty clay splotched with yellow and gray.

The soil is medium to strongly acid and apparently has a moderately high supply of plant nutrients and organic matter. A few cobbles are on the surface and throughout the profile in places. The soil is permeable to air, roots, and water. Water is readily absorbed and well retained.

Use and management.—This soil is all in forest, but it is suitable for crops and pasture. Many of the wooded areas are small and so inconveniently located that it is not feasible to clear and use them for crops or pasture. On cleared areas, use and management practices would be similar to those for Cumberland silty clay loam, eroded rolling phase, but water control would be a greater problem. This Third-class soil is in management group 11.

Cumberland silty clay loam, eroded hilly phase (12 to 25 percent slopes) (Cf).—This soil differs from the eroded rolling phase chiefly in having a steeper slope. In addition, it is generally more variable in color, texture, stoniness, and depth. Surface runoff is more rapid, and in most areas more of the original surface soil has been lost. Small severely eroded spots are common.

The surface soil is brown to reddish-brown silt loam or silty clay loam. The subsoil is dark-red or reddish-brown firm silty clay loam or silty clay. The soil has formed from old alluvium washed chiefly from uplands underlain by limestone. Some areas are included, however, that are predominantly from quartzite and slate. Most of this soil is on high terraces of the French Broad River. It is closely associated with Waynesboro, Nolichucky, Decatur, Dunmore, and Cumberland soils.

Use and management.—All of this soil has been cleared and cultivated. It is now used for general field crops and pasture. Crops are not systematically rotated, although a number of different crops are grown. The small acreage of tobacco and truck crops generally receives heavy applications of a complete fertilizer. Most of the other crops receive very little or no fertilizer.

This soil is moderately well suited to crops that require tillage. The use is somewhat restricted because it is eroded and is susceptible to further erosion. This phase is more exacting than the eroded rolling phase in kind and rotation of crops, tillage practices, fertilization, and water-control measures. Longer rotations that include a greater proportion of close-growing crops, the return of more organic matter in leguminous green-manure crops, and contour tillage are necessary to maintain the productivity of this soil. The

steeper more eroded areas are probably better suited to hay crops or permanent pasture. This Third-class soil is in management group 11.

Cumberland silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Ch).—This soil differs from Cumberland silt loam, hilly phase, chiefly in being severely eroded. Most of the original surface soil has been lost. The present surface layer consists of remnants of the original surface soil that have been mixed with the upper part of the subsoil. This mixed layer is brown to reddish-brown moderately friable silty clay loam. The subsoil is dark-red or reddish-brown firm silty clay or heavy silty clay loam. Shallow gullies are common in some areas. A few uncrossable gullies occur. This soil is mainly on the high terraces of the French Broad River. It is closely associated with Waynesboro, Nolichucky, Dunmore, Dewey, and Decatur soils.

Use and management.—All of this soil has been cleared and used for crops and pasture. A considerable part is now idle or abandoned and, to large extent, is reverting to forest.

Because this soil has lost organic matter and plant nutrients through erosion, and is susceptible to further erosion, it is not considered suitable for crops that require tillage. It is probably best used on most farms for semipermanent hay crops or for permanent pasture. A good sod is needed to help absorption of rainfall and to slow runoff. Lime and phosphate will probably be necessary to establish and maintain a good sod. Barnyard manure will aid greatly in establishing a sod on the galled spots. Grazing should also be regulated carefully, especially during the dry summer and fall months. Special engineering devices such as diversion ditches and check dams in gullies may be advisable in places. The slopes are too steep for effective use of broad-base terraces. This Fourth-class soil is in management group 12.

Dandridge silt loam, steep phase (25 to 60 percent slopes) (Di).—This well drained to excessively drained shallow soil of the uplands is known locally as black slate land. It has developed from materials weathered from calcareous shale. It occurs on narrow steep ridge slopes in the Dandridge-Hamblen-Whitesburg soil association. It is chiefly associated with Hamblen, Whitesburg, Sequoia, Cotaco, and other Dandridge soils.

Profile description:

0 to 6 inches, brownish-gray to yellowish-gray friable silt loam; in wooded areas the surface 2-inch layer stained dark with organic matter; moderate fine crumb structure.

6 to 20 inches, yellowish-gray to brownish-yellow friable (plastic when wet) shaly silty clay loam; splotched, especially in the lower part of the layer, with yellow, reddish yellow, gray, and dark brown; partially disintegrated bedrock is at depths ranging from 10 to 30 inches.

This soil varies from place to place in texture, color, and consistence, but particularly in depth to bedrock. Along the border of the area, adjacent to the areas dominated by limestone, the subsoil in many places is reddish and heavier and more plastic than usual. These differences result partly from a higher calcium carbonate content in the parent bedrock.

The soil, as mapped, also includes a small acreage, generally on the higher ridges, where the parent materials have weathered from a more

massive sandy calcareous shale or calcareous sandstone. This variation differs chiefly in being more acid, more reddish, and coarser textured than is normal for the Dandridge soils.

In most places the soil material contains numerous small shale fragments, many of which are calcareous. It is therefore about neutral in reaction and well supplied with lime. Bedrock outcrops are common in most areas of this soil. The organic-matter content is low except in the thin surface layer in wooded areas. The soil is moderately low in phosphate and nitrogen but there is evidence of a fairly high potash content. Owing largely to the shallow depth, the water-supplying capacity is low. Runoff is very rapid.

Use and management.—Practically all of this soil is in cutover forest. The present stand is small and includes many cull trees.

Chiefly because of shallowness, steep slope, and extreme susceptibility to erosion, this soil is very poorly suited to the production of crops. It is best suited to pasture, although some of the steeper slopes probably should be left in forest. Very likely phosphorus is the only fertilizer needed for pastures. Lime will not be needed in most places. Carefully controlled grazing will be necessary in order to maintain a good pasture sod. This Fourth-class soil is in management group 19.

Dandridge shaly silt loam, eroded steep phase (25 to 60 percent slopes) (Dg).—This excessively drained shaly soil of the uplands has developed from the residuum of calcareous shale. It differs from Dandridge silt loam, steep phase, chiefly in being eroded. In most of the areas 25 to 75 percent of the original surface soil has been lost; in some areas all of the surface soil and a part of the subsoil have been lost. Because of loss of surface soil, this phase has become lower in organic matter and plant nutrients and more susceptible to further injury from erosion and has a slightly heavier surface layer. No well-defined surface soil and subsoil layers are present. Tillage and erosion have tended to obliterate the minor differences in layers that once existed. Idle or abandoned areas appear to be more severely eroded than the tilled areas because the shallow gullies formed are not obliterated.

This soil is distributed throughout that part of the county underlain by calcareous shale or black slate. It is associated chiefly with Whitesburg, Hamblen, and other Dandridge soils.

The soil is about neutral in most places. It is apparently low in organic matter and most plant nutrients, although the content of potash is generally high. Numerous small shale fragments are throughout the profile and some large fragments are on the more severely eroded areas. Bedrock outcrops are common in most places. Runoff is very rapid. The soil is moderately permeable to air, roots, and water. The water-supplying capacity is low.

Use and management.—Nearly all of this soil is cleared, and most of the cleared areas are used for pasture (pl. 2). Some of the soil is used for crops. A considerable part is idle or abandoned. Chiefly because of shallowness, steep slope, and extreme erodibility, the soil is very poorly suited to crops. It is productive of pasture plants, however, especially where phosphate has been applied. The severely eroded areas are now poor for pasture but they probably can be made fairly productive if a vegetative cover is established and maintained. Deep subsoiling on the contour, application of phosphates, and restricted grazing may be expected to aid materially in establishing pasture on

eroded areas. These practices also should benefit some of the less eroded areas where the pasture stand is now thin. Very likely phosphorus is the only fertilizer needed for pastures, as excellent stands have been obtained where phosphate alone has been applied and the management has been good. Lime is not needed in most places. This Fourth-class soil is in management group 19.

Dandridge silt loam, hilly phase (12 to 25 percent slopes) (Dh).—This is a light-colored well drained to excessively drained shallow soil of the uplands. It has developed mainly from the residuum of calcareous shale, but some small areas derived from the residuum of calcareous sandstone are included. This soil differs from Dandridge silt loam, steep phase, chiefly in having milder relief. In addition it has a somewhat greater average depth and more distinct subsoil layers. It is largely confined to the Dandridge-Hamblen-Whitesburg soil association.

Profile description:

0 to 6 inches, brownish-gray to yellowish-gray friable silt loam; in wooded areas has a thin surface layer stained dark with organic matter.

6 to 20 inches, yellowish-gray to brownish-yellow friable (plastic when wet) shaly silty clay loam or silty clay; lower part splotched with yellow, reddish yellow, gray, and dark brown; partially disintegrated bedrock at depths of 10 to 30 inches.

The shale content and prevalence of bedrock outcrops vary greatly from place to place. Some small areas are relatively shale-free. Although in most areas the subsoil is brownish yellow, some areas are included that have a yellowish-red subsoil.

Numerous small calcareous shale fragments are scattered throughout the profile in most places. The soil is about neutral in reaction. Occasional bedrock outcrops occur. The organic-matter content is low except in the thin dark-colored surface layer. The soil is moderately low in nitrogen and phosphate but is fairly high in potash. It is moderately permeable, but, because of shallow depth and strong slopes, runoff is rapid. The water-supplying capacity is low.

Use and management.—Practically all of this soil is in cutover forest. It is rather poorly suited to crops, chiefly because of its strong slopes and great susceptibility to erosion. It is well suited to pasture, and good pastures can be established and maintained. The water-supplying capacity is low, however, and the pastures may be short during extended dry seasons. If this soil were cleared and used for crops or pasture, the management would be similar to that for Dandridge shaly silt loam, eroded hilly phase. This Fourth-class soil is in management group 15.

Dandridge shaly silt loam, eroded hilly phase (12 to 25 percent slopes) (De).—This is a well drained to excessively drained light-colored soil of the uplands. It has developed chiefly from the residuum of calcareous shale but includes some areas derived from calcareous sandstone.

This soil differs from Dandridge silt loam, hilly phase, chiefly in being eroded. An estimated 25 to 75 percent of the original surface layer has been lost as a result of erosion. In some places all the surface soil and part of the subsoil have been lost. As erosion advances, however, the topmost part of the bedrock shale comes nearer the surface and is turned by the plow. On exposure the shale soon

breaks down and becomes an integral part of the soil. It is therefore difficult to ascertain the loss of soil material. Furthermore, little or no decline in productivity has taken place because of the erosion, except where recent erosion has been severe. In abandoned fields shallow gullies are common. In some of the severely eroded spots, large shale fragments are on the surface.

Tillage and the accompanying erosion have tended to obliterate minor differences between the surface soil and subsoil layers. The soil material is predominantly yellowish-gray to brownish-yellow friable (plastic when wet) clay loam or silt loam. This soil is in small elongated irregularly shaped areas. It is associated with Whitesburg, Hamblen, Sequoia, and other Dandridge soils. Most of it is in the Dandridge-Hamblen-Whitesburg soil association.

Use and management.—Practically all of this soil has been cleared and used for crops or pasture. It is estimated that at present 35 percent is in cultivated crops, 35 percent is in pasture, and 30 percent is idle. Crop rotation and fertilizers are not commonly used.

This soil is well suited to pasture and rather poorly suited to field crops. Shallowness and the resulting low water-supplying capacity, hilly slope, and extremely high susceptibility to erosion are among the chief limiting factors. By very careful management, however, some farmers have used this soil for crops for a number of years. Erosion is difficult to control, but some farmers have reported increased yields where erosion has brought the calcareous shale bedrock within reach of the plow. Severe erosion, however, is decidedly harmful and should be prevented. All cultivation should be on the contour. Subsoiling on the contour has proved beneficial in many places (pl. 3, *A*). This practice can be expected to decrease surface runoff and increase the water-holding capacity.

This soil appears to be well suited to grasses and legumes, including alfalfa, probably because of its high supply of lime. Phosphate is usually required for high yields of grasses and legumes. Potash is apparently not needed in many places. This Fourth-class soil is in management group 15.

Dandridge shaly silt loam, eroded rolling phase (5 to 12 percent slopes) (Df).—This soil differs from the eroded hilly phase chiefly in having a gentler slope. Like the other Dandridge soils, it is about 10 to 30 inches deep over calcareous shale, moderately eroded, and well supplied with lime and contains numerous outcrops and a great many fragments of calcareous shale. The soil material is predominantly yellowish-gray to brownish-yellow friable shaly silt loam to silty clay loam. The soil is similar to the other Dandridge soils in association and distribution and includes similar variations. Typically, this soil is in narrow elongated areas on ridge crests.

Use and management.—Most of this soil is cleared and used for crops or pasture. At the time of the survey it was estimated that 40 percent was in crops, 50 percent was in hay or pasture, and about 10 percent was idle.

The management requirements of this soil are similar to those of the eroded hilly phase of Dandridge shaly silt loam, but because of the gentler slope, somewhat less attention to erosion control is necessary. The gentler slope also makes the soil somewhat easier to work and physically better suited to crops, although it is not well suited

to them because of its very low water-supplying capacity. It supports good pasture, however, especially where phosphate has been applied. Some areas may also require lime. This Third-class soil is in management group 15.

Dandridge and Litz silt loams, steep phases (25 to 60 percent slopes) (Dd).—This is a complex of two soils: (1) Dandridge silt loam, steep phase and (2) Litz silt loam, steep phase. The soils are so intricately associated and have such poorly defined boundaries that it was not practical to map them separately. The members of this complex are shallow excessively drained soils of the uplands. They were derived from materials weathered from shale. This complex is extensive and widely distributed in the Dandridge-Hamblen-Whitesburg soil association.

Dandridge silt loam, steep phase, consists of material weathered from calcareous shale. In most places brownish-gray to yellowish-gray friable silt loam rests on partially weathered shale at a depth of about 10 inches. In places where the soil is deeper, a yellowish-gray or brownish-yellow moderately plastic silty clay loam, 8 to 12 inches thick, underlies the first layer. In wooded areas the topmost 1 or 2 inches is stained dark with organic matter.

Litz silt loam, steep phase, is slightly deeper and less shaly than other Litz soils in the county. It has developed from material weathered from a shale that is apparently slightly coarser in texture. The underlying shale has leached to a depth of 3 to 7 feet. The soil material consists of yellowish-gray or grayish-yellow friable silt loam, 6 or 8 inches thick. This is underlain by 10 to 15 inches of brownish-yellow friable (plastic when wet) silty clay or silty clay loam highly splotched with red, gray, brown, and yellow.

Areas of this complex are extremely variable in proportion and distribution of the component soils. A considerable acreage of soil derived from massive calcareous sandstone is included. This inclusion, which differs from the Litz soil chiefly in being coarse textured and more friable, is on the higher ridge slopes in most places.

In most areas, the soil material contains numerous shale fragments, some of which are calcareous in the Dandridge soils. The soils of this complex vary from neutral to strongly acid. The organic-matter content is low except in the thin surface layer in wooded areas. The soils are moderately low in phosphorus and nitrogen but probably fairly high in potash. The water-holding capacity is low. Bedrock outcrops are common in most areas. They are generally harder and more massive than those in the Dandridge soils and they obstruct farm machinery.

Use and management.—Practically all of this soil is in cutover forest. The stand is mainly hardwoods, but some yellow pine is included, especially on the south-facing slopes. The trees are small and there are many culls.

Chiefly because of shallow depth, steep slope, and extreme susceptibility of cleared areas to erosion, the soils of this complex are very poorly suited to crops. They are poorly suited to pasture except under a very high level of management. Probably they should remain in forest on most farms. If areas of this complex are cleared, the management requirements will be similar to those for Dandridge and Litz shaly silt loams, eroded steep phases.

The members of this complex are Fifth-class soils and are in management group 19.

Dandridge and Litz shaly silt loams, eroded steep phases (25 to 60 percent slopes) (Db).—The soils of this complex differ from Dandridge and Litz silt loams, steep phases, chiefly in being eroded. In most areas from 25 to as much as 75 percent of the soil material has been lost. As a result, these soils are lower in organic matter and plant nutrients, have a slightly heavier surface layer that contains a greater proportion of shale fragments, and are more susceptible to further erosion. Erosion and tillage have tended to obliterate any distinction between surface soil and subsoil layers. Shallow gullies are common in idle or abandoned areas, but they are generally kept leveled off in the tilled fields. This complex is very extensive in the Dandridge-Hamblen-Whitesburg soil association area.

These soils vary from nearly neutral to strongly acid. They are apparently low or very low in organic matter and most plant nutrients. The content of potash is generally high. Numerous shale fragments occur throughout the profiles. Some large fragments appear in places. Bedrock outcrops are common. Runoff is very rapid, and the water-supplying capacity is very low.

Use and management.—Practically all areas of this complex are cleared. Most of them are in pasture, mainly unimproved, but a few are used for crops. A very large part is idle or abandoned.

These soils are very poorly suited to crops because of steep slope, low fertility, low water-supplying capacity, and extreme susceptibility to erosion. Pasture productivity is low or very low in most places. Fair pastures may be established by application of lime and phosphate, by deep subsoiling where feasible, and by careful grazing control. Lime is not needed in all places. Tests should be made before lime is applied. On most farms, areas of this complex are probably best used for forestry. This Fifth-class soil is in management group 19.

Dandridge and Litz silt loams, hilly phases (12 to 25 percent slopes) (Dc).—This complex consists of shallow well drained to excessively drained soils of the uplands that are underlain by calcareous or leached shale. These soils differ from Dandridge and Litz silt loams, steep phases, chiefly in having slopes that are less steep. In addition, they are somewhat deeper on the average and their surface soil and subsoil layers are more distinct. Like the complex of steep phases, this complex is extremely variable in proportion and distribution of the soils included. It occurs in the Dandridge-Hamblen-Whitesburg soil association, generally on the high ridge slopes.

Use and management.—Practically all areas of this complex are in forest. The soils are fairly well suited to pasture, but many areas are small and not readily accessible. Fair to good pastures can be established and maintained. Applications of phosphate and, in some places, lime will be necessary, and grazing will need to be carefully controlled. The water-supplying capacity is low, however, and pastures are expected to be short during extended dry seasons. If these soils are cleared and used for crops or pasture, their management will be similar to that for Dandridge and Litz shaly silt loams, eroded hilly phases. These are Fourth-class soils and are in management group 15.

Dandridge and Litz shaly silt loams, eroded hilly phases (12 to 25 percent slopes) (D).—This complex consists of well drained to excessively drained shallow soils formed from shale materials. It differs from Dandridge and Litz shaly silt loams, eroded steep phases, chiefly in having milder slopes. Most areas have lost a large part of the original surface soil through erosion; others have lost all of it and part of the subsoil. As erosion advances, however, the topmost part of the shale bedrock is incorporated into the soil. This shaly material soon breaks down and becomes an integral part of the soil, and estimates of the loss of soil material are therefore difficult. Bedrock outcrops are more common on the eroded areas, especially in those underlain by massive shale or calcareous sandstone. Shale fragments have accumulated on the surface and throughout the soil mass. Shallow gullies are common, especially in idle or abandoned areas. This complex is in the Dandridge-Hamblen-Whitesburg soil association.

Use and management.—All areas of this complex have been cleared and used for crops and pasture. Much of it is now in pasture, some is in crops, and a large part is idle or abandoned.

The soils of this complex are very poorly suited to crops and poorly suited to pasture. Shallowness, and the resultant very low water-supplying capacity, poor workability, and extremely high susceptibility to erosion are some of the limiting factors. Fair pastures can be established and maintained on most of the areas, but the soils vary greatly in productivity of pasture plants. Phosphate is required for high yields of grasses and legumes on the soils. Lime is generally not needed on the Dandridge soils, but is needed on the Litz. It is advisable to have the field tested before applying lime. Potash is apparently not needed, especially for pasture, on either of the soils. Subsoiling on the contour can be expected to decrease surface runoff and increase the water-holding capacity, but this practice is not generally feasible on the Litz soils because of the hard bedrock. These Fourth-class soils are in management group 15.

Dandridge and Litz shaly silt loams, eroded rolling phases (5 to 12 percent slopes) (Da).—This complex consists of well-drained soils formed from calcareous and acid shales. In some included areas the soil is from calcareous sandstone. These soils differ from Dandridge and Litz shaly silt loams, eroded steep phases, chiefly in occupying narrow winding ridge crests rather than steep ridge slopes. They also differ in being somewhat deeper over bedrock in most places and in having fewer bedrock outcrops. Shale fragments have accumulated on the surface because the finer material has been removed by erosion. In some places large shale fragments on the surface interfere materially with tillage. This complex of soils is inextensive and occurs in the Dandridge-Hamblen-Whitesburg soil association.

Use and management.—Most areas of this complex are cleared. Only a few are still in forest. At the time of the survey, the larger part was in mainly unimproved pasture, but a small part was in crops, and a considerable part was idle.

Because of their smoother slope, these soils are easier to work and conserve than the eroded hilly phases of Dandridge and Litz shaly silt loams. They cannot be considered suitable for crops, because they have a very low water-supplying capacity, and occur on narrow

winding ridge crests in a deeply dissected area. They will support good pasture, especially when properly fertilized. Pasture requires management similar to that on the eroded hilly phases. These Third-class soils are in management group 15.

Decatur silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Dk).—This is a dark reddish-brown well-drained soil of the limestone valleys. It has developed under a deciduous forest cover, largely from the residuum of high-grade limestone or high-grade dolomitic limestone. The soil is largely confined to the Dewey-Decatur-Fullerton soil association. It is closely associated with the Dewey, Fullerton, Farragut, and Emory soils and with stony miscellaneous land units.

Profile description:

0 to 8 inches, dark-brown friable silty clay loam with a moderate medium crumb structure.
8 to 16 inches, brown to reddish-brown friable silty clay loam; a weak fine to medium blocky structure.
16 to 60 inches, reddish-brown to dark-red firm to very firm (plastic when wet) silty clay with a strong medium to coarse blocky structure.
60 inches +, reddish-brown to yellowish-brown plastic silty clay splotched with yellow and gray in many places; the structure less distinct than that of the above layer; bedrock at depths of 7 to 20 feet in most places.

A considerable part of the original surface soil has been lost by erosion, and the present surface layer is highly variable in thickness and color. The thickness ranges from 0 to 10 inches and the color from brown to reddish-brown. In many small severely eroded spots all of the surface soil is missing and the red subsoil is exposed.

Boundaries between the Decatur soils and the associated Dewey soils are not always distinct. Therefore, small areas of the associated soils are included with this soil. Some of the soils included are lighter colored than the soil described, both in the surface soil and subsoil. A few small areas that occur on ridges in association with Fullerton soils are generally coarser textured and more friable than the soil described. Almost one-third of the total acreage of this eroded rolling phase is slightly sandy in texture. Some areas are a fine sandy loam.

The entire profile of this phase is medium to strongly acid. The quantity of organic matter appears to be moderate, and the content of plant nutrients is high. Although this soil is virtually stone-free, small rock outcrops and narrow ledges of limestone occur infrequently. This soil is sufficiently friable for moderately rapid penetration of plant roots and adequate movement of soil air and moisture. Moisture is readily absorbed and well retained, and the soil is not droughty. Runoff and internal drainage are medium. The water-supplying capacity is relatively high.

Use and management.—Most of this soil has been cleared of forest. An estimated 55 percent of the cleared land is in crops, 40 percent is in hay and pasture, and about 5 percent is idle.

This soil is well suited to the common crops of the county. It is one of the better soils for alfalfa. The loss of soil material by erosion has resulted in the loss of organic matter and plant nutrients, a lowering of the water-supplying capacity, and greater difficulty in maintaining good tilth. Despite these drawbacks, this is still one of the better soils of the county for crops. Excellent response can be expected from improved management practices, especially adequate

fertilization and proper rotations. Most crops need lime, phosphate, and nitrogen for high yields. Some crops show a good response to potash. Rotations usually can be moderately short. The soil is moderately susceptible to erosion. Mechanical means of erosion control, such as terraces, are not likely to be needed if tillage is on the contour, cover crops follow intertilled crops, and rotations include close-growing crops. This Second-class soil is in management group 7.

Decatur silty clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Do).—This is a reddish-brown well-drained soil of the limestone valleys. It was derived from materials that weathered from high-grade limestone or high-grade dolomitic limestone. It differs from Decatur silty clay loam, eroded rolling phase, chiefly in being more eroded. Practically all of the original surface soil and, in places, part of the subsoil have been lost. The plow layer consists of friable reddish-brown to brown silty clay loam or silty clay, plastic when wet. The subsoil is reddish-brown to dark-red plastic silty clay.

Shallow gullies, many of which cannot be obliterated by tillage, are common. This soil is widely distributed throughout the Dewey-Decatur-Fullerton soil association. It occurs chiefly with Dewey, Farragut, and other Decatur soils.

Use and management.—All of this soil has been cleared and cultivated. Although some have been abandoned, most areas are being used for crops or pasture.

The soil is fairly well suited to some tilled crops but is probably best used for pasture or semipermanent hay crops on most farms. Most of the organic matter and available plant nutrients have been lost as a result of erosion. Good tilth is difficult to maintain, and the soil can be tilled over a very narrow moisture range. The slow rate of moisture infiltration and the rolling relief encourage rapid runoff and further erosion. The low water-supplying capacity is probably one of the chief factors limiting crop yields. Some increased permeability may be obtained by adding organic matter, barnyard manure, or green-manure crops, and by growing deep-rooted legumes such as alfalfa or sericea lespedeza.

Lime and plant nutrients, especially phosphorus and nitrogen, are needed to obtain a vigorous growth of most crops. Potash is generally deficient for some crops, especially the deep-rooted legumes. A long rotation consisting chiefly of grasses and other close-growing crops is desirable. To help control erosion, tillage should be kept at a minimum. All row crops should be on the contour where feasible, and contour stripcropping may be advisable on the long slopes. Terraces may be effective if properly laid out and constructed, but they are generally not advisable because the slopes are irregular and suitable outlets are lacking. This Third-class soil is in management group 10.

Decatur silty clay loam, eroded undulating phase (2 to 5 percent slopes) (Dm).—This dark reddish-brown soil of the uplands has developed from materials weathered from high-grade limestone or high-grade dolomitic limestone. It differs from Decatur silty clay loam, eroded rolling phase, chiefly in having a milder slope.

The surface soil is dark-brown to reddish-brown friable silty clay loam. The subsoil is reddish-brown to dark-red friable to very firm silty clay, plastic when wet. The surface soil of a considerable acreage contains some sand but is not sandy enough to affect materially the workability of the soil. This soil is mainly on low ridgetops in the Dewey-Decatur-Fullerton soil association area. It is associated chiefly with Dewey, Farragut, and other Decatur soils and with the stony land units.

Use and management.—All of this soil has been cleared and most of it is being used for crops or pasture. It is well suited to practically all the common crops of the area. It has use and management requirements similar to those of the eroded rolling phase, but it can be used more intensively for row crops. The rotation can be shorter and can include more intertilled crops. Special measures for runoff control should not be necessary, although contour tillage is advisable where feasible. Fertilization needs are similar to those of the eroded rolling phase, but a better response can be expected on this soil because of its slightly higher water-supplying capacity. This First-class soil is in management group 4.

Decatur silty clay loam, eroded hilly phase (12 to 25 percent slopes) (Dj).—This soil has steeper slopes than Decatur silty clay loam, eroded rolling phase, and is also generally more eroded. In most places some of the subsoil has been mixed with the remainder of the original surface soil. The resulting surface layer is a reddish-brown moderately friable silty clay loam. The subsoil is a dark-red plastic silty clay. The soil has formed from the residuum of high-grade limestone. A large part of it is on moderately high ridges and is slightly sandy and more friable than the profile described. This phase is largely confined to the Dewey-Decatur-Fullerton soil association. It is closely associated with Dewey, Fullerton, Farragut, Emory, and Lindside soils and with the stony land units.

Use and management.—Practically all of this soil has been cleared for a number of years and is used for crops and pasture. Only a small part is lying idle. Normally the yields are lower than on the eroded rolling phase. Although a variety of crops are grown, they are not systematically rotated or commonly fertilized.

Chiefly because of its stronger slopes, this soil is not so well suited to crops as the eroded rolling phase. Management is considerably more exacting. Longer rotations and less frequent growth of row crops are required. In many areas it would be preferable to avoid row crops altogether. Tillage on the contour is desirable, but it may be impractical in certain fields.

The soil should not be left bare for long periods, and a cover crop should follow all intertilled crops. Contour stripcropping is beneficial where the slopes are suitable. Growing grasses and legumes and turning under green manures, especially leguminous green manures, can be expected to increase the supply of organic matter and available nitrogen and to improve the tilth of this soil. Fertilizer requirements presumably are similar to those for similar crops on the other Decatur soils. This Third-class soil is in management group 11.

Decatur silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Dn).—This soil differs from Decatur silty clay loam, eroded hilly phase, chiefly in being more eroded. Most of the original

surface soil and, in places, part of the subsoil have been lost. Shallow gullies are common. The present surface layer, consisting largely of subsoil material, is reddish-brown moderately friable silty clay loam. In a few places, remnants of the original surface soil remain. The subsoil is dark-red plastic silty clay. As a result of greater erosion, this soil is lower in organic matter, plant nutrients, and water-holding capacity than the eroded hilly phase. It is widely distributed in small areas throughout the Dewey-Decatur-Fullerton soil association.

Use and management.—All of this soil has been cleared of forest for a number of years. It has been used for crops and pasture but a large part is now lying idle. Crop and pasture yields are low under prevailing management.

Chiefly because of erosion, this soil is less suitable for farming than the eroded hilly phase. Good tilth is difficult to maintain. If cultivated when wet, the soil puddles readily; after heavy rains it tends to form a rather hard crust on drying. This crust hinders the growth of seeds. Tillage is impeded by the hilly slopes and the heavy plow layer. As the soil absorbs water rather slowly, runoff tends to be great. Plants on this soil are easily injured by drought.

In its present condition this soil is poorly suited to crops requiring tillage. It is better suited to permanent or semipermanent hay crops. Lime and phosphate are essential for the establishment and maintenance of good pastures. Grasses and legumes, especially deep-rooted legumes such as alfalfa and sweetclover, are highly desirable. These legumes improve the physical condition of the soil. By growing such plants for a number of years, it seems probable that the decreased productivity resulting from severe erosion might be largely overcome. This Fourth-class soil is in management group 12.

Decatur silty clay loam, eroded steep phase (25 to 60 percent slopes) (DI).—This soil has steeper slopes than the eroded hilly phase. Like that soil, it has developed from the residuum of high-grade limestone and has lost a considerable part of the surface soil as a result of erosion. The present surface layer is brown to reddish-brown moderately friable silty clay loam. The subsoil is reddish-brown to dark-red friable to firm silty clay, plastic when wet. The depth to bedrock is less than for the less steep Decatur soils, or from about 3 to 12 feet. This soil is closely associated with Dewey, Farragut, Fullerton, and other Decatur soils. Most of it is in the Dewey-Decatur-Fullerton soil association.

Use and management.—Most of this soil is in hay or pasture, but about 20 to 30 percent is idle, and 5 percent is in cutover forest.

Ordinarily this soil is too steep and too erodible for growing field crops over an extended period. It is better suited to permanent pastures. Excellent pastures can be produced and maintained if lime and phosphate are applied. Grazing will need to be carefully controlled, however, in order to maintain a good sod. This Fourth-class soil is in management group 19.

Dewey silt loam, rolling phase (5 to 12 percent slopes) (Dp). This is a well-drained soil of the uplands. It has developed from high-grade dolomitic limestone in the broader smoother limestone valleys and on the lower slopes of the cherty hills.

This soil has a lighter brown surface soil and a lighter red subsoil, generally contains more chert fragments, and is more friable than the

Decatur soils. It has developed under a deciduous forest consisting chiefly of oak, hickory, maple, and chestnut. Most of it is in the Dewey-Decatur-Fullerton soil association. It is closely associated with Decatur, Fullerton, Farragut, Lindside, Emory, and other Dewey soils.

Profile description:

0 to 12 inches, grayish-brown to light-brown friable silt loam; the upper 2 inches stained dark grayish brown with organic matter in most wooded areas.
12 to 48 inches, red or light-red friable to firm (plastic when wet) silty clay with a moderate medium blocky structure.
48 inches, yellowish-red or yellowish-brown friable to firm (plastic when wet) silty clay splotched with brown, yellow, red, and gray; bedrock at depths of 10 to 20 feet in most places.

The soil is medium to strongly acid and relatively well supplied with organic matter and plant nutrients. Although relatively stone free, some angular chert is on the surface and throughout the profile in many places. Small rocks and narrow ledges of limestone outcrop infrequently. The soil is permeable to roots, water, and air, but roots penetrate more slowly than in the Emory soils. Runoff and internal drainage are medium. The water-supplying capacity is relatively high.

Use and management.—All of this soil is in cutover deciduous forest consisting chiefly of oak and hickory. It is physically well suited to practically all the common crops, including alfalfa, but most of the areas are so small and so located that it is not feasible to clear and cultivate them. If areas of this soil were cleared, the use and management requirements would be similar to those of Dewey silty clay loam, eroded rolling phase. This First-class soil is in management group 7.

Dewey silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Dr).—This, a well-drained soil of the uplands, has developed from materials weathered from high-grade dolomitic limestone. It differs from Dewey silt loam, rolling phase, chiefly in being eroded. A considerable part of the original surface soil, including the thin surface layer of higher organic-matter content, has been lost as a result of erosion. The present surface layer consists of remnants of the original surface layer mixed with the upper part of the subsoil. This mixed layer varies from grayish brown to light brown or brownish red in color and from silt loam to silty clay loam in texture. The subsoil is red or light-red friable to firm silty clay. Small severely eroded spots are common. They are conspicuous because the subsoil is exposed.

This soil is widely distributed throughout the Dewey-Decatur-Fullerton soil association. It is closely associated with Decatur, Dunmore, Fullerton, and Farragut soils of the uplands and with Emory and Lindside soils of the colluvial lands and bottom lands.

Use and management.—All of this soil is cleared and most of it is used for crops and pasture. Very little is idle.

The soil is very desirable for crops or pasture. It is well suited to all the common crops, including deep-rooted legumes such as alfalfa. It is moderately susceptible to erosion, but under good management erosion is not a major problem. Good tilth is fairly easy to maintain, but the moisture range for safe tillage is narrower than for coarser textured soils such as the Sequatchie.

Crops will need to be rotated but the rotations can be of moderate length. Lime, phosphate, and nitrogen will be needed for continued high yields of most crops. And some crops, such as alfalfa, show a good response to potash fertilizer. Legumes, preferably deep-rooted, are needed in the rotation to help supply nitrogen. In most areas legumes require applications of lime, phosphate, and possibly potash for successful growth.

A well-selected rotation of crops, adequately fertilized, will largely eliminate soil loss through erosion. Nevertheless, all tillage should be as nearly on the contour as feasible. If more intensive use of the land is necessary, contour stripcropping should be considered, especially for the longer slopes. Terraces, properly laid out and constructed, may be effective on some fields. The irregular slopes and lack of suitable outlets prevent use of terraces in most places. This Second-class soil is in management group 7.

Dewey silty clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Du).—This soil differs from Dewey silt loam, rolling phase, chiefly in having lost through erosion practically all the original surface soil and, in places, part of the subsoil. The plow layer is predominantly reddish-brown to red moderately friable silty clay loam. The subsoil is red or light-red friable to firm silty clay. Gullies that are crossable but not obliterated by ordinary tillage occur in most areas. The soil has developed from materials weathered from high-grade dolomitic limestone. It is widely distributed throughout the Dewey-Decatur-Fullerton soil association area.

Use and management.—All of the soil has been cleared and used for crops and pasture. Much of it is now idle or in unimproved pasture. Some areas are used for crops but they are generally a part of a less eroded field. Both crop and pasture yields are rather low.

This soil has been seriously injured by erosion. It is probably better suited to close-growing crops or pasture than to intertilled crops. Much of the organic matter and available plant nutrients have been lost, and the water-supplying capacity is considerably lower than in the uneroded soil. The soil is highly susceptible to further erosion because it is slowly permeable and has moderately strong slopes.

A long rotation that includes as many close-growing crops as feasible is desirable. Crops that mature in spring or early summer generally produce better than those that mature in the dry hot seasons. Lime and phosphate and possibly potash are essential for success with the deep-rooted legume crops. Phosphate is needed for continued satisfactory yields of most crops, and nitrogen for all except the inoculated legume crops and crops immediately following.

Tillage of the soil should be kept to a minimum and should be on the contour. Contour stripcropping may be desirable on some slopes if row crops must be grown. Properly constructed terraces may aid in controlling runoff, but the irregular slopes, lack of suitable outlets, and maintenance difficulties discourage their use on most farms. This Third-class soil is in management group 10.

Dewey silty clay loam, eroded undulating phase (2 to 5 percent slopes) (Ds).—This is a well-drained soil of the limestone valleys. It has formed from materials weathered from high-grade dolomitic limestone. It has milder slopes than Dewey silty clay loam, eroded

849399—56——4

rolling phase, and is generally slightly less eroded. The present surface layer varies from grayish brown to light brown or brownish red in color, and from silt loam to silty clay loam in texture. The subsoil is red or light-red friable to firm silty clay. The soil is mainly on the crests of low ridges in the limestone valleys. It is largely confined to the Dewey-Decatur-Fullerton soil association area.

Use and management.—Practically all of this soil is cleared and is being used for crops or pasture. Very little of it is ever idle. Crop yields probably average slightly higher than on the eroded rolling phase, chiefly because this soil has a slightly higher water-supplying capacity.

This soil is well suited to practically all of the common field crops of the area, including alfalfa. It is more desirable for crops than the eroded rolling phase, chiefly because it has milder slopes. Since it is less susceptible to erosion and has a higher water-supplying capacity, management requirements are less exacting. The crop rotation can be shorter and can include more row crops. Fertilizer requirements are similar, but a somewhat better response can be expected. Special engineering measures for erosion control should not be necessary, although tillage on the contour is advisable in most places. This First-class soil is in management group 4.

Dewey silty clay loam, eroded hilly phase (12 to 25 percent slopes) (Dq).—This is a well-drained soil of the hilly uplands. It differs from Dewey silty clay loam, eroded rolling phase, chiefly in having steeper slopes. A considerable part of the original surface has been lost by erosion. The present surface layer is a grayish-brown or light-brown to brownish-red silty clay loam. The subsoil is red or light-red friable to firm silty clay. Small severely eroded spots are common and conspicuous because of exposure of the subsoil. A few uneroded areas are included that have surface layers that are thicker and higher in organic matter than usual for this phase. This soil is widely distributed in the Dewey-Decatur-Fullerton soil association area.

Use and management.—Most of this soil has been cleared and cultivated. The larger part is still used for crops, but a considerable acreage is in permanent pasture. A small part is idle or abandoned.

This soil is fairly productive of close-growing crops but is probably better suited to pasture. The moderately strong slopes make it somewhat difficult to work and highly susceptible to erosion, especially when bare of vegetation or in intertilled crops. The soil should be in close-growing crops or pasture as much of the time as possible, although it can be conserved in a long rotation if other management practices are good. Tillage should be on the contour, and contour stripcropping is desirable if row crops are to be grown. Phosphorus, nitrogen, and lime are the chief mineral requirements for crops and pasture. Potash may benefit some crops, especially the deep-rooted legumes. This Third-class soil is in management group 11.

Dewey silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Dt).—This is a well-drained soil of the uplands underlain by high-grade dolomitic limestone. It differs from Dewey silty clay loam, severely eroded rolling phase, chiefly in having steeper slopes. Like that soil, most of the original surface soil and, in places, a part of the subsoil have been lost as a result of erosion. Shallow gullies are common in some areas.

The present surface layer is reddish-brown to red moderately friable silty clay loam. The subsoil is red or light-red friable to firm silty clay. This soil is distributed throughout the Dewey-Decatur-Fullerton soil association area.

Use and management.—All of this soil has been cleared and cultivated. A large part of it has now been abandoned or is in unimproved pastures. A small acreage is used for crops, but yields are very low under the common management practices.

The soil is not suitable for crops requiring tillage because it is difficult to work and conserve and has low productivity. A fair permanent pasture can be established and maintained under good management (pl. 3, *B*); however, a minimum amount of tillage is desirable. Lime and phosphate are generally required in establishing a pasture. Potassium is generally not necessary, and the nitrogen needed can be supplied by legumes in the pasture mixture. The use of barnyard manure is very helpful in establishing stands on galled spots. The addition of barnyard manure or the turning under of green manures improves tilth and increases the water-absorption rate and the water-supplying capacity. This Fourth-class soil is in management group 12.

Dunmore silt loam, rolling phase (5 to 12 percent slopes) (Dw).—This is a well-drained soil of the limestone valleys. It has developed from residual materials of dolomitic limestone. This soil differs from the Dewey soils by having a lighter colored surface layer and a more yellowish less friable subsoil. It is also shallower over bedrock. It differs from the Fullerton soils in being much shallower over bedrock and in having a more plastic less permeable subsoil. This soil has developed under a deciduous forest vegetation consisting of oak and hickory and is largely confined to rolling ridge crests or mild slopes.

Profile description:

0 to 10 inches, grayish-brown to brownish-gray friable silt loam; in wooded areas the upper 1 to 2 inches stained dark with organic matter.

10 to 38 inches, yellowish-brown to yellowish-red friable to firm (plastic when wet) silty clay to clay; some yellow splotches in lower part; strong medium blocky structure.

38 inches +, reddish-yellow to brownish-yellow friable (plastic when wet) silty clay or clay, splotched with yellow, gray, and brown; bedrock at 3 to 10 feet.

This soil is medium to strongly acid and is apparently well supplied with organic matter and plant nutrients. It is relatively stone free, although bedrock outcrops in places. Because of the dense subsoil, moisture absorption is rather slow and runoff is medium. The soil is moderately high in water-supplying capacity.

Use and management.—Practically all of this soil is in cutover forests consisting chiefly of oak and hickory. It is well suited to crops and pasture, but most of the acreage is in small areas isolated from other cleared fields. If the soil is cleared, the use and management will be similar to that of Dunmore silty clay loam, eroded rolling phase. This Second-class soil is in management group 7.

Dunmore silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Dy).—This is a well-drained soil of the limestone valleys. It has developed from residual materials of dolomitic limestone. The native vegetation was deciduous forest. A part of the acreage is in the Stony land-Dunmore-Lindside soil association. This soil is closely

associated with Fullerton, Emory, Lindside, and Dewey soils and the stony land units.

Profile description:

0 to 8 inches, grayish-brown to light yellowish-brown friable or moderately friable silty clay loam with a weak medium crumb structure.
8 to 12 inches, yellowish-brown friable silty clay loam with a weak medium blocky structure.
12 to 36 inches, yellowish-brown to yellowish-red firm (plastic when wet) silty clay; well-defined medium blocky structure.
36 inches +, reddish-yellow to brownish-yellow friable (plastic when wet) silty clay splotched with gray and brown; contains small shale fragments in places; bedrock at depths of 3 to 10 feet or more.

A considerable part of the original surface layer has been removed by erosion. As a result the present surface layer varies greatly in color and thickness. Its color ranges from grayish brown to yellowish red, and its thickness from 4 to 8 inches. In a few severely eroded spots, all the original surface layer is gone and the reddish subsoil is exposed.

Some soils formed from a clayey limestone are included with this soil as mapped. These inclusions are shallower, heavier, and less permeable than the soil described. Also included in mapping are small areas of soil on 2 to 5 percent slopes.

This eroded rolling phase is medium to strongly acid and apparently has a moderate amount of organic matter except in the more severely eroded areas. It is relatively high in plant nutrients. It is virtually stone free, although bedrock outcrops occur in a few places. Because of the dense subsoil, moisture absorption is rather slow and runoff is medium. The soil has a moderate water-supplying capacity.

Use and management.—Most of this soil has been cleared and used for crops or pasture. About 40 percent is in crops, 35 percent in hay (including lespedeza and alfalfa), 15 percent in pasture, and 10 percent idle. Systematic rotation of crops is not a common practice, but some farmers use a 4-year rotation of corn, small grains, and hay and pasture.

This soil is well suited to most of the common field crops and pasture. It is handicapped for crop production, however, by the slow permeability of the subsoil. This subsoil inhibits absorption and percolation of water and causes alternate wet and dry extremes in the surface soil. Restricted absorption of water naturally increases runoff and the erodibility of this soil.

This phase differs from Dewey silty clay loam, eroded rolling phase, in use suitability, management requirements, and productivity mainly because of its greater susceptibility to erosion and less favorable moisture conditions. The rotation should therefore be longer and should include close-growing crops, especially grasses and legumes, a greater part of the time. Where feasible, deep-rooted crops such as alfalfa and sweetclover should be grown periodically in order to improve the permeability of the subsoil. Tillage should be on the contour where possible. Engineering measures, such as terracing, may help to control runoff and erosion. In view of the unfavorable consistence of the subsoil, the practicability of terracing is doubtful. The soil is deficient in lime, phosphate, and nitrogen for most crops. It may be slightly deficient in potash in places. This Second-class soil is in management group 7.

Dunmore silty clay loam, severely eroded rolling phase (5 to 12 percent slopes) (D3).—This soil differs from Dunmore silty clay loam, eroded rolling phase, chiefly in being more eroded. Most of the original surface soil and, in most places, part of the subsoil have been lost through erosion. The present surface layer ranges from yellowish red to brownish gray in color and from silty clay loam to heavy silt loam in texture. The subsoil is a yellowish-brown to yellowish-red friable to firm silty clay or clay. Gullies from 1 to 3 feet deep are rather common, but the intergully areas may still have a part of the original surface soil. The soil has developed under deciduous forest from materials weathered from dolomitic limestone. It is largely confined to the Stony land-Dunmore-Lindside soil association.

Use and management.—All of this soil has been cleared and used for crops and pasture. Although much of it is now lying idle, the larger part is used for pasture and crops.

This soil is inferior to the eroded rolling phase for crops or pasture. It has a lower content of organic matter and available plant nutrients, a lower water-supplying capacity, and greater susceptibility to erosion. It is suitable for crops if they are grown in a long rotation but on most farms it probably is best used for semipermanent hay crops or pasture.

Lime and phosphate are needed for the establishment and maintenance of good pastures. Barnyard manure is very helpful in establishing a stand on galled spots. Good stands of alfalfa can be established on areas that have received lime, phosphate, and potash, but manure is generally needed on the galled spots. Row crops should be grown in a long rotation with grasses and legumes (preferably deep-rooted). It is very important that cover crops follow all intertilled crops. Leguminous green-manure crops turned under greatly increase the absorption rate and the water-holding capacity and add much needed nitrogen. Tillage should all be on the contour. Terracing may help control of erosion, but its value is questionable because of the unfavorable consistence of the subsoil. This Third-class soil is in management group 10.

Dunmore silt loam, hilly phase (12 to 25 percent slopes) (Dv).—This well-drained soil of the limestone valleys occurs under deciduous forest. It was derived from the residuum of dolomitic limestone. The soil is widely distributed throughout the Stony land-Dunmore-Lindside soil association area. It is closely associated with Fullerton, Dewey, Emory, Lindside, and other Dunmore soils.

Profile description:

0 to 8 inches, grayish-brown to brownish-gray friable silt loam; has a thin surface layer stained dark with organic matter.
8 to 12 inches, yellowish-brown friable silty clay loam.
12 to 34 inches, yellowish-brown to yellowish-red firm (plastic when wet) silty clay; strong medium blocky structure.
34 inches +, reddish-yellow to brownish-yellow friable (plastic when wet) silty clay or clay; layer contains small shale fragments in places; bedrock at depths of 3 to 10 feet or more.

This soil, as mapped, includes a few small steep areas that have slopes of 25 to 60 percent. Some soils derived from the residuum of clayey limestone are also included. These soils are shallower, heavier, and less permeable than the soil described.

This phase is medium to strongly acid. It is relatively high in organic matter, especially in the surface layer, and moderately high in plant nutrients. It is virtually stone-free, although small outcrops of bedrock occur in places. Because of the dense subsoil, moisture absorption is somewhat slow. The soil is sufficiently permeable for normal root distribution and for adequate air and moisture circulation.

Use and management.—All of this soil is now forested. It is fairly well suited to crops and well suited to pasture. However, it is not practical to clear many of the areas because they are too far from other tillable land. Cleared areas would require the same use and management as Dunmore silty clay loam, eroded hilly phase. This Third-class soil is in management group 11.

Dunmore silty clay loam, eroded hilly phase (12 to 25 percent slopes) (Dx).—This soil differs from Dunmore silt loam, hilly phase, chiefly in being eroded. A considerable part of the original surface soil has been lost, and in a few severely eroded spots the subsoil is exposed. The present surface layer consists of a mixture of the subsoil and remnants of the original surface soil. This mixed layer is heavier in texture and lower in organic matter and plant nutrients than the surface layer of the uneroded hilly phase. It ranges in color from grayish brown to yellowish red and in thickness from 2 to 10 inches. The subsoil, like that of the other Dunmore soils, is friable to firm (plastic when wet) yellowish-brown to yellowish-red silty clay. This soil occurs on relatively short ridge slopes.

Use and management.—Practically all of this soil has been cleared for many years. About 30 percent is in crops, 30 percent in hay, 20 percent in pasture, and 20 percent in land left idle. Although a variety of crops are grown, they are not systematically rotated on many farms. Some fertilization is practiced, but applications are light.

The soil is moderately well suited to crops under a high level of management. It is moderately fertile, although somewhat deficient in lime, nitrogen, and phosphate for many crops. The supply of organic matter is low, and good tilth is difficult to maintain. The range of moisture conditions over which the soil can be tilled without injury is narrow. Moisture absorption is relatively slow, runoff is rapid, and a limited amount of moisture is retained for the growing plant. Owing to the rapid runoff, the susceptibility to erosion is great.

Crop rotations will need to be long and consist chiefly of close-growing crops, preferably grasses and legumes. All tillage should be on the contour if at all feasible, and on the longer slopes strip-cropping may be desirable. On many farms this soil is probably best used for pasture or semipermanent hay crops. Good pastures can be established and maintained rather easily if enough lime and phosphate are used. This Third-class soil is in management group 11.

Dunmore silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (D2).—In slope this soil is similar to the eroded hilly phase of Dunmore silty clay loam. In degree of erosion it is much like the severely eroded rolling phase. Most of the original surface layer has been lost. The present surface layer consists largely of the yellowish-brown to yellowish-red subsoil material. Gullies from 1 to 3 feet deep are rather common. The intergully areas may still retain a considerable part of the original surface soil.

Use and management.—All of this soil has been cleared and used for crops and pasture, but most of it is now lying idle. Some, however, is in pasture, and a small acreage is in crops. Yields of crops are generally very low, and failure to obtain a stand is rather common.

This soil has been severely injured by erosion. In its present condition, it is better suited to pasture or semipermanent hay than to crops that require tillage. Lime and phosphate are essential for the establishment and maintenance of good pastures.

When it is necessary to grow crops, hay crops should be selected. Satisfactory stands of alfalfa are sometimes difficult to obtain because of unfavorable tilth. Good stands of alfalfa have been obtained where lime, phosphate, and manure have been applied. By growing grasses and deep-rooted legumes for a number of years, the decreased productivity resulting from severe erosion would be overcome to a large extent. Then the soil possibly could be used in a long rotation. This Fourth-class soil is in management group 12.

Dunmore silty clay loam, eroded steep phase (25 to 60 percent slopes) (Dz).—This is a steep well-drained soil of the limestone valleys. It has formed from the residuum of dolomitic limestone. It differs from Dunmore silty clay loam, eroded hilly phase, chiefly in having steeper slopes. The present surface soil is somewhat heavier, lower in organic matter and plant nutrients, and considerably more variable in color and thickness than the surface soil of the uneroded phases. It is grayish brown to yellowish red and 2 to 10 inches thick. The subsoil is yellowish-brown to yellowish-red friable to firm (plastic when wet) silty clay or clay. Shallow gullies are common in some areas. This soil is closely associated with Dewey, Fullerton, Emory, Lindside, and other Dunmore soils.

Use and management.—All areas of this soil have been cleared and used for crops and pasture. Most of the soil is used for pasture or hay, but some is used for tilled crops and some is idle.

Owing to the steep slopes, loss of organic matter and plant nutrients through cropping and erosion, and extreme susceptibility to erosion, the soil is not suited to crops and only moderately well suited to pasture. Good pasture can be established and maintained under a high level of management. Such management includes the use of lime and phosphate and careful control of grazing. This Fourth-class soil is in management group 19.

Emory silt loam, undulating phase (2 to 7 percent slopes) (Eb).—This is a brown well-drained soil of the colluvial lands. It has formed from materials accumulated at the bases of slopes occupied by Dunmore, Decatur, Dewey, and associated soils. It occurs in relatively narrow and elongated areas fairly well distributed throughout the area underlain by relatively high-grade limestone. It is associated with the Dewey, Decatur, Dunmore, and Lindside soils.

Profile description:

0 to 20 inches, brown to light-brown friable silt loam.
20 to 40 inches, reddish-brown to yellowish-brown friable silt loam to silty clay loam; a few yellow splotches are generally present in the lower part.
40 to 60 inches, yellowish-brown moderately plastic silty clay loam to silty clay; the accumulation is always at least 18 inches thick and usually more than 3 feet.

The soil varies somewhat from place to place, largely according to the kind of soil from which its parent material has washed. The

color in most places is similar to that of the soil from which the parent material came.

As mapped, this soil includes a few areas of soils formed from accumulations in shallow well-drained sinks and in narrow bottomlike areas along intermittent drainageways.

The soil is medium acid, apparently well supplied with organic matter, and high in content of plant nutrients. It is easily permeable to plant roots, air, and moisture. Water is readily absorbed, and the water-supplying capacity is very high. Both runoff and internal drainage are medium. The soil is relatively stone-free. Tilth is naturally good and easy to maintain.

Use and management.—All of this soil has been cleared and cultivated. Most of it is now used for the common field crops of the area. About 65 percent is in crops, 30 percent in hay and pasture, and 5 percent in land left idle. Fertilizers are commonly used only on tobacco and vegetables. Although a wide variety of crops are grown, they are not systematically rotated on many farms.

This soil is well suited to intensive use for all the common crops of the county (pl. 4). The productivity, workability, and conservability are all favorable, and management requirements are simple. Ordinarily, good yields of many crops can be obtained without using rotations or fertilization, but increased yields can be expected if both are practiced. The rotation can be short; for example, a corn-legume hay rotation is well suited.

Lime and phosphate are somewhat deficient for maximum yields of many crops. Nitrogen and potash are less likely to be deficient. Needs for these fertilizers will depend largely on the cropping system followed. In general, protection against erosion or flooding is not necessary. In some places it may be necessary to prevent excessive washing of material from the slopes above. A light deposit of washed-in material ordinarily benefits the soil. This First-class soil is in management group 2.

Emory silt loam, rolling phase (7 to 15 percent slopes) (Ea).—This is a brown well-drained soil of the colluvial lands. It has formed from materials accumulated at the base of slopes occupied by Dunmore, Decatur, Dewey, and associated soils. It has somewhat steeper slopes than Emory silt loam, undulating phase. Consequently, the depth of the accumulation is less and the comparable soil layers are thinner. Furthermore, it has slightly less organic matter, greater susceptibility to erosion, a slightly heavier texture in the surface layer, and a smaller supply of plant nutrients than the undulating phase. This soil is in relatively small areas widely distributed throughout the area underlain by high-grade limestone, although most of the acreage is in the Dewey-Decatur-Fullerton soil association. It is closely associated with Dunmore, Decatur, Dewey, Lindside, and other Emory soils.

Use and management.—All of this soil has been cleared and cultivated. At present it is used for field crops. Many areas are so small that they do not receive individual attention, but are tilled with the associated soils. About 60 percent of the land is in crops, 30 percent is in hay and pasture, and 10 percent is idle. The prevailing practices of tillage, rotation, and fertilization are similar to those of the undulating phase.

This soil is well suited to crops that require tillage and can be more intensively used than the associated Dewey, Decatur, and Dunmore soils on similar slopes. The problems of controlling runoff and erosion and conserving the fertility are greater than on the undulating phase. Longer rotations and a greater proportion of such close-growing crops as small grains and legumes should be favored. Also, for comparable yields, more liberal fertilization is generally required. This Second-class soil is in management group 2.

Farragut silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Fa).—This well-drained soil of the uplands has developed from materials weathered from high-grade limestone that contains thin lenses of shale or from interbedded shale and limestone that has a high percentage of limestone. It has developed under a forest cover consisting chiefly of oak and hickory. The soil is largely confined to the Armuchee-Litz-Farragut soil association, although some areas are in the Dewey-Decatur-Fullerton. It is closely associated with Armuchee, Litz, Sequoia, Dewey, and Decatur soils of the uplands, and with Emory and Lindside soils of colluvial and bottom lands.

Profile description:

0 to 8 inches, light-brown or brown friable silty clay loam.
8 to 36 inches, reddish-brown to light-red friable to firm (plastic when wet) silty clay that has a moderate fine to strong coarse blocky structure.
36 inches +, yellowish-red to reddish-yellow very plastic clay splotched with yellow; bedrock is at depths of 5 to 15 feet in most places.

The surface layer varies greatly in color and texture because of moderate erosion. In some places the plow layer consists almost entirely of the original brown silt loam surface layer; in others this layer is missing and the plow layer is in the subsoil. The small severely eroded spots are conspicuous because of exposure of the subsoil.

This soil is medium to strongly acid in reaction and moderate in content of plant nutrients. The content of organic matter is apparently moderately low. Both runoff and internal drainage are medium. The soil is fairly permeable to air and water but plant roots penetrate the subsoil rather slowly. The water-supplying capacity is only moderate. There are a few bedrock outcrops, but they do not interfere appreciably with tillage. Shale fragments occur in the lower part of the subsoil and become more common at greater depths.

Use and management.—All of this soil has been cleared and most of it is being used for crops and pasture. A part of the acreage is idle or used for nonfarm purposes. The soil is well suited to the common field crops of the county; and if properly fertilized, is well suited to alfalfa. Erosion has made it less suitable for crops by removing much organic matter and available plant nutrients, lowering the water-supplying capacity, and increasing the difficulty of maintaining good tilth.

The soil is responsive to good management that includes proper rotation of crops and adequate fertilization. A rotation of moderate length that includes a legume, preferably deep-rooted, is desirable. The soil needs lime, phosphate, and nitrogen to produce high yields of most crops. Such crops as alfalfa respond well to applications of potash. The legume in the rotation, especially if turned under, generally adds enough nitrogen for all crops in the rotation.

The soil is susceptible to erosion. Special engineering devices such as terraces are not likely to be needed, however, if all tillage is on the contour, cover crops follow all intertilled crops, and a rotation is used that includes a large proportion of close-growing crops. The growing of deep-rooted legume crops improves the permeability of the soil and increases rate of absorption and thus aids runoff and erosion control. This Second-class soil is in management group 7.

Farragut silty clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Fd).—This is a well-drained soil of the uplands underlain chiefly by high-grade limestone that contains thin lenses of shale. It differs from Farragut silty clay loam, eroded rolling phase, chiefly in being more severly eroded. Most of the original surface soil and, in places, part of the subsoil have been lost. Gullies 1 to 3 feet deep are common. The present surface layer is a brown to reddish-brown moderately friable silty clay loam, and the subsoil is reddish-brown to light-red friable to firm (plastic when wet) silty clay. In the less eroded spots the surface layer is browner and has a silt loam texture. This soil is largely confined to the Armuchee-Litz-Farragut soil association area.

Use and management.—All of this soil has been cleared and cultivated. Some areas are idle or abandoned but most of the acreage is in crops or pasture. Chiefly because of the greater erosion, this soil is inferior to the eroded rolling phase for crop production. The fertility level is lower and the water-supplying capacity is considerably less. The tilth is especially unfavorable. The soil is susceptible to puddling and clodding and can be safely tilled only within a narrow range of moisture content. The rate of water infiltration is slow and runoff is rapid. Erosion control is a serious problem if the soil is used for row crops. Contour tillage should be practiced, and on the longer slopes contour stripcropping may be desirable. Cover crops should follow all intertilled crops.

In its present condition the soil is better suited to pasture or semipermanent hay crops than to intertilled crops. After an extended period in hay or pasture, it would very likely become more suitable for cultivated crops. Alfalfa grows fairly well on this soil but is difficult to establish. This is true to some extent for red clover and grasses. Lime and phosphate are especially necessary where alfalfa or red clover is to be grown. Lespedeza (including sericea lespedeza), orchardgrass, and redtop are easier to establish and can be grown with less lime and phosphate, although they respond very well to fertilization. The growing of deep-rooted plants, such as alfalfa and sericea lespedeza, and fibrous-rooted plants, such as grasses, should be especially beneficial because they have a favorable effect on the physical condition of the soil. If row crops must be grown, they should be in a long rotation that consists largely of close-growing crops. This Third-class soil is in management group 10.

Farragut silty clay loam, eroded undulating phase (2 to 5 percent slopes) (Fb).—This is a well-drained soil of the uplands underlain by high-grade limestone that contains thin layers of shale. It differs from Farragut silty clay loam, eroded rolling phase, chiefly in having a milder slope. Like that soil, it is moderately eroded and the present surface layer consists of remnants of the original surface layer mixed with the upper part of the subsoil. The present surface layer ranges

from brown to reddish brown in color and from silt loam to silty clay loam in texture. The subsoil is a reddish-brown to light-red friable to firm (plastic when wet) silty clay. Small severely eroded spots are common and conspicuous because of the exposure of the subsoil. This soil is chiefly on low ridge crests in the Armuchee-Litz-Farragut soil association area.

Use and management.—Practically all of this soil is cleared and used for crops and pasture. Only a small part is idle or in nonfarm uses.

The soil is well suited to most of the common crops and to pasture. In use and management it is similar to the eroded rolling phase, but it is more desirable for crops because it has milder slopes. It is less susceptible to erosion and the water-supplying capacity is somewhat higher. Crop rotations can be longer and engineering devices for erosion control are not so likely to be needed, although contour tillage is desirable. Fertilization requirements are similar to those for the eroded rolling phase, but the response should be somewhat greater. This First-class soil is in management group 4.

Farragut silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Fc).—This is a severely eroded soil of the hilly uplands underlain by high-grade limestone that contains thin layers of shale. It differs from Farragut silty clay loam, severely eroded rolling phase, chiefly in having a steeper slope. Most of the original surface soil and, in places, a part of the subsoil have been lost by erosion. Gullies 1 to 3 feet deep are common. The present surface layer is brown to reddish-brown moderately friable silty clay loam. The subsoil is reddish-brown to light-red friable to firm (plastic when wet) silty clay. This soil is confined to short moderately steep slopes chiefly in the Armuchee Litz-Farragut soil association area. About 25 acres that differs in being only moderately eroded or uneroded is included.

Use and management.—Crops are grown on only a small part of this soil. Some of it is used for pasture but much of it is idle and covered by brush and weeds. The severe erosion injury and the extreme susceptibility to further erosion make this soil poorly suited to crops. Pastures can be obtained, but at considerable expense and risk of failure. Lime and phosphate obviously will be required, and some of the gullies may have to be leveled. Because of the unfavorable tilth, the establishment of a good pasture may be difficult. Once good pastures are established and well managed, the soil can be expected to support them well. This Fourth-class soil is in management group 12.

Fullerton silt loam, hilly phase (12 to 25 percent slopes) (Fr).—This is a well-drained soil of the uplands derived from the residuum of moderately cherty dolomitic limestone. It has formed under a deciduous forest vegetation. This soil differs from the Dunmore soils chiefly in having a deeper more permeable subsoil and in being chertier and deeper over bedrock. It occurs on ridge slopes in irregularly shaped tracts distributed throughout the area underlain by cherty dolomitic limestone. The larger part is in the Fullerton-Greendale-Lindside soil association. The soil is closely associated with Dunmore, Dewey, Greendale, Pace, and Lindside soils and the stony land units.

Profile description:

0 to 8 inches, brownish-gray to light grayish-brown very friable silt loam; in wooded areas the surface 2-inch layer is stained dark with organic matter.

8 to 20 inches, brownish-yellow friable silty clay loam with a weak fine to medium blocky structure.
20 to 40 inches, reddish-yellow to yellowish-red firm (plastic when wet) heavy silty clay loam or silty clay with a moderate medium blocky structure.
40 inches +, reddish-yellow friable (plastic when wet) silty clay streaked and splotched with yellow, gray, and brown; cherty in many places; bedrock at depths of 10 to 15 feet or more.

The boundaries between this and the associated soils are rather indistinct in many places. Consequently, this soil, as mapped, includes small areas of the associated soils. Also included are a few small tracts that have enough chert to interfere materially with cultivation and considerable acreage that is underlain by slightly sandy dolomitic limestone and is somewhat sandy in texture.

The soil is medium to strongly acid throughout and only moderately well supplied with organic matter and plant nutrients. Some chert is on the surface and throughout the profile but it does not interfere materially with cultivation. Bedrock outcrops are not common. The soil is permeable to moisture, air, and plant roots. Water is readily absorbed, so that loss of moisture through runoff is not as great as on the heavier limestone soils. The water-supplying capacity is moderately high. Runoff is rapid and internal drainage is medium. Good tilth is easily maintained.

Use and management.—Although all of this soil is in forest, it is suitable for crops under a high level of management. Such management includes selection of especially suitable crops and rotations, proper fertilization, and careful tillage. This soil is well suited to pasture but needs lime and phosphate to produce high yields of good quality. The use and management requirements for crop production would be similar to those of Fullerton silt loam, eroded hilly phase. This Third-class soil is in management group 11.

Fullerton silt loam, eroded hilly phase (12 to 25 percent slopes) (Fo).—This soil differs from the hilly phase of Fullerton silt loam chiefly in being eroded. A considerable part of the original surface soil has been lost. In many places the remainder has been mixed with the topmost part of the subsoil. As a result the present surface layer has a light reddish-yellow cast. On most places texture or consistence have not been materially affected by the amount of subsoil material incorporated into the surface layer, although both are slightly heavier than in the uneroded phase.

The surface layer is brownish-gray to light reddish-yellow friable silt loam or heavy silt loam. The subsoil is reddish-yellow to yellowish-red friable to firm (plastic when wet) silty clay loam or silty clay. This soil is distributed throughout the Fullerton-Greendale-Lindside soil association.

Some small areas are included with this soil that are sufficiently cherty to interfere materially with cultivation. Because of indistinct boundaries, some areas of the associated soils are also included. In addition, a considerable acreage is derived from the residuum of sandy dolomitic limestone and is consequently sandier than described, especially in the surface layer.

Use and management.—All of this phase is cleared. The greater part is used for crops common to the area, but a large part is in pasture and some is idle. An estimated 30 percent is in crops, 35 percent in

hay, 25 percent in pasture, and 10 percent idle. A variety of crops are grown but generally not in any systematic rotation.

Because this soil is hilly, somewhat difficult to work, and rather highly susceptible to erosion, it is not well suited to crops requiring tillage. On the other hand, the slope is not steep enough or the degree of erosion great enough to prevent proper tillage. For continued use for crop production, however, this soil requires careful management that includes the proper selection and rotation of crops, proper fertilization, and careful tillage. The crop rotation will probably need to be long and consist chiefly of close-growing crops, especially grasses and legumes. Cover crops should follow intertilled crops. Lime, phosphate, and possibly potash are deficient for most crops. Nitrogen is deficient for all except legume crops and those immediately following. Contour cultivation is necessary and contour stripcropping deserves consideration where the slopes are favorable. This Third-class soil is in management group 11.

Fullerton silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Ft).—This soil differs from the eroded hilly phase of Fullerton silt loam chiefly in being more eroded. Most of the original surface soil and, in many places, the topmost part of the subsoil have been lost. In some places, however, several inches of the surface soil remain. The yellowish-red to reddish-yellow subsoil is exposed in most places. The erosion is uneven, however, and areas of exposed subsoil adjoin small patches retaining several inches of the original surface soil. Gullies, some of which are more than 2 feet deep, are fairly common.

This soil is well distributed throughout the area underlain by cherty dolomitic limestone. Most of the acreage, however, is in the Fullerton-Greendale-Lindside soil association. Included with the soil as mapped are areas of the associated soils and some tracts more sandy or more cherty than normal.

Use and management.—Some areas of this soil are still used for field crops, but yields are generally very low. Some of the soil is in pasture and a large part is idle or abandoned and covered sparsely with weeds and brush.

This soil has been severely injured by erosion, and in its present condition, it is very poorly suited to field crops. It has low organic-matter and plant-nutrient contents and low water-holding capacity; consequently it is low in productivity. It is thought to be better suited to pasture, but pastures may be rather difficult to establish. Liberal applications of lime, phosphate, and possibly potash will be needed. Nitrogen may also be needed. This Fourth-class soil is in management group 12.

Fullerton silt loam, rolling phase (5 to 12 percent slopes) (Fs).—This well-drained soil of the uplands was developed from the residuum of moderately cherty dolomitic limestone. It occurs largely on the crests of ridges. It is closely associated with Dewey, Decatur, Dunmore, and Greendale soils. Areas are widely distributed in the Fullerton-Greendale-Lindside and the Dunmore-Greendale-Stony land soil associations.

Profile description:

0 to 10 inches, brownish-gray to light grayish-brown friable silt loam; in wooded areas the surface 1 to 2 inches is stained dark with organic matter.

10 to 22 inches, brownish-yellow friable silty clay loam; weak fine to medium blocky structure.
22 to 44 inches, reddish-yellow to yellowish-red firm (plastic when wet) silty clay loam or silty clay with a moderate medium blocky structure.
44 inches +, reddish-yellow friable (plastic when wet) silty clay streaked and splotched with yellow, gray, and brown; bedrock at depths of 10 to 20 feet or more.

The entire profile is medium to strongly acid in reaction. The content of organic matter and plant nutrients is moderate. A few local areas are cherty, but there is not enough chert to interfere materially with tillage. This soil allows easy penetration of plant roots and free movement of soil air and moisture. Moisture is readily absorbed and well retained. The water-holding capacity is moderately high. Both runoff and internal drainage are medium.

Boundaries between the Fullerton soils and the associated soils are not always distinct. Small areas of associated soils are therefore included. A considerable acreage of this soil is derived from sandy dolomitic limestone and consequently the surface layer is somewhat sandier than described.

Use and management.—Practically all of this soil is in cutover forest consisting chiefly of oak and hickory. The soil is physically well suited to crops and pasture. Many of the areas, however, are so located in relation to cleared fields that it is not practical to clear them at present. Use and management on cleared areas would be similar to that of Fullerton silt loam, eroded rolling phase. This Second-class soil is in management group 6.

Fullerton silt loam, eroded rolling phase (5 to 12 percent slopes) (Fp).—This well-drained soil of the uplands has developed from materials weathered from moderately cherty dolomitic limestone. It differs from Fullerton silt loam, rolling phase, chiefly in being eroded. A considerable part of the original surface soil has been lost, and in places there has been some mixing with the subsoil in the plow layer. The present surface layer is brownish-gray, brownish-yellow, or reddish-yellow friable silt loam. The subsoil is reddish-yellow to yellowish-red friable to firm (plastic when wet) heavy silty clay loam or silty clay.

The soil occurs mainly on the crests of round-topped ridges and is widely distributed in the Fullerton-Greendale-Lindside soil association area. A few small severely eroded spots are included with this soil on the map, and some areas are somewhat sandy in texture. A small acreage that differs in having 2 to 5 percent slopes is included.

Use and management.—All of this soil is cleared and most of it is being used for crops and pasture. Only a small part is idle or in nonfarm use.

This soil is moderately well suited to most of the common crops of the county. It has about the same productivity as the associated Dunmore silty clay loam, eroded rolling phase. It is in greater need of fertilization but requires less attention for the maintenance of tilth. Both soils need a moderately long rotation that includes legumes and grasses. This soil is lower in organic matter than the Dunmore soil, and the plowing under of leguminous green-manure crops should prove especially beneficial. The soil does not have enough lime, phosphorus, nitrogen, and possibly potash for continued high yields of most crops. So far as practicable, cultivation should be on the

contour. Engineering measures for the control of water should not be necessary if the management is otherwise good and row crops are not grown too frequently. This Second-class soil is in management group 6.

Fullerton silty clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Fu).—This soil differs from Fullerton silt loam, rolling phase, chiefly in being severely eroded. The original surface layers and, in places, a part of the subsoil are missing. Shallow gullies that have penetrated the subsoil are common, but the intergully areas may retain a part of the original surface soil. The present surface layer ranges from brownish gray to yellowish red in color and from silt loam to silty clay loam in texture. The subsoil is a reddish-yellow to yellowish-red friable to firm (plastic when wet) silty clay or heavy silty clay loam.

Like the other Fullertor soils, this soil has developed from materials weathered from cherty dolomitic limestone. Some slightly sandy material is included in places. The soil is widely distributed throughout the Fullerton-Greendale-Lindside soil association.

Use and management.—All of this soil has been cleared and cultivated. Some areas are still used for crops and some are used for pasture. Yields are generally very low. A considerable part is idle or abandoned, and some of this is reverting to forest.

This soil is decidedly inferior to Fullerton silt loam, eroded rolling phase, for crop production. With the greater loss of the original surface soil, there has been a greater loss of organic matter and plant nutrients, increased susceptibility to erosion, and decreased moisture absorption and water-holding capacity. If the soil is to be used for intertilled crops, a use for which it is not well suited, a long rotation made up largely of close-growing crops is desirable. The soil needs lime, phosphorus, and potassium for satisfactory yields of most crops and nitrogen for all except legume crops and crops immediately following.

All tillage should be on the contour, and contour stripcropping may be advisable on the longer slopes. Properly constructed and maintained terraces probably would be effective in slowing runoff on many fields. The best use of this soil on many farms will be for pasture or semipermanent hay crops. Practically all of the common hay and pasture plants can be grown successfully if adequate lime and phosphate are applied. This Third-class soil is in management group 10.

Fullerton cherty silt loam, rolling phase (5 to 12 percent slopes) (Fk).—This is a well-drained cherty soil of the limestone ridges. It developed from the residuum of cherty dolomitic limestone. It differs from the eroded hilly phase of Fullerton cherty silt loam chiefly in having milder slopes. In general it is deeper to bedrock and has fewer bedrock outcrops. It differs from Fullerton silt loam, rolling phase, in having enough chert fragments on the surface and in the plow layer to interfere materially with tillage. The soil is largely on ridge crests, where it is closely associated with other Fullerton soils. It is largely confined to the Fullerton-Greendale-Lindside soil association.

Profile description:

0 to 8 inches, yellowish-gray to brownish-gray friable cherty silt loam.
8 to 16 inches, brownish-yellow friable silty clay loam; weak fine to medium blocky structure.

16 to 42 inches, reddish-yellow to yellowish-red friable to firm (plastic when wet) silty clay loam or silty clay.
42 inches +, reddish-yellow friable silty clay loam splotched with yellow, gray, and brown; bedrock at depths of 10 to 20 feet or more.

The soil is strongly acid in reaction throughout the profile and apparently moderately low in organic matter except in the thin surface layer. It is moderately well supplied with plant nutrients. This soil is sufficiently permeable for easy penetration of plant roots and circulation of soil air and moisture. Water is readily absorbed and moderately well retained. The water-holding capacity is moderately high. Both runoff and internal drainage are medium.

Use and management.—Practically all of this phase is in cutover forest. The soil is suitable for the crops common to the area, but it is inherently slightly less productive than Fullerton silt loam, rolling phase. If it were cleared and used for crops, its requirements for management would be similar to those of the eroded rolling phase of Fullerton cherty silt loam, but yields would probably be higher, at least for some years. This Third-class soil is in management group 9.

Fullerton cherty silt loam, eroded rolling phase (5 to 12 percent slopes) (Ff).—This soil differs from Fullerton cherty silt loam, rolling phase, chiefly in being eroded. A large part of the original surface soil has been lost. In some places the upper part of the subsoil has been brought up by tillage and mixed with the remaining original surface soil. In most places the amount of subsoil material incorporated into the surface layer has not been enough to alter materially either the texture or consistence, but it has imparted a light reddish-yellow color in places. Although a few gullies have formed, they generally are in idle fields where they have not been obliterated by tillage.

The present surface layer is brownish-gray to light reddish-yellow friable cherty silt loam. The subsoil is reddish-yellow to yellowish-red friable firm (plastic when wet) silty clay loam or silty clay. This soil is widely distributed throughout the Fullerton-Greendale-Lindside soil association.

Use and management.—Practically all of this soil is cleared. Most of it is used for the crops common to the area, although some is idle or is used for pasture.

Owing largely to its chertiness but also to its lower fertility and lower water-holding capacity, this soil is less desirable for crops than the eroded rolling phase of Fullerton silt loam. This cherty soil also appears to leach more readily and retain improvements for a shorter period, but it is less erodible.

The requirements for management are similar to those of Fullerton silt loam, eroded rolling phase, but there are a few exceptions. This soil is in greater need of fertilizers, lime, and organic matter, and these amendments need to be applied more frequently. If fertilization must be held to a minimum, it might be well to select crops that will grow successfully on soils of relatively low fertility. Lespedeza, for example, would be selected in preference to alfalfa or red clover. The deep-rooted legumes can be grown successfully, however, if adequate applications of lime, phosphorus, and possibly potassium are made. The growing of grasses or the use of barnyard manure or green manures will aid in maintaining or increasing the low supply of organic matter.

Engineering measures for control of water may be beneficial, but they should not be necessary if row crops are not grown frequently and management is otherwise good. Contour tillage is desirable and contour stripcropping would be a good practice where the slope is favorable. The crop rotation should be moderately long in order to control erosion and, in addition, to maintain or increase productivity. This Third-class soil is in management group 9.

Fullerton cherty silt loam, hilly phase (12 to 25 percent slopes) (Fh).—This is a well-drained cherty soil of the limestone ridges. It has developed from the residuum of cherty dolomitic limestone. The native vegetation consists mainly of deciduous trees. The soil is chiefly on ridge slopes in the Fullerton-Greendale-Lindside soil association. It is closely associated with Dewey, Pace, Lindside, Greendale, and other Fullerton soils.

Profile description:

0 to 8 inches, brownish-gray to yellowish-gray friable cherty silt loam; in wooded areas a thin surface layer 1 to 2 inches thick is stained dark with organic matter.
8 to 16 inches, brownish-yellow friable light cherty silty clay loam; weak fine to medium blocky structure.
16 to 40 inches, yellowish-red to reddish-yellow friable to firm (plastic when wet) silty clay loam or silty clay with moderate medium blocky structure.
40 inches +, reddish-yellow friable silty clay loam streaked and splotched with yellow, gray, and brown; bedrock at depths of 10 to 20 feet or more.

The soil is strongly acid throughout the profile. It is fairly low in content of organic matter except in the thin surface layer, and fairly well supplied with plant nutrients. Enough chert fragments are on the surface and in the plow layer to interfere materially with tillage. Runoff is rapid but internal drainage is medium. This soil is sufficiently permeable for plant-root penetration, soil-air circulation, and moisture movement. Water is readily absorbed and moderately well retained and the water-holding capacity is moderately high.

Use and management.—All of this soil has a forest cover that remained after incomplete timber harvest. The soil is fairly well suited to the production of crops under a high level of management. The steeper areas on many farms are probably best suited to pasture grasses. On many farms it is not practical to use the soil for either crops or pasture because of its inaccessibility. Permanent pastures may be expected to give fair yields of fair quality without amendments. Pastures are very responsive to lime and phosphate, which greatly increase yields. The use and management practices for crops would be similar to those for Fullerton cherty silt loam, eroded hilly phase. This Fourth-class soil is in management group 14.

Fullerton cherty silt loam, eroded hilly phase (12 to 25 percent slopes) (Fe).—This soil differs from Fullerton cherty silt loam, hilly phase, chiefly in being eroded. A considerable part of the original surface soil, including the thin surface layer of higher organic-matter content, has been lost. In many places the subsoil and the surface soil have been mixed to some extent in the plow layer. The present layer ranges in color from yellowish gray to brownish yellow or even yellowish red. Small severely eroded spots are common and conspicuous because of exposure of the subsoil and have a somewhat heavier and less friable surface layer than other areas of this soil. The subsoil, like that of the hilly phase, is a reddish-yellow to yel-

349399—56——5

lowish-red friable to firm (plastic when wet) silty clay loam or silty clay. This soil occurs in small tracts widely distributed throughout the area underlain by cherty dolomitic limestone. It is largely confined to the Fullerton-Greendale-Lindside soil association.

Use and management.—All of this soil has been cleared and used for crops and pasture. At the present time an estimated 25 percent of the land is in crops, 35 percent in hay, 25 percent in pasture, and about 15 percent in idle land.

Some of the characteristics that make this soil rather poorly suited to crops requiring tillage are (1) rather steep slope, (2) relatively low natural fertility, (3) chertiness, and (4) moderate water-holding capacity. It is not so well suited to crops as the hilly phase because it has lost part of the original surface soil. This erosion has resulted in a loss of organic matter and plant nutrients, an increased susceptibility to erosion, and a decrease in productivity for most crops.

This soil is moderately deficient in lime, nitrogen, phosphorus, and potash for most crops, but it is highly responsive to good management practices that include the application of these amendments. The soil is susceptible to erosion, so all water-control measures consistent with good management should be followed. Use of long rotations that have a large proportion of close-growing crops, contour tillage, and, on some slopes, contour stripcropping are all desirable practices if the soil is cropped. This soil is probably best used for permanent pastures on most farms; however, applications of lime and phosphate are required to produce high-yielding pastures. This Fourth-class soil is in management group 14.

Fullerton cherty silty clay loam, severely eroded hilly phase ((12 to 25 percent slopes) (Fm).—This soil differs from the eroded hilly phase of Fullerton cherty silt loam chiefly in having lost nearly all of the original surface soil by erosion. It is generally unevenly eroded. Gullies 1 to 2 feet deep are rather common. In many areas practically all of the original surface soil and even the upper part of the subsoil have been lost. In the intergully areas several inches of the original surface soil remains. The present surface layer is quite variable, ranging from brownish gray to yellowish red and from cherty silt loam to cherty silty clay loam. The subsoil is reddish-yellow to yellowish-red friable to firm (plastic when wet) silty clay or silty clay loam. This is not an extensive soil, but it is widely distributed in the Fullerton-Greendale-Lindside soil association area.

Use and management.—Some of this soil is still used for crops, but the yields are very low. Some of the acreage is in pasture, but a larger part is idle or abandoned and covered sparsely with weeds and brush. Pines often become established on the abandoned areas.

This soil has been severely injured by erosion. In its present condition it is very poorly suited to crops or pasture. It is thought to be better suited to pasture than crops, but the pastures are rather difficult to establish. Lime and phosphate are required, and manure is very beneficial in establishing a stand, especially on the galled spots. This soil is probably best used for forest on most farms. This Fifth-class soil is in management group 14.

Fullerton cherty silt loam, steep phase (25 to 60 percent slopes) (Fl).—This soil differs from Fullerton cherty silt loam, hilly phase, chiefly in having steeper slopes. Like that soil, it has a brownish-

gray to yellowish-gray friable cherty silt loam surface soil and a reddish-yellow to yellowish-red friable to firm (plastic when wet) silty clay or silty clay loam subsoil. Its soil layers, however, are more variable in thickness and probably somewhat thinner. About 80 acres are relatively free of chert. This phase is inextensive and is confined mainly to the Fullerton-Greendale-Lindside soil association.

Use and management.—Practically all of this soil is still woodland that consists chiefly of deciduous trees, dominantly oaks.

Ordinarily this soil is considered too steep for feasible production of field crops over a long period. Other characteristics, such as chertiness, relatively high susceptibility to erosion, and rather easily depleted virgin fertility, also contribute to its unfitness for this use.

The soil is only moderately well suited to pasture; but with the use of lime and phosphate, reasonably good pastures can be established and maintained. Areas cleared for pasture should not be used for crops and allowed to erode and become depleted of plant nutrients. Under present conditions this soil is better suited to forestry, and unless there is a definite need for additional pasture, the shifting from forest to pasture is not advised. This Fourth-class soil is in management group 19.

Fullerton cherty silt loam, eroded steep phase (25 to 60 percent slopes) (Fg).—This soil differs from the steep phase of Fullerton cherty silt loam chiefly in having lost a large part of the original surface soil. The surface soil consists of a brownish-gray to yellowish-gray silt loam and is about 3 to 8 inches thick. In some tilled areas it has a light reddish-yellow cast as a result of the incorporation of the topmost part of the subsoil. The subsoil is reddish-yellow to yellowish-red friable to firm (plastic when wet) silty clay loam. A considerable acreage included with this soil differs in being relatively chert-free. This soil is widely distributed throughout the Fullerton-Greendale-Lindside soil association.

Use and management.—All of this phase has been cleared for a number of years. Most of it is now used for pasture, although some is used for crops and some is idle. Both crop and pasture yields are relatively low under the prevailing management.

This soil is very poorly suited to crops, only moderately well suited to permanent pasture, and probably best suited to forestry. Owing to the steep slopes, the soil is difficult to till. In addition, it is rather highly susceptible to erosion and moderately low in content of most plant nutrients. It has been demonstrated, however, that fairly good pastures can be established and maintained by proper management, especially by the application of lime and phosphate. The grazing will need to be carefully controlled in order to maintain a good pasture sod. This Fourth-class soil is in management group 19.

Fullerton cherty silty clay loam, severely eroded steep phase (25 to 60 percent slopes) (Fn).—This soil differs from the eroded steep phase of Fullerton cherty silt loam in being more eroded. Most of the original surface soil and, in many places, the topmost part of the subsoil have been lost. The reddish-yellow to yellowish-red subsoil is exposed in most places, but the erosion is uneven, so that areas of exposed subsoil adjoin small patches retaining several inches of the original surface soil. Shallow gullies are common. A considerable acreage is included that differs in not having enough chert in the

plow layer to interfere materially with tillage. This soil occurs in small but conspicuous areas scattered throughout the Fullerton-Greendale-Lindside soil association.

Use and management.—Most of this soil is temporarily idle or has been abandoned. Obviously, in its present condition, the soil is very poorly suited to pasture and crops. It is thought to be best suited to forestry. Pines are becoming established on many of the abandoned areas. There is some evidence that pastures can be established and maintained, but the expense and risk are likely to be high. For pastures, lime and phosphate are obviously required; engineering measures, such as check dams and diversion ditches, may be necessary; and plants that are easy to establish and rather resistant to drought should be selected. This Fifth-class soil is in management group 19.

Greendale and Pace silt loams, undulating phases (2 to 7 percent slopes) (Gb).—This complex is an association of Greendale and Pace soils. These are moderately well-drained to well-drained soils of the colluvial lands formed from local alluvial or colluvial materials washed largely from Fullerton and Dunmore soils. They are on gently sloping areas at the base of slopes from which the soil material has washed. The soils differ chiefly in degree of distinctness between profile layers. Surface soil and subsoil layers are distinct in the Pace soils, whereas they are indistinct or nonexistent in the Greendale. The native vegetation consisted chiefly of deciduous forest. These soils are in small areas widely distributed throughout the Fullerton-Greendale-Lindside soil association.

Profile descriptions:

Greendale silt loam—
- 0 to 12 inches, grayish-brown to brownish-gray friable silt loam.
- 12 to 20 inches, yellowish-brown friable silt loam or light silty clay loam.
- 20 to 32 inches, brownish-yellow friable silt loam or silty clay loam lightly splotched with gray.
- 32 inches +, brownish-yellow silty clay loam or clay loam splotched with gray; the depth of the accumulation ranges from 3 to 10 feet.

Pace silt loam—
- 0 to 10 inches, light grayish-brown to brownish-gray friable silt loam.
- 10 to 30 inches, brownish-yellow to yellow friable silty clay loam.
- 30 inches +, mottled gray, yellow, and brownish-yellow firm to moderately compact silty clay loam; thickness of deposition varies from 3 to 10 feet.

These soils vary somewhat in characteristics from place to place because of differences in parent material, in depth of accumulation, in texture, and in drainage. As mapped, this complex includes soils not only at the base of the slopes but also soils on narrow bottomlike areas along the intermittent drainageways and soils on small alluvial-colluvial fans formed by the deposits small streams have left on the flood plains of larger streams.

Use and management.—Practically all areas of this complex have been cleared and cultivated. About 50 percent is in crops, 40 percent in hay and pasture, and 10 percent in other uses. These soils are used intensively for crops, which generally are not systematically rotated. Many farmers do not use fertilizers on all crops.

These soils are physically well suited to crops that require tillage and will permit rather intensive cropping. They have a relatively low susceptibility to erosion, and although control of runoff and erosion is a minor problem, it cannot be entirely ignored. The soils of this

complex are moderately fertile and have a high water-holding capacity; consequently yields of most crops are relatively high. They are somewhat deficient in lime, phosphate, and nitrogen in most places. A good response can be expected from the addition of these materials.

If these soils are properly fertilized, yields probably can be maintained for long periods under continuous cropping. However, on most farms it is better to use a short rotation that includes a legume crop, such as red clover. Although fairly well suited to most crops of the county, they are not so well suited to alfalfa as such upland soils as Decatur and Dunmore. They are, however, among the better soils of the county for tobacco. The soils of this complex are Second-class soils and are in management group 2.

Greendale and Pace silt loams, rolling phases (7 to 15 percent slopes) (Ga).—This complex differs from Greendale and Pace silt loams, undulating phases, chiefly in having steeper slopes. Like those soils, the surface layers of these soils are grayish-brown to brownish-gray friable silt loams. The colluvial material is somewhat more variable in depth and generally shallower than that under the undulating phase. This complex occurs in very small tracts widely distributed in the Fullerton-Greendale-Lindside soil association.

Use and management.—Practically all of this complex has been cleared and is used for the common crops of the area. An estimated 40 percent is in crops, 45 percent is in hay and pasture, and 15 percent is in other uses or is idle.

These soils are well suited to crops that require tillage, and to all the common crops of the county. They are especially good soils for tobacco. They are suited to more intensive use than the associated Fullerton and Dunmore soils. Owing chiefly to their stronger slopes, they are not so well suited to such use as Greendale-Pace silt loams, undulating phases. They are similar to that complex in use and management requirements, but crop rotation and fertilization are more essential if yields are to be maintained or increased. They are also slightly susceptible to erosion, and such practices as contour tillage and the use of cover crops after intertilled crops are desirable. The soils of this complex are Second-class soils and are in management group 2.

Hamblen silt loam (0 to 3 percent slopes) (Hb).—This is an imperfectly drained soil of the bottom lands. It occurs on nearly level flood plains and much of it is subject to overflow. It consists of recent general alluvium originating chiefly from sandstone, shale, slate, and quartzite and to some extent from limestone. This soil differs from Staser silt loam chiefly in having inferior drainage. Although it is widely distributed over the county, the larger and more typical areas are in the Dandridge-Hamblen-Whitesburg soil association. It occurs in narrow elongated tracts of small acreage and is closely associated with Dandridge, Ramsey, Litz, Sequatchie, Staser, and Jefferson soils.

Profile description:

0 to 14 inches, brownish-gray to grayish-brown very friable silt loam.
14 to 30 inches, grayish-yellow to brownish-gray friable silt loam to silty clay loam, splotched and mottled with gray, yellow, and brown.
30 inches +, friable silt loam or clay loam highly mottled with rust brown, yellow, and gray; the alluvial deposit is 3 to 10 feet or more in depth.

As mapped, this soil includes many variations small in extent. Although it is predominantly imperfectly drained, some included areas

are poorly drained, and others are well drained. Texture ranges from silt loam to loam. Some areas are included that differ from the soil described chiefly in being strongly acid; others are derived chiefly from materials washed from granite and gneiss.

This soil is medium to slightly acid and appears to be moderately well supplied with organic matter and plant nutrients. It is very permeable and permits easy penetration of plant roots and good circulation of soil air and moisture when not saturated with water. Rainfall is readily absorbed and well retained. The water-supplying capacity is very high. Runoff and internal drainage are slow. The soil is relatively free of stones or gravel.

Use and management.—Nearly all of this soil is cleared. It is used chiefly for corn but also to some extent for truck crops, hay, and pasture. Yields are variable, but in general yields of corn and many hay and forage crops are comparatively high.

Chiefly because of the inferior drainage, this soil is not so well suited to crops as Staser silt loam. Corn frequently has to be planted later in the spring and is more susceptible to injury from wet conditions. Hay crops and pasture plants that are moderately tolerant of wet conditions are about equally well suited to both soils.

Hamblen silt loam is especially valuable for pasture in some areas, because it remains moist and productive through extended dry periods when the pastures of the uplands become scant. Drainage is generally inadequate for alfalfa. Although some small grain crops are grown, the soil is not considered well suited to them. Artificial drainage can be expected to broaden the use suitability of this soil to some extent. Lime is not ordinarily needed, except on the strongly acid variations; phosphorus and nitrogen are the amendments most likely to be needed. This Second-class soil is in management group 1.

Hamblen fine sandy loam (0 to 3 percent slopes) (Ha).—This is an imperfectly drained sandy soil of the bottom lands. It is on nearly level flood plains and is subject to overflow. It consists of recent general alluvium originating chiefly from sandstone and quartzite but to some extent from shale, slate, and limestone. This soil differs from Hamblen silt loam in being coarser textured throughout, particularly in the surface layer. It occurs in narrow elongated areas along streams, mainly in the mountainous southeastern section of the county or along larger streams flowing from this area. The soil is closely associated with Barbourville, Cotaco, Sequatchie, Hayter, Jefferson, and Ramsey soils.

Profile description:

0 to 14 inches, brownish-gray to grayish-brown loose very friable fine sandy loam.
14 to 32 inches, grayish-yellow friable or very friable fine sandy loam, splotched with gray, yellow, and brown.
32 inches +, friable fine sandy loam or clay loam, highly mottled with rust brown, yellow, and gray.

The soil is medium acid and moderately well supplied with organic matter and plant nutrients. In most places it is apparently lower in plant nutrients and organic matter than Hamblen silt loam and is more variable in reaction. Some included areas are strongly acid and others are nearly neutral. The soil is very permeable and permits easy penetration of plant roots and good circulation of air and moisture when not saturated. The water-supplying capacity is high. Runoff is very slow

and internal drainage is slow. Some gravel and cobbles are on the surface and throughout the soil in many places but they do not interfere materially with tillage.

Use and management.—Practically all of this soil is cleared and used chiefly for corn and hay. Some is used for rotation pasture, and a small but important acreage is used for vegetable crops. Crop yields are variable but in general they are higher than on the adjacent soils of the uplands.

Because of imperfect drainage and susceptibility to flooding, this soil is limited mainly to summer crops. It is well suited to corn and to hay crops that are moderately tolerant of wet conditions. It is not well suited to alfalfa or small grains but is very well suited to many of the vegetable crops. It is especially valuable for pasture because it remains productive through extended dry periods when the pastures on the uplands are short. Artificial drainage can be expected to broaden to some extent the use suitability of this soil. Lime is not ordinarily needed for the suitable crops; phosphorus and nitrogen are the amendments most likely to be needed. This Second-class soil is in management group 1.

Hayter silt loam, undulating phase (2 to 5 percent slopes) (He).—This is a brown well-drained soil of the colluvial lands. It has formed from local alluvium or colluvium washed from uplands underlain largely by slate and fine-grained quartzite, but mixed with this are materials from limestone or other calcareous rocks. The alluvium or colluvium is chiefly from Ramsey soils, but in some places materials from Dunmore soils are included. Some areas are below or adjacent to outcroppings of limestone and are very likely influenced by lime-bearing water. However, in this county, the calcareous material comes from calcite veins or bands in the slate. This soil is in small areas that are closely associated with Dunmore, Ramsey, Barbourville, Cotaco, Sequatchie, and Jefferson soils. Most of the areas are either in the Hayter-Jefferson-Hamblen or Jefferson-Barbourville-Sequatchie soil association.

Profile description:

0 to 12 inches, grayish-brown to brown very friable silt loam; in wooded areas the surface 2 or 3 inches is stained dark grayish brown with organic matter.

12 to 30 inches, yellowish-brown to light reddish-brown friable silty clay loam; weak fine blocky to moderate medium blocky structure.

30 inches +, yellowish-brown to reddish-brown friable heavy silty clay loam; in most places layer is splotched with yellow and gray and contains partially weathered slate fragments; the depth of the colluvial deposit ranges from 3 to 10 feet or more.

Hayter silt loam, as mapped, includes small areas of Jefferson silt loam and Sequatchie silt loam as well as other Hayter soils. It also includes several areas with surface soil and subsoil layers that are less distinct than usual. These areas are chiefly along narrow drainageways or at the base of eroding slopes where they receive frequent additions of fresh sediments.

This soil is medium to strongly acid, high in plant nutrients, and apparently well supplied with organic matter. Some areas have a few small slate fragments on the surface and throughout the soil, but not enough to interfere materially with tillage. The lower soil layers

are slaty in many places. The soil is permeable and permits easy penetration of plant roots and circulation of soil air and moisture. Water is readily absorbed and the water-holding capacity is high.

Use and management.—Practically all areas of this soil have been cleared and cultivated. It is estimated that about 55 percent is in crops, 40 percent is in hay and pasture, and 5 percent is idle or in nonfarm uses. Systematic crop rotations are not commonly used. Some farmers, however, use a 3-year rotation of corn, small grains, and hay.

This soil is well suited to the production of crops and pasture. It is well suited to practically all crops, including tobacco, alfalfa, and market vegetables. Although the soil is naturally relatively fertile, crops respond well to fertilizer and lime. If tilth and moisture relations are favorable, large yields can be produced consistently where the supply of plant nutrients, lime, and organic matter is kept at a high level. The soil is slightly susceptible to erosion in most places, but it can be maintained under a crop rotation of short or moderate length if contour farming is practiced. This First-class soil is in management group 3.

Hayter silt loam, eroded rolling phase (5 to 12 percent slopes) (Hd).—This is a brown well-drained soil of the colluvial lands. It has formed from materials washed chiefly from Ramsey shaly silt loam soils. It differs from Hayter silt loam, undulating phase, in having a stronger slope and in being eroded. A considerable part of the original surface layer has been lost through erosion. Generally tillage has incorporated the rest of this layer with the upper part of the subsoil. Erosion losses have been uneven, however, and in many spots the plow layer is entirely within the original surface layer. The few severely eroded areas included are conspicuous because the subsoil is exposed.

The present surface layer ranges from silt loam to silty clay loam in texture and from grayish brown or light brown to yellowish brown in color. The subsoil is a yellowish-brown to light reddish-brown friable silty clay loam. Most of this soil is in the Hayter-Jefferson-Hamblen soil association, but small acreages are in the Jefferson-Barbourville-Sequatchie.

Use and management.—All of this soil is cleared and most of it is used for crops and pasture. It is well suited to a wide variety of crops, including truck crops, alfalfa, and tobacco. Additions of lime and fertilizers are necessary for successful growth of some crops and for increased yields of most. The soil does not have enough phosphorus for continuous high yields of most crops. It lacks nitrogen for all except legumes and crops immediately following. Potash may be limiting for many crops, especially the deep-rooted legumes.

The soil is moderately susceptible to erosion. A crop rotation of moderate length that includes grasses and legumes is desirable not only for protection against erosion, but also for the improvement of tilth and organic-matter and nitrogen content. Contour tillage should be used where feasible. Properly constructed terraces would be effective but probably will not be needed if other management practices are good. This Second-class soil is in management group 6.

Hayter silt loam, eroded hilly phase, (12 to 25 percent slopes) (Hc).—This is a brown well-drained soil formed from materials washed or rolled chiefly from Ramsey shaly silt loam soils. It differs from Hayter silt loam, eroded rolling phase, chiefly in having steeper slopes. Like that soil, it has lost a considerable part of the original surface layer by erosion. Tillage operations have mixed the remaining part with the upper part of the subsoil. The surface layer has not been uniformly removed, however, and in places the plow layer is entirely within the original surface layer. The severely eroded areas are conspicuous because of the exposed subsoil and the numerous shallow gullies. A small forested acreage of uneroded soil is included.

The present surface layer ranges from silt loam to silty clay loam in texture and from grayish brown or light brown to yellowish brown in color. The subsoil is yellowish-brown to light reddish-brown friable silty clay loam.

This soil is in small areas closely associated with Ramsey, Barbourville, Cotaco, Sequatchie, and Jefferson soils. Most of the acreage is in the Hayter-Jefferson-Hamblen and Jefferson-Barbourville-Sequatchie soil associations.

Use and management.—Most of this soil is cleared and is used for crops and pasture. A small acreage is in forest, however, and some of the severely eroded areas are abandoned and are reverting to forest.

Chiefly because of its stronger slopes, the soil is not so well suited to crops as Hayter silt loam, eroded rolling phase. It is moderately productive of a wide variety of crops; but because of erosion losses, the productivity of row crops is difficult to maintain. A longer rotation, chiefly of close-growing crops, is needed on this soil than on the eroded rolling phase. All tillage should be on the contour and contour stripcropping may be desirable on the longer slopes. On many farms the best uses for this phase are semipermanent hay crops or pasture. Applications of lime and phosphate will be needed to establish and maintain highly productive pastures. This Third-class soil is in management group 11.

Hollywood silty clay loam (2 to 5 percent slopes) (Hf).—This is a dark-colored almost black heavy soil of the colluvial lands. It occurs on nearly level to undulating colluvial fans spread over low terraces and bottom lands. It consists of materials washed chiefly from highly calcareous shale. The native vegetation was largely a dense growth of deciduous trees, mainly water-tolerant species.

Profile description:

0 to 10 inches, very dark-gray to dark brownish-gray plastic silty clay loam.
10 to 22 inches, dark grayish-brown very plastic silty clay or clay, splotched with brownish yellow, especially in the lower part.
22 inches +, very plastic olive-gray clay profusely mottled with yellow, brown, and gray; thickness of the colluvial material ranges from 3 to 6 feet in most places.

Hollywood silty clay loam is moderately fertile, slightly acid or neutral in reaction, and apparently high in organic-matter content. It is slowly permeable to air and water and to the roots of many field crops. Moisture conditions are unfavorable for most of the common field crops during periods of heavy rainfall as well as during periods of drought. Runoff is medium in most places, but internal drainage

is slow or very slow. Some small included areas, however, are nearly level and have slow runoff. Some of these areas are subject to flooding by the large streams along which they occur.

Use and management.—Practically all of this soil is cleared and is being used for crops, hay, and rotation pasture. Corn, red clover, lespedeza, soybeans, and sorghum are the crops most commonly grown. Systematic rotations are not used and crops are not commonly fertilized.

This soil is fairly well suited to crops and pasture. Its suitability is limited to some extent, however, by the restricted internal drainage, by droughtiness, and by unfavorable tilth conditions.

Such crops as corn, soybeans, sorghum, and many annual hay crops are fairly well suited to this soil in its present condition. Red clover is apparently well suited if the soil is fertilized with a phosphate fertilizer. Lime is not needed for any of the common field crops in most places. Practically all crops respond well to applications of phosphorus, however. Many crops, especially the deep-rooted legumes, respond to potash. Nitrogen is needed for all crops except legumes and the crops immediately following. The soil can be tilled without puddling or clodding within a very narrow range of moisture conditions. This Third-class soil is in management group 2.

Holston loam, undulating phase (2 to 5 percent slopes) (Hl).—This is a yellow well-drained soil of old stream terraces. It has formed under a deciduous forest from old general alluvium originating from quartzite, sandstone, slate, and shale. Nearly all areas are underlain by shale. This soil is on high terraces along many of the larger streams in the county, but most of the acreage is in the Holston-Nolichucky-Tyler soil association. It is closely associated with Nolichucky, Monongahela, and Tyler soils of the terrace lands; with Dandridge, Sequoia, and Litz soils of the uplands; and with Staser, Hamblen, and Prader soils of the bottom lands.

Profile description:

0 to 10 inches, gray or yellowish-gray very friable loam; in wooded areas the top 1 or 2 inches is stained dark gray with organic matter.
10 to 32 inches, yellow firm to friable sandy clay loam or clay loam.
32 inches +, yellow moderately compact sandy clay or sandy clay loam, highly mottled with gray, yellow, and brown; the alluvial deposit ranges from 3 to 15 feet or more in thickness.

Most of this soil is only slightly eroded, but a few moderately eroded and uneroded areas are included. Since the boundaries between this and the associated terrace soils are indistinct, some of the associated soils are included in mapping.

This soil is strongly to very strongly acid in reaction, and moderately low in water-supplying capacity. It is characteristically somewhat cobbly on the surface and throughout the soil mass. Locally there are stone-free areas. Thin beds of gravel or cobbles may occur at various depths but are more likely to be near the base of the deposit (pl. 5, *A*). The soil is sufficiently permeable for easy plant-root penetration and normal circulation of air and moisture. Water is readily absorbed by the surface and subsoil layers, but within the compact substratum absorption and movement of soil water tends to be retarded. Runoff is medium but internal drainage is moderately slow.

Use and management.—Practically all of this soil is cleared and used rather intensively for crops and pasture. A wide variety of crops are

grown, but not generally in a systematic rotation. Truck crops and tobacco are usually heavily fertilized. Fertilization is not a common practice for other crops.

This soil is well suited to crops. It is moderately responsive to good management, but the response is not so lasting as on soils such as those of the Cumberland series. The maintenance of fertility is somewhat difficult, but good tilth is easily maintained and erosion control is not a problem.

The soil appears to be well suited to wheat and other small grains. Corn is grown with fair success, but the yields are generally low. Hay crops can be grown successfully, although the soil is not well suited to alfalfa. Potatoes and other truck crops grow well, and good tobacco can be produced. For the successful production of all crops, however, fertilization is very necessary. The soil is low in organic matter, lime, phosphate, potash, and nitrogen. A complete fertilizer is needed for most crops. If the crops are properly fertilized, production can be maintained under a fairly short rotation. This Second-class soil is in management group 5.

Holston loam, rolling phase (5 to 12 percent slopes) (Hk).—This is a yellow well-drained soil on old stream terraces. It has formed from old general alluvium originating from quartzite, sandstone, slate, and shale. The soil differs from Holston loam, undulating phase, chiefly in having a stronger slope. Like that soil, it has a gray or yellowish-gray very friable loam surface soil about 10 inches thick. Below this is a yellow firm to friable sandy clay loam or clay loam subsoil. A 1- to 2-inch surface layer is stained dark gray with organic matter. Most of this soil is in the Holston-Nolichucky-Tyler soil association.

Use and management.—Practically all of this soil is in forest that consists chiefly of hardwood trees but includes many pines in places. The soil is suitable for crops and pasture but has only medium productivity, chiefly because it is deficient in plant nutrients and has only a moderate water-supplying capacity. Many of the areas are too small and inconveniently located for practical clearing and cultivating. Use and management practices on cleared areas would be similar to those for the undulating phase. These areas would be more susceptible to erosion than areas of the undulating phase; consequently, the rotation would need to be longer and include more close-growing crops. Tillage should be on the contour, and terraces may be advisable in places. This Third-class soil is in management group 8.

Holston loam, eroded rolling phase (5 to 12 percent slopes) (Hh).—This is a yellow well-drained soil of old stream terraces. Most of it is 75 to 150 feet above the present flood plain and has formed from old general alluvium originating from quartzite, sandstone, slate, and shale. Most of the soil is in the Holston-Nolichucky-Tyler soil association. It is closely associated with Nolichucky, Monongahela, Jefferson, Allen, and other Holston soils.

Profile description:

0 to 8 inches, gray or yellowish-gray very friable loam.
8 to 30 inches, yellow firm to friable sandy clay loam or clay loam.
30 inches +, yellow moderately compact sandy clay or sandy clay loam, highly mottled with gray and brown; the alluvial deposit ranges from 3 to 15 or more feet in thickness.

This soil is moderately eroded. In most places a considerable part of the original surface layer has been lost. There has been some mixing of the surface soil and subsoil in the plow layer, but the texture is significantly heavier only in the more severely eroded spots. Small severely eroded spots commonly occur and are conspicuous because the yellow subsoil is exposed.

As mapped, this soil includes small areas of the associated Nolichucky, Monongahela, and Jefferson soils. A small acreage is included that differs from the soil described chiefly in being browner throughout the profile. This variation is more productive than the typical soil.

The soil is strongly to very strongly acid in reaction and moderately low in plant nutrients, organic matter, and water-holding capacity. It is characteristically somewhat stony on the surface and throughout the soil mass. Locally there are stone-free areas. Thin beds of gravel or cobbles may be at various depths within the soil mass but are more likely to be near the base of the deposit. The soil is sufficiently permeable for easy plant-root penetration and normal circulation of soil air and moisture. Water is readily absorbed by the surface and subsurface layers, but its absorption and movement are retarded in the compact substratum. Runoff and internal drainage are medium.

Use and management.—Practically all of this soil has been cleared and used for crops or pasture. At present, however, an estimated 20 percent is idle each year. A number of crops are grown but generally not in a systematic rotation. Truck crops and tobacco are usually heavily fertilized, but other crops are not commonly fertilized.

This soil is physically well suited for crop production. However, it appears to be only moderately responsive to good management. The maintenance of fertility is somewhat difficult, but good tilth is easily maintained and erosion control is not a very serious problem. This soil appears to be well suited to wheat and other small grains. Corn yields are generally low. Hay crops can be grown successfully, but alfalfa is not well suited. Potatoes and other truck crops grow well. Good tobacco can be produced.

For the successful production of crops, fertilization and liming are very necessary, as the soil is low in most elements necessary to normal plant growth. In most places, the soil is susceptible to erosion, and cultivation needs to be on the contour. Under ordinary conditions a rotation of at least moderate length is needed. This Third-class soil is in management group 8.

Holston loam, eroded hilly phase (12 to 25 percent slopes) (Hg).—This is a light-colored, well-drained soil of the high stream terraces. The old alluvium from which it formed has washed largely from Ramsey and associated soils. It differs from Holston loam, eroded rolling phase, chiefly in having steeper slopes, but it is also more variable in such characteristics as color, texture, depth, and content of cobbles and gravel. The surface soil is gray or yellowish-gray very friable loam. The subsoil is yellow, firm to friable sandy clay loam or clay loam. This soil is similar to the eroded rolling phase in distribution and association.

Use and management.—Most of this soil is now used for pasture but some is used for crops and a considerable part is idle. About

50 acres is still in forest. Owing to the strong slopes, low fertility, and content of cobbles, the soil is not well suited to intertilled crops. Probably it is best used for pasture on most farms. It is not naturally productive of pasture plants. To obtain pastures of even fair quality moderate to heavy applications of lime and phosphate will be required in most places. If the soil is cropped, a long rotation consisting chiefly of close-growing crops is needed. Tillage should be on the contour. Contour stripcropping should be considered on the longer slopes. Complete fertilizers are needed for most crops. Lime, phosphate, and potash are essential to success with deep-rooted legumes. If the legumes are properly inoculated, however, nitrogen should not be needed. This Fourth-class soil is in management group 13.

Jefferson fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (Jb).—This is a yellow sandy well-drained soil of the colluvial lands. It was formed from local alluvium or colluvium that washed largely from the Ramsey soils of the uplands. It occurs on gently sloping to sloping areas at the base of the upland slopes from which the parent material washed. In most places this material has spread out a considerable distance over the valley floor.

This soil is in small irregularly shaped areas. It is closely associated with Allen, Sequatchie, Ramsey, and other Jefferson soils. Most of the acreage is in the Jefferson-Barbourville-Sequatchie and Jefferson-Barbourville-Dunmore soil associations.

Profile description:

0 to 8 inches, yellowish-gray or brownish-gray very friable fine sandy loam; wooded areas have a thin surface layer stained dark with organic matter.
8 to 28 inches, yellow to brownish-yellow friable sandy clay loam.
28 inches +, brownish-yellow to reddish-yellow friable sandy clay mottled with gray, brown, and yellow; the depth of the accumulation ranges from about 4 to 20 feet.

Most areas of this soil are moderately eroded, and a considerable part of the original surface soil has been lost. There has been some mixing with the subsoil in places; consequently, the present surface layer is highly variable in thickness, color, and texture. Some areas are severely eroded and have lost most of the original surface layer. Shallow gullies are common in these areas. A few small areas of associated soils and a few very small stony areas are included with this soil as mapped.

The soil is strongly acid and low in organic matter and plant nutrients. Runoff and internal drainage are medium. The soil is permeable and permits easy penetration of plant roots and normal circulation of air and moisture. The few stones on the surface and throughout the soil mass do not interfere materially with cultivation.

Use and management.—Most of this soil has been cleared and placed under cultivation. However, 10 to 20 percent is currently idle or in nonfarm uses. A variety of crops are grown in a very irregular rotation. The tobacco and truck crops are generally heavily fertilized. Other crops receive only light applications, if they are fertilized at all. About 125 pounds an acre of a 0–10–4 mixture is used for corn and small grains. Commonly, 250 to 500 pounds of a 3–8–5 mixture is used for tobacco.

This soil is moderately well suited to crops and pasture. Owing to the naturally low fertility and moderately low water-supplying

capacity, the yields of most crops are low. The soil is deficient in lime, phosphate, nitrogen, and potash for most crops and is highly deficient for some. However, it responds well to the application of these amendments. It is not highly susceptible to erosion and can be maintained under a moderately short rotation if properly fertilized and tilled on the contour. This Third-class soil is in management group 8.

Jefferson fine sandy loam, eroded hilly phase (12 to 25 percent slopes) (Ja).—This is a yellow sandy well-drained soil of the colluvial lands. It was formed mainly from materials washed from Ramsey soils of the uplands. It differs from Jefferson fine sandy loam, eroded rolling phase, chiefly in having a steeper slope. It has a yellowish-gray or brownish-gray very friable fine sandy loam surface soil and a yellow to brownish-yellow friable sandy clay loam subsoil.

The soil is eroded. A considerable part of the original surface soil has been lost. There has been some mixing of surface soil with the subsoil in places, and in these the present surface layer is highly variable in thickness, color, and texture. This soil is mainly confined to the Jefferson-Barbourville-Dunmore and the Jefferson-Barbourville-Sequatchie soil associations.

Use and management.—Practically all of this soil is cleared. Some is being used for crops and some for pasture. A considerable part is idle or abandoned. Owing to the strong slopes, low fertility, and moderately low water-supplying capacity, this soil is not well suited to crops requiring tillage. On most farms it is probably best used for pasture. It is not naturally productive of pasture and will require moderate to heavy applications of lime and phosphate before it will produce pastures of even fair quality.

If the soil is cropped, a long rotation consisting chiefly of close-growing crops is needed. All tillage should be on the contour if this practice is at all feasible. Contour stripcropping should be considered for the longer slopes. The soil does not have enough lime, phosphorus, potassium, and nitrogen for the successful growth of most crops. This Fourth-class soil is in management group 13.

Jefferson stony fine sandy loam, undulating phase (2 to 5 percent slopes) (Jr).—This is a light-colored stony well-drained soil of the colluvial lands. It lies at the base of steep mountain slopes or spreads out a short distance over the valley floor. The soil has formed from materials washed or rolled from uplands underlain by quartzite, sandstone, shale, and slate. In this county most of the material is from Ramsey soils. The soil occurs in relatively small areas, mainly in the Jefferson-Barbourville-Sequatchie and the Jefferson-Barbourville-Dunmore soil associations. It is associated with Ramsey, Allen, and other Jefferson soils.

Profile description:

0 to 8 inches, yellowish-gray or brownish-gray very friable stony fine sandy loam; in most places has a thin surface layer 1 to 2 inches thick that is stained dark with organic matter.

8 to 26 inches, yellow to brownish-yellow friable stony sandy clay loam or clay loam.

26 inches +, brownish-yellow friable stony sandy clay loam mottled with gray, red, and brown in most places; the colluvial deposit ranges from 3 to 15 feet or more in depth.

The soil is strongly acid in reaction and apparently low in organic matter and plant nutrients. It absorbs moisture readily, but the moisture-holding capacity is low. It is very permeable to air, roots, and water. A few to many rounded and angular stones 5 to 10 inches across occur on the surface and throughout the soil. These stones interfere materially with cultivation.

Use and management.—All of this soil now has a forest cover. It is suited to crops and pasture, but its low fertility and stoniness limit its usefulness. On many farms the soil areas are small and not readily accessible. Because it is deficient in most of the essential plant nutrients and has a low water-supplying capacity, this soil would have low productivity for most crops and pasture. Although most of the common crops of the area could be grown, such crops as tobacco, red clover, and alfalfa would require very heavy fertilization for successful growth. This Third-class soil is in management group 5.

Jefferson stony fine sandy loam, rolling phase (5 to 12 percent slopes) (Jo).—This is a stony light-colored well-drained soil of the colluvial lands. It has formed from materials washed or rolled mainly from Ramsey soils of the uplands. It differs from Jefferson stony fine sandy loam, undulating phase, chiefly in having a steeper slope. Like that soil, it has a yellowish-gray or brownish-gray very friable stony fine sandy loam surface soil and a yellow to brownish-yellow friable stony sandy clay loam or clay loam subsoil.

This soil is closely associated with Ramsey, Allen, Sequatchie, Staser, Hamblen, Barbourville, Cotaco, and other Jefferson soils. It is widely distributed in the mountainous parts of the county.

Use and management.—All of this soil is in forest at the present time. It is suited to crops and pasture, but its low fertility, stoniness, and slope limit its usefulness. In addition, the areas are small and inaccessible on many farms. The soil is deficient in most of the essential plant nutrients and in water-supplying capacity; consequently, it would have low productivity for most crops and pasture. Most of the common crops of the area can be grown, but such crops as tobacco, red clover, and alfalfa will require very heavy fertilization. This Third-class soil is in management group 9.

Jefferson stony fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (Jm).—This soil is on rolling areas of alluvial-colluvial material that lie below and adjacent to areas of hilly and steep Ramsey soils. It differs from Jefferson stony fine sandy loam, rolling phase, chiefly in having lost a considerable part of the surface soil through erosion. The original surface layer still constitutes the plow layer in most of the areas, but this layer has been mixed with the subsoil in small spots. The present surface layer is yellowish-gray to grayish-yellow stony fine sandy loam. The subsoil is brownish-yellow friable stony fine sandy clay loam. This soil is closely associated with Ramsey, Allen, and other Jefferson soils. Most of it is in the Great Smoky Mountains area in the eastern part of the county.

Use and management.—All areas of this soil have been cleared and used for crops or pasture. A considerable part is idle, and some is reverting to forest. A number of crops are grown in very irregular rotations. Tobacco and truck crops are commonly heavily fertilized. Other crops receive only light applications if they are fertilized at all.

The soil is moderately well suited to crops and pasture but it is not naturally productive of either. Low fertility, low water-supplying capacity, stoniness, and slope greatly limit its usefulness. The content of major plant nutrients is deficient for practically all crops. Fertilization is necessary for good yields of most crops. Heavy applications of lime and fertilizers are required to maintain stands of such crops as alfalfa and red clover. The soil is moderately susceptible to erosion, and some special effort is required to control water on the land. This Third-class soil is in management group 9.

Jefferson stony fine sandy loam, hilly phase (12 to 25 percent slopes) (Jn).—This is a light-colored stony well-drained soil of the colluvial lands. It has formed at the base of mountain slopes from materials that have washed or rolled mainly from Ramsey soils. It differs from Jefferson stony fine sandy loam, rolling phase, chiefly in having steeper slopes but it is somewhat more variable in other characteristics, especially stoniness and depth to underlying material. This soil occurs in small irregularly shaped areas on foot slopes in the Great Smoky Mountains section of the county. The Ramsey and Allen are closely associated soils.

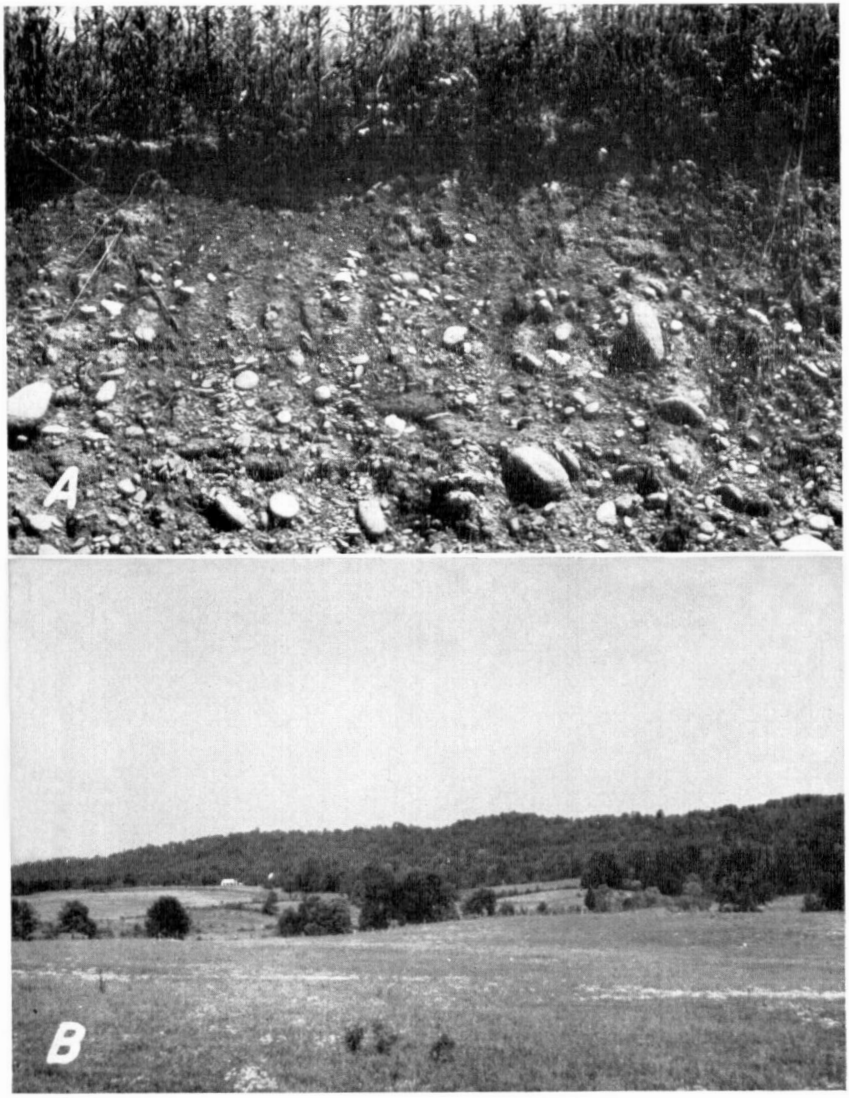
Profile description:

0 to 8 inches, yellowish-gray very friable stony fine sandy loam.
8 to 24 inches, yellow to brownish-yellow friable stony sandy clay loam or clay loam.
24 inches +, brownish-yellow stony sandy clay loam mottled with gray, yellow, red, and brown; the colluvial deposit ranges from 3 to 15 feet or more in depth.

This soil is strongly acid. It absorbs moisture readily but is too porous to retain it well. The content of organic matter and plant nutrients is low. The soil allows easy penetration of plant roots, air, and moisture. Numerous rounded and angular stone fragments 2 to 10 inches across are on the surface and throughout the soil mass. A few large stones more than 10 inches across are on the surface.

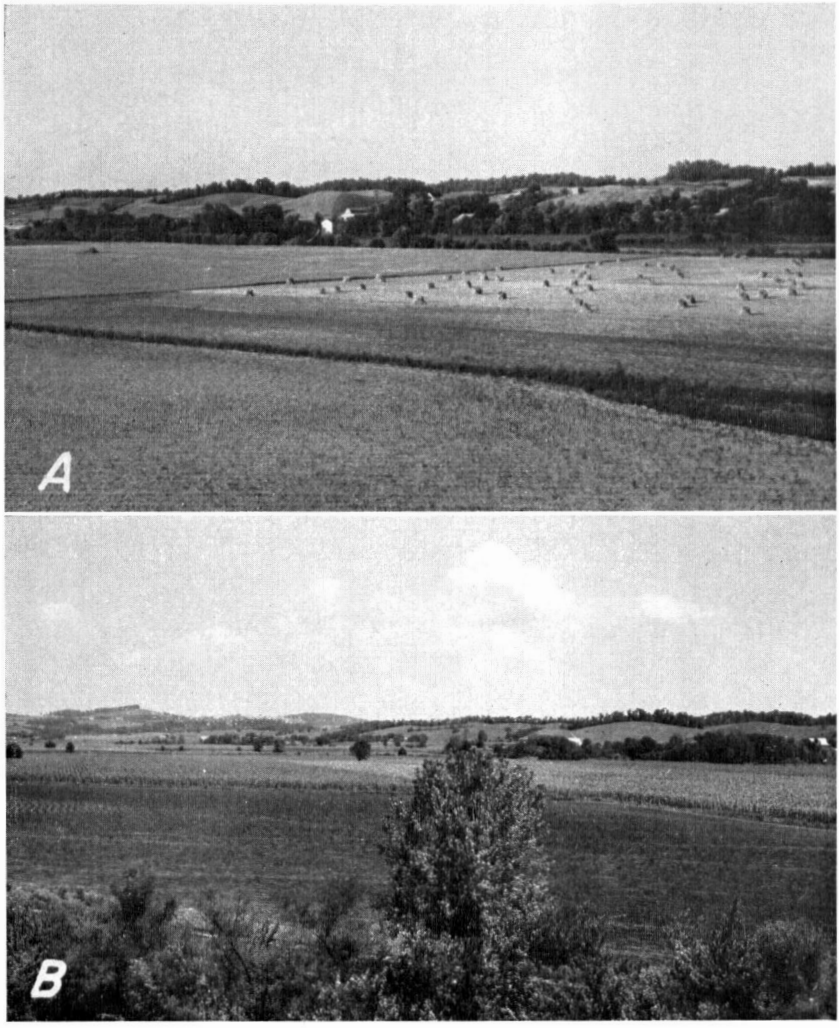
Use and management.—Practically all of this soil is forested. It is not suited to crops and is poorly suited to pasture. Owing to the low fertility and low water-supplying capacity, it is low in productivity for both crops and pasture. Because of stoniness and strong slopes, tillage and clipping of weeds in pastures are difficult. A good practice therefore is to grow clean-cultivated crops only at long intervals. Moderate to heavy applications of lime and phosphate are generally required to establish and maintain good pastures. On many farms the soil is best used for forestry. This Fourth-class soil is in management group 14.

Jefferson stony fine sandy loam, eroded hilly phase (12 to 25 percent slopes) (Jl).—This soil differs from Jefferson stony fine sandy loam, hilly phase, chiefly in being moderately eroded. A considerable part of the original surface soil has been lost, and in a few places the subsoil is exposed. In the plow layer the remnants of the surface soil have been mixed to some extent with the subsoil. As a result the present surface soil has become slightly heavier in texture and lower in plant nutrients and organic matter. The surface soil ranges from 4 to 10 inches in thickness and is a yellowish-gray to grayish-yellow friable stony fine sandy loam. The subsoil is yellow to brownish-yellow friable stony fine sandy clay loam.



A, Profile of Holston loam, undulating phase, showing cobbles.
B, Jefferson silt loam soils on undulating to rolling foot slopes.

A, Young tobacco plants on Sequatchie silt loam. Waynesboro soils are on the higher terrace and Ramsey soils are on the wooded slopes in the background. *B*, Excellent crop of corn on Sequatchie silt loam. The hay crop is on Hollywood silty clay loam, which is too poorly drained for dependable corn production.



A, Land use pattern of corn and wheat on Staser soils of the flood plain along the Little Pigeon River. The flood plain also includes some Hamblen soils. The hills in the distance consist chiefly of Dandridge soils.

B, Staser and Hamblen soils on flood plain of the Little Pigeon River. The Staser soils are commonly near the stream channel.

A, Whitesburg silt loam in foreground. Most of the material from which this soil formed has washed from the adjacent slopes.

B, Typical area in the Dandridge-Hamblen-Whitesburg soil association. In this association Dandridge and Litz soils are on most of the uplands, Whitesburg soil on the colluvial foot slopes, and Hamblen soils on the flood plains.

This soil is similar to the hilly phase of Jefferson stony fine sandy loam in distribution and associations. A few small areas that differ in having a slope greater than 25 percent are mapped with this soil.

Use and management.—All of this soil has been cleared and used for crops or pasture. Much of it is now in hay or pasture. A considerable part is idle, and some is used for cultivated crops. Crop and pasture yields are generally very low.

This soil is generally considered unsuitable for crops that require tillage. It is also rather poorly suited to pasture, but on most farms pasture is probably its best use. Fair pastures can be established and maintained under a high level of management. Moderate to heavy applications of lime and phosphate are generally required. The stones, which largely prevent clipping, make the control of weeds in pastures difficult. This Fourth-class soil is in management group 14.

Jefferson stony fine sandy loam, severely eroded hilly phase (12 to 25 percent slopes) (Jp).—This light-colored well-drained stony soil of the colluvial lands was formed from materials washed or rolled mainly from Ramsey soils. It differs from Jefferson stony fine sandy loam, hilly phase, chiefly in being severely eroded. Most of the original surface soil and, in places, a part of the subsoil have been lost through erosion. Shallow gullies are common. The present surface layer varies greatly in thickness, color, and texture, but in most places it is a grayish-yellow friable stony fine sandy loam. The subsoil is yellow to brownish-yellow friable stony sandy clay loam. This soil is closely associated with Ramsey, Allen, Barbourville, Cotaco, and Hayter soils throughout the mountainous part of the county.

Use and management.—All of this soil has been cleared and used for crops and pasture. Much of the acreage is now idle or abandoned, and some of this is reverting to forest.

Because of low fertility, low water-supplying capacity, and stoniness, this soil is very poorly suited either to crops or to pasture. On most farms it is probably best used for forests. Heavy applications of lime and phosphate are needed to establish and maintain permanent pastures. Barnyard manure is very helpful in establishing a stand on the galled spots. Diversion ditches and other special practices may be necessary to check gullying. This Fifth-class soil is in management group 14.

Jefferson very stony fine sandy loam, rolling phase (5 to 12 percent slopes) (Jv).—This is a well drained to excessively drained light-colored soil of the colluvial lands. It occurs at the base of steep or very steep mountain slopes and consists of materials rolled and washed from Ramsey soils of the uplands. It has many loose stones on the surface and throughout the soil. In fact, it differs from Jefferson stony fine sandy loam, rolling phase, chiefly in containing more stones. This soil has formed under a mixed hardwood and coniferous forest. It is distributed in the Great Smoky Mountains section of the county.

Profile description:

0 to 8 inches, gray to yellowish-gray loose very stony fine sandy loam; the 1- to 2-inch surface layer is stained dark with organic matter.

8 to 26 inches, grayish-yellow to brownish-yellow friable very stony sandy clay loam or clay loam.

26 inches+, yellow or brownish-yellow friable very stony sandy clay loam splotched with gray, red, and brown; consists of loose beds of stone in many places.

This soil is strongly to very strongly acid and apparently has moderately low supplies of organic matter and plant nutrients. Water infiltrates very rapidly, but the water-holding capacity is low. The soil is extremely permeable to air, roots, and water. Numerous rounded stones 2 to 10 inches across are on the surface and throughout the soil. A few boulders larger than 10 inches across are on the surface in places. The stones in the plow layer make tillage impractical.

Use and management.—All of this soil is forested. Extreme stoniness, low fertility, and low water-supplying capacity make it poor for tilled crops and very poor for pasture. The areas are generally small and not readily accessible. On most farms the soil is probably best left in forest. Fair pastures can be established if they are properly limed and fertilized, but weed control will be very difficult. The removal of stones will greatly improve the workability of the soil, and this practice may be feasible on small plots used for truck and garden crops. This Fourth-class soil is in management group 18.

Jefferson very stony fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (Jt).—This soil differs from Jefferson very stony fine sandy loam, rolling phase, chiefly in being eroded. A considerable part of the original surface soil has been lost by erosion, and the remainder has been mixed with the subsoil in places. The present surface layer is a grayish-yellow very stony fine sandy loam. The subsoil is grayish-yellow to brownish-yellow friable very stony sandy clay loam. This soil is distributed in small areas throughout the mountainous section of the county.

Use and management.—Practically all of this soil has been cleared and used for crops and pasture. At present, however, a large part is idle. Because of extreme stoniness, this soil is very poorly suited to intertilled crops. It is not naturally productive either of crops or of pasture, mainly because of the low fertility and low water-supplying capacity. Fair pastures can be established if they are properly limed and fertilized, but weed control is very difficult. The removal of stones to improve workability may be feasible on patches used for truck or garden crops. This Fourth-class soil is in management group 18.

Jefferson very stony fine sandy loam, hilly phase (12 to 25 percent slopes) (Ju).—This very stony light-colored soil of the colluvial lands has formed from materials washed or rolled mainly from Ramsey soils of the uplands. It differs from Jefferson very stony fine sandy loam, rolling phase, chiefly in having steeper slopes. It has a gray to yellowish-gray loose very stony fine sandy loam surface soil. The subsoil is a grayish-yellow to brownish-yellow friable very stony sandy clay loam.

This soil is closely associated with Ramsey, Allen, Barbourville, and other Jefferson soils. It is widely distributed throughout the mountainous part of the county.

Use and management.—All of this soil is in forest, and on most farms this is probably its best use. Many of the areas are small and not readily accessible. Fair pastures could be established on areas that were cleared and properly limed and fertilized, but weed control is very difficult. The pastures would be too stony to clip, and an intertilled crop might be needed at 7- or 8-year intervals to control weeds. This Fourth-class soil is in management group 18.

Jefferson very stony fine sandy loam, eroded hilly phase (12 to 25 percent slopes) (Js).—This is a very stony light-colored soil of the colluvial lands. It has formed on materials washed or rolled mainly from Ramsey soils of the uplands. It differs from Jefferson very stony fine sandy loam, hilly phase, chiefly in being eroded. A considerable part of the original surface soil, including the thin surface layer of higher organic-matter content, has been lost as a result of erosion. The remaining surface layer has mixed with the subsoil in places, but for most of the areas the plow layer is still within it. Removal of the finer particles by erosion has resulted in further accumulation of gravel and stones on the surface. The present surface layer consists of grayish-yellow very stony fine sandy loam. The subsoil is grayish-yellow to brownish-yellow friable very stony sandy clay loam. This soil is closely associated with the Ramsey soils and with Rough mountainous land (Ramsey soil material).

Use and management.—Practically all of this soil has been cleared and used for crops and pasture. At present, however, a large part is idle or abandoned and is reverting to forest. Because of very poor workability, the soil is considered very poorly suited to crops requiring tillage. Fair pastures can be established if they are properly limed and fertilized, but weed control will be very difficult. This Fourth-class soil is in management group 18.

Jefferson silt loam, undulating phase (2 to 5 percent slopes) (Jg).—This soil of the colluvial lands washed or rolled chiefly from Ramsey silt loam, Lehew, and Muskingum soils of the uplands. It occurs at the base of steep ridge or mountain slopes or is spread out a short distance over the valley floor (pl. 5, *B*). The soil formed chiefly under a deciduous forest cover and occurs in association with Ramsey, Lehew, Muskingum, Litz, and Hayter soils.

Profile description:

0 to 8 inches, brownish-gray to yellowish-gray friable silt loam.
8 to 30 inches, yellowish-brown to brownish-yellow or yellow friable silty clay loam.
30 inches +, brownish-yellow or yellow friable to slightly compact clay loam or silty clay loam, splotched with gray, yellow, red, and brown; bedrock, chiefly shale or slate, is at 3 to 8 feet.

This soil is quite variable in many characteristics. It is well drained to moderately well drained. The color of the subsoil ranges from yellow to yellowish-red. The reddish colored subsoil is a heavy silty clay loam or silty clay in most places. The soil is predominantly a silt loam but includes some areas that are very fine sandy loam or loam. Some of the soils included have weak hardpans and profiles quite similar to those of the Leadvale series mapped in nearby counties. Practically all of the soil is only slightly eroded, but a few areas are moderately eroded and others are uneroded.

The soil is strongly acid in reaction and apparently low in organic matter and most plant nutrients. It is permeable to air, roots, and water and has a moderate water-supplying capacity. A few shale fragments are on the surface and throughout the profile in most places.

Use and management.—Practically all of this soil is cleared and used for crops and pasture. Many different crops are grown but generally not in a systematic rotation. Truck crops and tobacco are usually

heavily fertilized, but fertilization is not a common practice for other crops.

This soil is well suited to a wide variety of crops. It is deficient, however, in all the major plant nutrients. The use of amendments is necessary for satisfactory yields of most crops and is essential for growth of such crops as alfalfa and red clover. This soil is probably less deficient in potash than the sandy Jefferson soils, but a complete fertilizer is needed for most crops.

This soil is moderately responsive to good management practices that include proper crop rotation and fertilization. If the crops are properly fertilized, yields can be maintained under a relatively short crop rotation. Runoff and erosion control are not serious problems, provided other management practices are good. The slopes are mild, good tilth is relatively easy to maintain, and the soil can be worked over a fairly wide range of moisture conditions without injury. This Second-class soil is in management group 5.

Jefferson silt loam, rolling phase (5 to 12 percent slopes) (Jf).—This is a moderately well-drained to well-drained soil of the colluvial lands. It is formed from materials washed chiefly from Ramsey shaly silt loam and Muskingum-Lehew soils and occurs at the base of steep ridges or mountain slopes. This soil is even more variable in characteristics than Jefferson silt loam, undulating phase. It differs from that soil chiefly in having steeper slopes. As mapped, it includes a noticeably larger acreage with a reddish colored subsoil than the undulating phase. The surface soil is brownish-gray to yellowish-gray friable silt loam. The subsoil is yellowish-brown to brownish-yellow or even yellowish-red friable silty clay loam.

The soil is closely associated with Ramsey, Lehew, Muskingum, Litz, and other Jefferson soils.

Use and management.—All of this soil is in forest. It is suited to crops and pasture, but many of the areas are small and not readily accessible. It is suited to a wide variety of crops, especially if adequately fertilized. It does not have enough lime, phosphorus, potassium, and nitrogen for high yields of most crops. If this soil is cleared and used for crops or pasture, the management requirements are similar to those of the undulating phase. This Third-class soil is in management group 8.

Jefferson silt loam, eroded rolling phase (5 to 12 percent slopes) (Jd).—This soil differs from Jefferson silt loam, undulating phase, in having steeper slopes and in being more eroded. A considerable part of the original surface layer has been lost by erosion. In many places a part of the subsoil has been mixed by tillage with the remnants of the original surface layer. The small severely eroded spots included are conspicuous because the subsoil is exposed. The present surface layer is a grayish-yellow to brownish-yellow friable silt loam. The subsoil is yellowish-brown to brownish-yellow or even yellowish-red friable silty clay loam. Reddish colored exposures of subsoil are common and conspicuous.

Use and management.—All of this soil is cleared and has been used for crops and pasture. At present, a considerable part is idle or in unimproved pasture. A wide variety of crops are grown, but not in any systematic rotation. Fertilization is not a common practice, except for tobacco and truck crops.

The soil is fairly well suited to many common field crops; but if it is not fertilized, yields are generally low. Lime and phosphate are essential for successful growing of deep-rooted legumes. A complete fertilizer is needed for satisfactory yields of most crops and pasture. A rotation of moderate length that includes legumes and other close-growing crops is desirable. The soil is moderately susceptible to erosion. All tillage should be on the contour where feasible. Contour stripcropping is desirable on the longer slopes. Terraces and other mechanical means of erosion control should not be necessary if other management practices are good. This Third-class soil is in management group 8.

Jefferson silty clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Jk).—This is a severely eroded soil of the colluvial lands. It was formed from materials washed mainly from Ramsey shaly silt loam and Muskingum-Lehew soils. It differs from Jefferson silt loam, eroded rolling phase, chiefly in being more eroded. Most of the original surface soil and, in places, a part of the subsoil have been lost by erosion. Gullies that have cut into the subsoil or substrata are common, but some of the original surface soil remains on the intergully areas in most places. The present surface layer ranges from yellowish gray to yellowish brown or yellowish red in color and from silt loam to silty clay loam in texture. The subsoil is yellowish-brown to brownish-yellow or even yellowish-red friable silty clay loam. This soil occurs in small areas.

Use and management.—All of this soil has been cleared and used for crops and pasture, but at the present time most of it is idle or in unimproved pasture.

This soil has been severely injured by erosion and is now unproductive of either crops or pasture. On most farms it can be used to best advantage for pasture. Unless a high level of management is to be practiced, the soil probably should be allowed to revert to forest. Considerable soil preparation is necessary before pastures can be successfully established. Suitable structures are required to stabilize gullies, and moderate to large applications of lime, phosphorus, and potassium are needed at the time of seeding. Scattering of droppings of grazing animals goes far toward maintaining an adequate supply of potassium on established pastures, but applications of lime and phosphorus are needed periodically. After a long period of good pasture management, fertility will be improved and physical properties restored to the extent that the soil can be used again for cropland. When conditions permit such use, management requirements will be similar to those of the eroded rolling phase of Jefferson silt loam. This Fourth-class soil is in management group 8.

Jefferson silt loam, hilly phase (12 to 25 percent slopes) (Je).—This is a light-colored well-drained soil of the colluvial lands. It has formed at the base of steep upland slopes from materials washed chiefly from Ramsey shaly silt loam and Muskingum-Lehew soils. This soil is more variable in characteristics than the rolling phase of Jefferson silt loam, but its chief difference is its steeper slopes. In addition, depth over bedrock averages less and more areas with reddish-colored subsoil are included. The surface layer is a brownish-gray to yellowish-gray, friable silt loam. In the wooded areas the

upper 1 to 2 inches is stained dark with organic matter. The subsoil is yellowish-brown, brownish-yellow, or even yellowish-red friable silty clay loam.

Use and management.—All of this phase is in forest, and on many farms this is probably its best use. Many of the areas are small and not readily accessible. The soil is fairly well suited to pasture. Lime, phosphorus, and possibly potassium are needed to establish and maintain good pastures. If the soil is properly fertilized, all the common pasture plants are well suited. If it must be used for crops, this soil requires a long rotation consisting chiefly of close-growing crops. All tillage should be on the contour and diversion ditches may be helpful in places. This Fourth-class soil is in management group 13.

Jefferson silt loam, eroded hilly phase (12 to 25 percent slopes) (Jc).—This soil differs from Jefferson silt loam, hilly phase, chiefly in being eroded. A considerable part of the original surface soil has been lost and the remainder has mixed to some extent with the subsoil. Small severely eroded spots are common and are conspicuous because the subsoil is exposed. The present surface layer is grayish-yellow to brownish-yellow friable silt loam. The subsoil is yellowish-brown to brownish-yellow or even yellowish-red friable silty clay loam. Like the uneroded hilly phase, this soil has formed from materials washed or rolled chiefly from Ramsey shaly silt loam, Lehew, or Muskingum soils.

Use and management.—All of this soil is cleared and has been used for crops or pasture. At the present time, however, a considerable part is idle or in unimproved pasture. Crop and pasture yields are generally low.

The soil is fairly well suited to pasture; but because of high susceptibility to erosion, moderately steep slopes, and low fertility, it is not considered well suited to crops requiring tillage. Its best use on most farms is probably for pasture or semipermanent hay crops. Lime, phosphorus, and possibly potassium are needed to establish and maintain productive pastures. Grazing will need careful control in order to maintain a good sod and control erosion.

If the soil must be cropped, it requires a long rotation consisting chiefly of close-growing crops. Fertilization is necessary for satisfactory yields of most crops and is essential for growing some, such as the deep-rooted legumes. All tillage should be on the contour, and diversion terraces may be effective in some places. This Fourth-class soil is in management group 13.

Jefferson silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Jh).—This soil differs from Jefferson silty clay loam, severely eroded rolling phase, chiefly in having a steeper slope. Erosion has removed most of the original surface soil and shallow gullies are common. The present surface layer ranges from yellowish gray to yellowish brown in color and from silty loam to silty clay loam in texture. The subsoil is yellowish-brown to brownish-yellow or even yellowish-red friable silty clay loam. This inextensive soil has formed from materials washed from Ramsey shaly silt loam, Lehew, and Muskingum soils.

Use and management.—All of this soil has been cleared and used for crops and pasture, but most of it is now idle. A large part of the

acreage has been abandoned and is reverting to forest—probably its best use on most farms. Under a high level of management, however, fair pastures can be maintained. Considerable soil preparation is necessary before productive pastures can be successfully established. Gullies need stabilizing, and moderate to large applications of lime, phosphorus, and potassium are required at the time of seeding. Additional applications of lime and phosphate are needed periodically. Very careful control of grazing is necessary in order to maintain a good sod for erosion control. This Fifth-class soil is in management group 13.

Lindside silt loam (0 to 3 percent slopes) (La).—This is a light-brown imperfectly drained soil of the stream bottoms in the limestone valleys. It consists of general alluvium washed from uplands underlain by limestone but includes, in most places, small amounts of material from other sources. Dunmore, Decatur, and Fullerton soils are the source of most of the material. The surface is nearly level, and all areas are subject to overflow. Most of this soil is in narrow, elongated areas along small streams. It is associated with Dunmore, Decatur, and Fullerton soils of the adjacent uplands and with Emory and Greendale soils of the colluvial lands.

Profile description:

0 to 16 inches, grayish-brown to light-brown mellow silt loam.
16 to 30 inches, mottled gray and light yellowish-brown friable heavy silt loam.
30 inches +, predominantly gray silt loam to silty clay loam splotched with brown and yellow; bedrock at depths of 5 to 10 feet or more.

Small areas of Greendale or Emory soils along some of the smaller streams are included with this soil as mapped. A small acreage occupying a depressional position and a few small poorly drained areas are also included.

The soil is slightly acid to near neutral in reaction and apparently well supplied with organic matter. It is relatively high in content of plant nutrients. Air, roots, and water penetrate the soil readily except when the lower layers are saturated with water. Runoff and internal drainage are slow. The water-supplying capacity is very high.

Use and management.—Practically all of this soil has been cleared and cultivated. An estimated 35 percent is used for corn, 10 percent for small grains, 30 percent for hay, 20 percent for rotation pasture, and 5 percent for other crops. Crops are not systematically rotated, and fertilization is not a common practice.

This is a productive soil for certain crops but its use suitability is limited by imperfect drainage and susceptibility to overflow. It is well suited to corn and certain hay and pasture crops but not well suited to alfalfa and small grains. The water table is apparently too high for alfalfa, and small grains commonly lodge. Excessive moisture often interferes with tillage and other field operations but the soil is not otherwise difficult to work. It is naturally well supplied with plant nutrients and organic matter, which are periodically replenished by sediment deposited by floodwaters. Drainage would probably increase the productivity of suitable crops, but it would not greatly broaden use suitability unless the soil were also protected from flooding. This Second-class soil is in management group 1.

Litz shaly silt loam, eroded rolling phase (5 to 12 percent slopes) (Lc).—This shallow shaly soil of the uplands was formed from materials weathered from acid shale that contains widely spaced beds of limestone or calcareous shale. It has formed under a yellow pine-hardwood forest. It is relatively inextensive and occurs in narrow belts closely associated with soils of the Sequoia series and Jefferson silt loam soils.

In most places, this soil consists of grayish-yellow to yellowish-brown friable shaly silt loam to silty clay loam. It rests on soft grayish-yellow shale at depths of 4 to 14 inches. Fragments of shale are numerous on the surface and in the soil material. In wooded areas and in well-established pastures, the topmost 1 or 2 inches of the material is stained dark with organic matter. The soil and also the shale are generally strongly acid.

Use and management.—Practically all of this soil has been cleared and used for crops or pasture. Most of it is now idle or in unimproved pasture. Some areas are reverting to forest, chiefly Virginia pine. This soil is considered to be best suited to forestry, although its use for pasture may be feasible. Because of the shallow depth, extreme susceptibility to erosion, low water-supplying capacity, and low fertility, it is unsuitable for crops requiring tillage. These characteristics also make it poorly suited to pasture but, with the use of lime and phosphate, fairly good pastures can possibly be established and maintained. Contour subsoiling may also be expected to aid materially in establishing and maintaining pastures. This Fourth-class soil is in management group 16.

Litz silt loam, hilly phase (12 to 25 percent slopes) (Ld).—This is a shallow inextensive shaly soil of the uplands. It was derived from materials weathered from acid shale that contains widely spaced beds of limestone or calcareous shale. It has formed under a yellow pine-hardwood forest.

The soil consists of grayish-yellow to yellowish-brown friable silt loam to silty clay loam. The topmost 1 or 2 inches is stained dark with organic matter. Soft grayish-yellow shale is 4 to 14 inches below the surface. The soil contains numerous shale fragments and is strongly acid throughout. It occurs on very short slopes in narrow, elongated areas closely associated with Jefferson silt loam and Sequoia soils.

Use and management.—This soil is covered with second-growth oak, hickory, and a scattering of Virginia pine. It is poorly suited to crops, chiefly because of the strong slopes, susceptibility to erosion, low water-supplying capacity, and low fertility. If properly fertilized, it can be expected to produce fair pastures. Use for pasture is not feasible in many places, however, because of the inaccessibility of the soil tracts. Lime and phosphorus are the chief requirements, but nitrate fertilizers may also be needed to establish the pasture. On most farms this soil is probably best used for forest. This Fifth-class soil is in management group 16.

Litz shaly silt loam, eroded hilly phase (12 to 25 percent slopes) (Lb).—This shallow shaly soil was formed in place from materials weathered from acid shale containing widely spaced beds of limestone or calcareous shale. The limestone constitutes 10 percent or less of the parent rock in most places. It differs from Litz shaly silt loam, eroded

rolling phase, chiefly in having a steeper slope. Average depth over bedrock is somewhat shallower, and shallow gullies are more common than on the eroded rolling phase. The soil consists of grayish-yellow to yellowish-brown friable shaly silt loam to silty clay loam. Soft grayish-yellow shale splotched with reddish yellow, dark brown, and gray occurs at depths of 4 to 14 inches in most places. A small acreage included in mapping has a slope greater than 25 percent.

Use and management.—All of this soil has been cleared and cultivated, but most of it is now either in largely unimproved permanent pasture or in idle land. Some of the idle areas are reverting to forest, mainly Virginia pine. Pastures are generally of poor quality and low carrying capacity. The soil is not considered suited to crops, because of its extreme susceptibility to erosion, very low water-supplying capacity, and low fertility. It is strongly acid in reaction and low in content of organic matter and plant nutrients. It is especially deficient in lime, phosphorus, and nitrogen. Its best use on most farms is probably for forest. This Fifth-class soil is in management group 16.

Monongahela silt loam (2 to 5 percent slopes) (Ma).—This is a pale-yellow imperfectly drained soil of the stream terraces. It has formed from old general alluvium originating from quartzite, sandstone, slate, and shale. It occurs on nearly level to undulating old stream terraces along almost all the major streams in the county and is closely associated with Holston, Tyler, and Hamblen soils. The larger part of the acreage is in the Holston-Nolichucky-Tyler soil association.

Profile description:

0 to 8 inches, yellowish-gray to light brownish-gray mellow silt loam; in wooded areas or well-established pastures, the upper 1 or 2 inches is stained dark with organic matter.
8 to 22 inches, yellow or pale-yellow friable silty clay loam.
22 inches +, compact silty clay highly mottled with yellow, gray, and olive.

The soil is strongly acid in reaction and apparently low in organic matter and plant nutrients. Generally a few cobbles are present in the soil, but in some small areas there are enough to interfere with tillage. Surface drainage is adequate but internal drainage is slow. The upper part of the soil is permeable to air, roots, and water, but the compact layer is relatively impermeable.

Use and management.—Most of the soil is cleared and used for crops and pasture. Most yields are low—lower than those obtained on the Holston soils. Because of its low fertility and somewhat unfavorable internal moisture condition, this soil is not well suited to crop production. Nevertheless, it is easy to work and the tilth of the surface soil is generally good. The soil responds fairly well to fertilization but not so well as the better drained soils. Like the Holston soils, it is in great need of fertilization. Most crops common to the area have been grown on this soil, but alfalfa and tobacco are not well suited and other crops are not highly productive. Fair yields, however, can be obtained, especially of wheat. A complete fertilizer is needed for satisfactory yields of most crops. Liming is essential for success with legumes. The control of erosion is no problem, because of the gentle slopes. This Third-class soil is in management group 5.

Muskingum-Lehew loams, steep phases (25 to 60 percent slopes) (Mb).—This is a complex of two soils so intricately associated geo-

graphically that it was considered impractical to delineate each soil separately on the map. The soils are Muskingum loam, steep phase, and Lehew loam, steep phase. They are excessively drained shallow sandy soils on steep upland slopes. The parent materials were weathered from the underlying acid sandstone and shale. The soils differ chiefly in color. The parent material of the Lehew soil has a noticeable purplish cast, whereas that of the Muskingum soil is predominantly yellow. These are the dominant soils in the Muskingum-Lehew-Jefferson soil association.

Profile descriptions:

Muskingum loam, steep phase—
0 to 10 inches, gray or yellowish-gray loose loam; the upper part, about 1 inch thick, stained dark with organic matter; some small shale and sandstone fragments on the surface and throughout the layer.
10 to 20 inches, brownish-yellow or light yellowish-brown friable loam or light clay loam; depth to bedrock averages about 20 inches but varies from about 10 inches to 3 feet; bedrock outcrops not uncommon.

Lehew loam, steep phase—
0 to 8 inches, purplish-gray loose loam; upper inch stained dark with organic matter in wooded areas.
8 to 20 inches, purplish-red or purplish-brown friable loam or light clay loam mixed with partially weathered, red, purple, and green shale and sandstone fragments; depth to bedrock varies from about 10 to 30 inches.

These soils are strongly to very strongly acid and apparently low in organic matter and most plant nutrients. They are very permeable throughout to air, roots, and water. The water-holding capacity is very low. Runoff and internal drainage are rapid to very rapid. Small fragments of sandstone and shale are on the surface and throughout the soil in most places, and bedrock outcrops are fairly common.

Use and management.—Nearly all areas of this complex are in yellow pine-hardwood forest. This is the best use for these soils. They are very poorly suited to pasture. They are wholly unsuited to ordinary crop production because of steepness, shallowness, presence of bedrock outcrops, and high susceptibility to erosion. The members of this complex are Fifth-class soils and are in management group 19.

Nolichucky loam, undulating phase (2 to 5 percent slopes) (Ne).—This is a sandy well-drained soil on high stream terraces. The old general alluvium from which the soil originated came mainly from sandstone, quartzite, slate, and shale. In most places there is a small admixture of materials from granite, gneiss, and limestone. The native vegetation was chiefly deciduous hardwoods. This soil is largely confined to the Holston-Nolichucky-Tyler and Cumberland-Waynesboro-Congaree soil associations.

Profile description:

0 to 10 inches, yellowish-gray to brownish-gray very friable loam.
10 to 20 inches, brownish-yellow or yellowish-brown friable light clay loam or silty clay loam.
20 to 50 inches, reddish-yellow or yellowish-red friable clay loam to silty clay loam.
50 inches +, yellowish-red firm clay loam to sandy clay streaked and splotched with gray; beds of gravel and cobbles or limestone or shale residuum are at depths of 3 to 15 feet in most places.

The soil is strongly acid and appears to be moderately low in organic matter and plant nutrients. A few pebbles and cobbles are on the surface and throughout the soil. The soil is permeable to air, roots,

and water. Runoff is slow to medium and internal drainage is medium. The water-holding capacity is moderate.

Use and management.—Practically all of this soil has been cleared and is used for crops and pasture. A very small acreage is idle or in nonfarm uses. A wide variety of crops are grown, but generally not in a systematic rotation. Tobacco and truck crops are heavily fertilized. Other crops receive very little fertilizer.

This soil is fairly well suited to all the common crops and to pasture. It is low in fertility but responds well to the use of fertilizers and amendments. Lime is needed, especially for the legume crops. All crops need phosphorus for continued high production. Nitrogen is a limiting element except when supplied by legumes. Potash is likely to be needed, especially for tobacco and legumes. The soil is easily tilled and conserved. This Second-class soil is in management group 3.

Nolichucky loam, rolling phase (5 to 15 percent slopes) (Nd).—This sandy well-drained soil occurs on high stream terraces that are mostly 75 to 150 feet above the present flood plain. It was derived from old alluvium originating largely from sandstone, quartzite, slate, and shale. This alluvium included, however, a small admixture of material from granite, gneiss, and limestone. Most of these terrace deposits are underlain by limestone or calcareous shale at depths of 3 to 15 feet or more.

The soil is confined mainly to the Holston-Nolichucky-Tyler soil association.

Profile description:

0 to 8 inches, yellowish-gray to brownish-gray very friable loam; upper 1 or 2 inches stained dark with organic matter.
8 to 18 inches, brownish-yellow or yellowish-brown friable light clay loam or silty clay loam.
18 to 48 inches, reddish-yellow or yellowish-red friable clay loam to silty clay loam; moderate medium blocky.
48 inches +, yellowish-red firm clay loam to sandy clay streaked and splotched with gray; beds of coarse gravel and cobbles at depths of 3 to 15 feet in most places.

The soil is strongly acid, apparently moderately low in organic matter, and moderately low in plant nutrients. A few pebbles and cobbles are on the surface and throughout the profile. The soil is permeable and permits easy root penetration and good circulation of air and moisture. Both runoff and internal drainage are medium. The water-holding capacity is moderate.

Use and management.—All of this soil is in forest, generally in small tracts not easily accessible from other cropland on the farm. It is well suited to crops and pasture. It is deficient in lime and most of the major fertilizing elements. Correction of these deficiencies is necessary for the successful growth of many of the common crops. If the soil is cleared and used for crops and pasture, the management will be similar to that for the eroded rolling phase. This Third-class soil is in management group 6.

Nolichucky loam, eroded rolling phase (5 to 15 percent slopes) (Nb).—This is a well-drained soil on high stream terraces. The old alluvium from which it was derived washed chiefly from Ramsey soils, but it included some material from many other soils.

This phase differs from the rolling phase of Nolichucky loam chiefly in being eroded. A considerable part of the original surface layer has been lost. In some spots all the original surface layer is missing and the subsoil is exposed. A few shallow gullies are in the more eroded areas. Some of the subsoil has mixed with the remaining surface soil in the plow layer, and as a result the present layer is highly variable in color, texture, and thickness. It is yellowish-gray to brownish-yellow friable loam. The subsoil consists of reddish-yellow or yellowish-red moderately friable clay loam or silty clay loam.

Most of this soil is in the Holston-Nolichucky-Tyler soil association, but some areas are in the Cumberland-Waynesboro-Congaree soil association.

Use and management.—Practically all of this soil has been cleared and cultivated. A wide variety of crops are grown, but only a few farmers follow a systematic crop rotation. Tobacco and truck crops are heavily fertilized with a complete fertilizer. Other crops receive only light applications. The use of lime and phosphate on hay crops and pasture has been increasing rapidly in recent years, however.

The soil is well suited to crops and pasture, but proper fertilization and crop rotation are required for satisfactory yields. Under ordinary conditions a rotation of at least moderate length that includes a deep-rooted legume crop is desirable. The soil does not have enough lime and major fertilizing elements for high crop yields. It responds to fertilization, but the response is not likely to be so lasting as on the Cumberland soils, for example. Adequate applications of lime and phosphate are essential for success with such crops as alfalfa and red clover. The soil is moderately susceptible to erosion, and contour cultivation is necessary. Terracing, if feasible, may make it possible to shorten the rotation. This Third-class soil is in management group 6.

Nolichucky loam, hilly phase (12 to 25 percent slopes) (Nc).—This is a well-drained sandy soil of the high stream terraces. It was derived from old general alluvium that came chiefly from sandstone, quartzite, slate, and shale. In most places the alluvium contained a small admixture of materials from granite, gneiss, and limestone.

The soil differs from Nolichucky loam, rolling phase, chiefly in having stronger slopes. The surface soil consists of yellowish-gray to brownish-gray very friable loam. The subsoil is reddish-yellow or yellowish-red friable clay loam or silty clay loam. Depth to underlying bedrock is more variable than in the rolling phase, but it is 3 feet or more in most places. This soil is associated with Holston, Waynesboro, and Monongahela soils of the terraces and with Dunmore, Fullerton, Sequoia, and Dandridge soils of the uplands.

Use and management.—All of this soil is in forest at the present time. Because of strong slopes, low fertility, and susceptibility to erosion, it is poorly suited to crops that require tillage. Pasture and close-growing hay are fairly well suited crops. The soil is low in available plant nutrients but is responsive to good management that includes proper fertilization. Tillage is moderately difficult, and soil and moisture conservation is a problem. If the soil is cleared and used for crops and pasture, the management will be similar to that for Nolichucky loam, eroded hilly phase. This Fourth-class soil is in management group 13.

Nolichucky loam, eroded hilly phase (12 to 25 percent slopes) (Na).—This hilly sandy well-drained soil occurs on high stream terraces that are 75 to 150 feet above the present flood plains. It has formed from old general alluvium originating chiefly from sandstone, quartzite, slate, and shale. The alluvium also contained a small admixture of materials from granite, gneiss, and limestone in most places. The soil differs from the eroded rolling phase of Nolichucky loam chiefly in having steeper slopes. The surface soil, which consists of a yellowish-gray to brownish-yellow fine sandy loam, is from 4 to 8 inches thick. The subsoil consists of a reddish-yellow or yellowish-red friable clay loam or silty clay loam. Most of this soil is on high terraces of the French Broad and Little Pigeon Rivers. Holston, Monongahela, and Waynesboro soils are closely associated.

Use and management.—Practically all of this soil has been cleared and used for crops and pasture. Although some is in tilled crops, most of it is now used for hay and pasture and a considerable part is idle. Both crop and pasture yields are moderately low.

This soil is not well suited to crops that require tillage. Such crops should be grown in a long crop rotation that consists largely of close-growing legumes and grasses. The soil is low in organic matter, lime, phosphate, and potash. Fertilization is therefore very necessary for successful yields of most crops and essential for the production of some. This soil is rather highly susceptible to erosion, and cultivation therefore should be on the contour.

This soil is better suited to pasture or semipermanent hay crops than to tilled crops. On most farms pasture is probably its best use. Good pastures can be established and maintained under a management system that includes the use of lime and phosphate and carefully controlled grazing. This Fourth-class soil is in management group 13.

Prader silt loam (0 to 3 percent slopes) (Pa).—This gray poorly drained soil consists of recent alluvium washed from Dandridge, Sequoia, Litz, and Ramsey soils. It occupies bottom lands that lie a little higher than the normal level of the streams. Many of the areas occupied, especially those on the river bottoms, are depressional old stream channels.

Much of the soil on narrow bottoms of perennial streams in the calcareous shale uplands receives considerable seepage from the adjacent upland slopes. Both runoff and internal drainage are poor. Water remains on the surface during much of the year, and the water table is near the surface at all times. The native vegetation was largely water-tolerant oaks, willow, and sweetgum. Individual areas are small and occur mainly as long narrow belts. They are widely distributed in all parts of the county except the area underlain by limestone.

Profile description:

0 to 10 inches, medium-gray friable silt loam splotched with yellow and rust brown.
10 to 20 inches, gray, friable, heavy silt loam or silty clay loam splotched with yellow and rust brown.
20 inches +, bluish-gray plastic silty clay or heavy silty clay loam; the thickness of the alluvium varies from 4 to 10 feet or more.

The soil is nearly neutral to slightly acid and contains a moderate amount of plant nutrients and organic matter. When not saturated

with water, it is relatively permeable to air, roots, and water. The high water table greatly restricts the root development of many crops.

Use and management.—A large part of the acreage of this soil has been cleared, but much of it has since grown up in willow and alder thickets. Most of the cleared areas are in pasture, but some are in crops, mainly corn. Average yields of corn are low and total failures are common. Artificial drainage can be expected to broaden the use suitability, but the soil would still be largely limited to summer annual crops, such as corn, soybeans, and sorghum. Moderate fertility and the ability to support vegetation during prolonged dry periods make Prader silt loam fairly well suited to pasture. This Fourth-class soil is in management group 17.

Ramsey shaly silt loam, steep phase (25 to 60 percent slopes) (Rd).—This shallow excessively drained soil occurs extensively on the lower slopes and foothills of the Great Smoky Mountains. It consists mainly of residual materials weathered from slate and fine-grained quartzite. Individual areas are large and are in the Rough mountainous land—Ramsey soil association. This soil is closely associated with Hayter, Staser, Hamblen, Dandridge, and other Ramsey soils.

Profile description:

0 to 2 inches, dark grayish-brown loose shaly silt loam that contains considerable organic matter.
2 to 10 inches, light-brown, yellowish-brown, or brownish-yellow friable shaly light silty clay loam.
10 to 30 inches, partially weathered beds of shale and brownish-yellow silty clay loam; unweathered bedrock at depths of 6 to 30 inches in most places.

Color and depth to bedrock are quite variable. The soil on the south-facing slopes is lighter and that on the north-facing slopes is darker than in the profile described. On the lower and milder slopes the soil is deeper and on the upper slopes it is shallower than in this profile.

The soil is strongly acid throughout. It is moderately well supplied with organic matter in wooded areas but it is apparently moderately low in plant nutrients. Shale or slate fragments ½ inch to 2 inches across are on the surface and throughout the soil. Bedrock outcrops are not uncommon. The soil is permeable to air, roots, and water. Runoff is very rapid and internal drainage is rapid. The water-holding capacity is very low.

Use and management.—Practically all of this soil is in yellow pine-hardwood forest. Virginia, shortleaf, and pitch pines and oaks are dominant on the south-facing slopes, and poplar, white pine, and oaks on the north-facing slopes.

Because of its steep slopes, shallowness, low water-holding capacity, low fertility, and susceptibility to erosion if cleared, this soil is best used for forest on most farms. This Fifth-class soil is in management group 19.

Ramsey shaly silt loam, eroded steep phase (25 to 60 percent slopes) (Rb).—This is a shallow excessively drained soil on steep mountain slopes that are underlain by slate and fine-grained quartzite. It differs from Ramsey shaly silt loam, steep phase, chiefly in being eroded. A considerable part of it has been lost, including the thin

surface layer of high organic-matter content. The soil consists of 6 to 10 inches of light-brown, yellowish-brown, or brownish-yellow friable shaly silt loam or light silty clay loam. Beneath this material are partially weathered beds of slate as much as 20 inches thick. These beds overlie unweathered slate. On the more eroded areas, the partially weathered slate is mixed with the plow layer. In many places, however, the rate of erosion has been more rapid than the rate of slate decomposition, and the mixed plow layer is down to the unweathered bedrock. Shallow gullies are common, especially in the idle or abandoned fields.

Use and management.—Practically all of this soil has been cleared and used for crops and pasture. Some of it is still used for crops, mainly corn, and a larger part is in pasture. A considerable part is idle or abandoned. Most of the pastures are unimproved and not very productive, but some have been improved by the use of lime and phosphate and the seeding of improved pasture mixtures.

This soil is considered unsuited to crops and very poorly suited to pasture because of steepness, low water-holding capacity, low fertility, and susceptibility to erosion. On most farms, it is probably best suited to forest. Pastures will require lime and phosphate and an improved pasture mixture to obtain a satisfactory sod that will hold the soil. Grazing will need to be carefully controlled. This Fifth-class soil is in management group 19.

Ramsey shaly silt loam, very steep phase (60 + percent slopes) (Re).—This is a shallow excessively drained soil on very steep mountain slopes. It consists mainly of residual materials weathered from slate and fine-grained quartzite. This soil differs from Ramsey shaly silt loam, steep phase, chiefly in having a steeper slope. It is a light-brown, yellowish-brown, or brownish-yellow friable shaly light silty clay loam or silt loam, 6 to 12 inches thick. This material is underlain by partially weathered slate beds as much as 12 inches thick. In wooded areas, the 1- to 3-inch surface layer is stained dark with organic matter. Bedrock outcrops are common in most places.

This is a very extensive soil in the Great Smoky Mountains section of the county. It occurs in relatively large areas in the Rough mountainous land-Ramsey soil association, where it is closely associated with Hayter, Staser, Hamblen, Cotaco, Dandridge, and other Ramsey soils.

Use and management.—Most of this soil is in yellow pine-hardwood forest. Some areas have been cleared and used for crops, but most of these areas are now idle or abandoned or in unimproved pasture. This soil is very shallow and very low in water-holding capacity and fertility. Consequently, it is extremely difficult to conserve when used for either crops or pasture. It is probably best used for forest. This Fifth-class soil is in management group 20.

Ramsey shaly silt loam, hilly phase (12 to 25 percent slopes) (Rc).—This is a shallow excessively drained soil on some of the less steep mountain slopes and ridgetops underlain by slate and fine-grained quartzite. It differs from Ramsey shaly silt loam, steep phase, chiefly in being less strongly sloping. The soil consists of light-brown, yellowish-brown, or brownish-yellow friable shaly light silty clay loam or silt loam, 6 to 15 inches thick. This material is underlain

by partially weathered slate as much as 15 inches thick. The 1- to 3-inch surface layer is stained dark with organic matter in most places. The average depth of this soil is practically the same as the average depth of the steep or very steep Ramsey soils, but bedrock outcrops are less common. Most of this soil is associated with Hayter, Barbourville, Cotaco, Dandridge, Hamblen, Staser, and other Ramsey soils.

Use and management.—Practically all of this soil is in yellow pine-hardwood forest. Virginia, shortleaf, and pitch pines and oaks are dominant in most of the forests. Some white pine is in the forests on north-facing slopes.

This soil is not considered suitable for crops, especially intertilled crops, because of its shallowness, low water-holding capacity and low fertility, and high susceptibility to erosion. Although the soil is considered suitable for pasture, much of it is isolated by large areas of steep or very steep soils and cannot be feasibly cleared. If cleared, the pasture management will be similar to that for Ramsey shaly silt loam, eroded hilly phase. This Fourth-class soil is in management group 16.

Ramsey shaly silt loam, eroded hilly phase (12 to 25 percent slopes) (Ra).—This is a shallow excessively drained soil that differs from Ramsey shaly silt loam, eroded steep phase, chiefly in having a milder slope. Like that soil, it consists of residual materials weathered from slate and fine-grained quartzite. A considerable part of the original soil material, including the thin surface layer of higher organic-matter content, has been lost as a result of erosion. The soil consists of 4 to 12 inches of light-brown, yellowish-brown, or brownish-yellow, friable shaly silt loam or light silty clay loam underlain by partially weathered slate. Unweathered bedrock is at depths of 30 inches or less. In some places, however, the rate of erosion has been more rapid than the rate of slate decomposition, and in these places the plow layer is down to the unweathered bedrock. Shallow gullies are common in the idle or abandoned fields.

Use and management.—This soil has been cleared and used for crops and pasture, but a considerable part is idle or abandoned at present. Some is still used for crops, but a larger part is in pasture, mainly unimproved. The unimproved pastures are low to very low in productivity, but fairly productive pastures have been obtained under good management.

The soil is very poorly suited to intertilled crops because of strong slopes, susceptibility to erosion, low water-holding capacity, and low fertility. Fair to good pastures can be established and maintained, however, under a high level of management. Use of lime and phosphate and a good pasture mixture for seeding generally will greatly increase the productivity and produce a good sod that is effective in controlling erosion. Careful control of grazing is necessary to maintain a good sod at all times. Some of the more severely eroded areas are probably best used for forestry. This Fourth-class soil is in management group 16.

Ramsey stony fine sandy loam, steep phase (30 to 60 percent slopes) (Rh).—This is a light-colored excessively drained stony soil on steep mountain slopes. It consists of residual materials weathered from quartzite, sandstone, and conglomerate. Sandstone and quartz-

ite fragments 2 to 10 inches across are on the surface and throughout the profile. This soil differs from Ramsey shaly silt loam, steep phase, chiefly in being coarser textured and stony. It is widely distributed in the Rough mountainous land-Ramsey soil association. It occurs in large areas associated with Staser, Hamblen, Jefferson, Allen, Barbourville, Cotaco, and other Ramsey soils.

Profile description:

0 to 8 inches, pale-brown to light yellowish-brown loose stony fine sandy loam; in wooded areas the surface inch is stained dark gray with organic matter.

8 to 18 inches, brownish-yellow to pale-yellow friable stony fine sandy loam or sandy clay loam.

18 inches +, pale-yellow sandy clay loam and thin layers of soft partially weathered rock fragments; in most places unweathered bedrock is at depths of 36 inches or less.

The soil is medium to strongly acid in reaction and apparently low in content of organic matter except in the thin surface layer. It is moderately low in plant nutrients and very permeable to air, roots, and water. Runoff is very rapid and internal drainage is rapid. The water-holding capacity is very low.

Use and management.—Practically all of this soil is still in yellow pine-hardwood forest. A large proportion is within the Great Smoky Mountains National Park. Owing to its steepness, stoniness, shallow depth, and low fertility, it is best used for forestry. For a discussion of forest management, see the section on Forests. This Fifth-class soil is in management group 19.

Ramsey stony fine sandy loam, eroded steep phase (25 to 60 percent slopes) (Rf).—This is a shallow excessively drained stony soil on steep mountain slopes. It consists of residual materials weathered from quartzite, sandstone, and conglomerate. It differs from Ramsey stony fine sandy loam, steep phase, chiefly in being eroded. A considerable part of the original surface soil, including the thin surface layer of higher organic-matter content, has been lost through erosion.

This phase consists of about 6 to 12 inches of yellowish-gray to brownish-yellow friable stony fine sandy loam, underlain by a layer of partially disintegrated rock mixed with soil material. Unweathered bedrock is at depths of less than 30 inches in most places, although bedrock outcrops are common. Numerous shallow gullies occur, especially in idle or abandoned fields.

Use and management.—This soil has been cleared and used for crops and pasture, but a large part is now idle or abandoned and is reverting to forest. Abandoned fields grow up in Virginia pine in just a few years. Owing to steepness, stoniness, low fertility, low water-holding capacity, and extreme susceptibility to further erosion, this soil is considered unsuitable either for crops or for pasture. On most farms, it is best used and managed for forestry. This Fifth-class soil is in management group 19.

Ramsey stony fine sandy loam, very steep phase (60+ percent slopes) (Rk).—This is a light-colored excessively drained stony soil on very steep mountain slopes. It consists of residual materials weathered from quartzite, sandstone, and conglomerate. It differs from Ramsey stony fine sandy loam, steep phase, chiefly in having a

349399—56——7

steeper slope, but in general it is more shallow and stony and has more bedrock outcrops. The surface soil is a pale-brown to light yellowish-brown loose stony fine sandy loam. The subsoil is a brownish-yellow to pale-yellow friable fine sandy loam or light sandy clay loam. In wooded areas the 1- to 2-inch surface layer is stained dark gray with organic matter. This soil is very extensive and widely distributed throughout the Rough mountainous land-Ramsey soil association.

Use and management.—Practically all of this soil is still in yellow pine-hardwood forest, and a large part is within the Great Smoky Mountains National Park. Because of the very steep slopes, shallow depth, stoniness, and low fertility, this soil is unsuited for either crops or pasture. It is best used for forestry, although not very productive of forests. This Fifth-class soil is in management group 20.

Ramsey stony fine sandy loam, hilly phase (12 to 25 percent slopes) (Rg).—This is a light-colored excessively drained soil of the mountain uplands. It consists of residual materials weathered from quartzite, conglomerate, and sandstone. It differs from Ramsey stony fine sandy loam, steep phase, chiefly in having less steep slopes. In general this soil also differs in being somewhat deeper and slightly less stony and in having fewer bedrock outcrops.

The surface soil is pale-brown to light yellowish-brown loose stony fine sandy loam. The subsoil is brownish-yellow to pale-yellow friable stony fine sandy loam or sandy clay loam. Bedrock is at depths of ½ to 3 feet in most places. A small acreage is included that has lost a considerable part of the original surface layer as a result of erosion. This is the least extensive of the Ramsey soils. It occurs in small areas in the Rough mountainous land-Ramsey soil association.

Use and management.—Practically all of this soil is still in yellow pine-hardwood forest.

The soil is poorly suited to crops, chiefly because of stoniness, low fertility, and susceptibility to erosion. It is also poorly suited to pasture, but fair to good pastures can be established and maintained under a high level of management. The soil is deficient in lime, phosphate, nitrogen, and potash for most crops and pasture plants. Adequate amounts of lime and phosphate would be required under good pasture management, and potash would possibly be needed to establish a good pasture mixture. The legumes in the pasture should supply most of the nitrogen needed. Weed control is difficult because of stoniness and strong slopes. This Fourth-class soil is in management group 16.

Roanoke silt loam (0 to 3 percent slopes) (Rl).—This is a gray poorly drained soil of the stream terraces. The old alluvium from which the soil has formed was washed largely from uplands underlain by granite and gneiss. On most places, however, it included a small admixture of a wide variety of materials. The soil occurs in small tracts on nearly level to slightly depressional areas of the low stream terraces. It is closely associated with State silt loam and differs chiefly in being poorly drained.

Profile description:

0 to 8 inches, light-gray to brownish-gray friable silt loam; weak medium crumb structure.

8 to 22 inches, friable to firm (plastic when wet) silty clay to silty clay loam mottled with gray, yellow, and brown; moderate medium blocky structure.

22 inches +, compact bluish-gray clay highly mottled with yellow and rust brown; the terrace deposit is 5 feet or more in thickness.

As mapped, the soil includes small areas that vary greatly from the soil described in color and drainage. The color may range from gray to yellow and the drainage from poor to imperfect. Some areas that are poorly drained, largely because of seepage, do not have the slowly permeable compact clay subsoil.

This soil is apparently moderately low in organic-matter content, is medium to strongly acid in reaction throughout, and is low in most plant nutrients. It is practically stone- and gravel-free. Both runoff and internal drainage are slow to very slow. The soil is very slowly permeable to water. For extended periods normal air circulation and root penetration are prevented by waterlogging.

Use and management.—Most of the soil is cleared and used for crops and pasture. The acreage is about equally divided between corn, hay, pasture, and idle land. Crop yields are very low and complete failures are common.

Mainly because of poor drainage, this soil is not considered suited to crops that require tillage. It is suited to pasture and certain hay crops, however. The soil is deficient in lime and most of the major plant nutrients and produces very poor pasture. Results of good management, including fertilization, are poor and do not last. This Fourth-class soil is in management group 17.

Rough gullied land (Ramsey and Litz soil materials) (12 to 60 percent slopes) (Ro).—This land type consists of badly gullied areas that originally were covered by Ramsey or Litz soils derived from quartzite, slate, or acid shale materials. It has been reduced to an intricate pattern of gullies, and very little of the original soil layers remains. In some places bedrock outcrops are common, but in others the soil material is 12 to 24 inches thick. Most of the acreage is in the Armuchee-Litz-Farragut soil association.

Use and management.—This land type is very poorly suited to crops or pasture. Forestry, although also very poorly suited, is the most practical use on most farms. Virginia and shortleaf pine are probably best adapted to the severe growing conditions and can be expected to stabilize the erosion within a few years. This Fifth-class soil is in management group 20.

Rough gullied land (Dandridge soil material) (12 to 60 percent slopes) (Rm).—This land type consists of badly gullied areas that originally were covered by Dandridge soils. The gullies, which cover 40 to 100 percent of the surface, are usually less than 3 feet deep. The soft black calcareous shale bedrock is exposed in most areas, and little soil material remains. Areas of this land type are very small and are largely confined to the Dandridge-Hamblen-Whitsburg soil association.

Use and management.—Under ordinary conditions, it would be unwise to attempt to reclaim this land for either pasture or cropland. It should be allowed to revert to woodland and be kept in this use if reasonably possible. As the shale is calcareous, black locust can be expected to do well, especially in the fill material in the gullies. This Fifth-class soil is in management group 20.

Rough gullied land (limestone material) (12 to 60 percent slopes) (Rn).—This land type consists of badly gullied areas originally covered by one of the soils developed from limestone residuum, such as the Decatur, Dewey, Dunmore, or Fullerton. It has been reduced to an intricate pattern of gullies, and very little of the original soil remains. The silty clay parent material is nearly everywhere exposed. In some places, outcrops of limestone are common, but in most places the soil material is several feet thick. Most of this land type is in small conspicuous areas. It is associated with Dunmore, Fullerton, Dewey, and Decatur soils.

Use and management.—Practically all areas of this rough gullied land are abandoned and many are reverting to forest. Reforestation is the most practical means of reclaiming it on most farms. Shortleaf and Virginia pine, which tend to establish themselves by natural reproduction, or black locust, which generally has to be planted, are useful trees for reforesting. This Fifth-class soil is in management group 20.

Rough mountainous land (Ramsey soil material) (25 to 60 percent slopes) (Rp).—This is a very extensive land type in the mountainous part of the county. It is characterized by steep or very steep slopes, great differences in elevation, and extreme stoniness. All areas, however, are not stony. Outcrops and boulders, mainly quartzite and slate, occupy 20 to 70 percent of the surface in most places. Ramsey soil material occupies the space between outcrops and boulders in most places. This material varies greatly in depth, color, and texture. The content of organic matter is also extremely variable, the amount depending mainly on the exposure, elevation, and vegetation. The major part of this land type is in the Rough mountainous land-Ramsey soil association. The greater part of the acreage is in the Great Smoky Mountains National Park.

Use and management.—This land type is almost entirely in forest, dominantly hardwoods with scattered areas of pine, hemlock, fir, and spruce. It is best suited to forestry. This Fifth-class soil is in management group 20.

Sequatchie fine sandy loam (2 to 5 percent slopes) (Sa).—This is a light-brown well-drained soil of the low stream terraces. The parent material consists of old general alluvium originating chiefly from quartzite, sandstone, slate, and shale. It also contains a small admixture of material from limestone. In Sevier county this soil is underlain by limestone or calcareous shale at depths of 5 feet or more.

This soil occurs in small irregularly shaped areas on low terraces of the Little Pigeon River and along most of the larger creeks in the southeastern part of the county. Closely associated are the Staser, Hamblen, Hayter, Allen, Jefferson, Barbourville, Nolichucky, and other Sequatchie soils.

Profile description:

0 to 10 inches, light-brown to grayish-brown very friable fine sandy loam.
10 to 30 inches, yellowish-brown to brownish-yellow friable light clay loam or sandy clay loam.
30 inches +, brownish-yellow very friable sandy loam or sandy clay loam splotched with gray, yellow, and brown in most places.

The soil is generally medium to strongly acid but some areas are only slightly acid. It is moderately well supplied with most plant

nutrients and apparently moderately high in organic matter. The few cobbles that occur locally on the surface and throughout the soil do not interfere materially with cultivation. Good tilth is maintained with ease, and tillage can be carried on over a fairly wide range of moisture conditions. Plant roots penetrate the soil readily, and soil air and moisture circulate freely. The moisture-holding properties are relatively poor, but the supply of moisture for growing plants is ordinarily adequate because of the position of the soil in the landscape. Runoff and internal drainage are medium.

Some areas are included that have a slope range of from 5 to 15 percent. A few tracts in Emerts Cove and along Dunn Creek have a silt loam or loam surface soil.

Use and management.—All of this soil has been cleared and used for crops and pasture. About 30 percent is used for corn, 15 percent for small grain, 30 percent for hay crops, 10 percent for pasture, and 10 percent for miscellaneous crops, including vegetables and tobacco. About 5 percent is idle.

Systematic rotation of crops is not commonly practiced. Row crops and small grains are grown for a few years, and followed by a few years of hay or pasture. Moderate to large amounts of complete fertilizers are used on tobacco and truck crops, and small amounts on corn and small grains. Hay crops ordinarily are not fertilized. Very little of the soil is limed.

This soil is well suited to a wide variety of crops and can be used intensively for intertilled crops if adequately limed and fertilized. It is somewhat deficient in lime, phosphate, potash, and nitrogen for high yields of most crops. Crops, however, respond readily to the application of these amendments. The soil can be maintained in a short rotation that includes a deep-rooted legume to supply the needed nitrogen. It is only slightly susceptible to erosion. When crops are rotated and adequately fertilized, water control is not a problem. This Second-class soil is in management group 3.

Sequatchie silt loam (2 to 5 percent slopes) (Sb).—This is a brown well-drained soil of the low stream terraces. It was derived from old general alluvium originating predominantly from slate and to some extent from quartzite, shale, and limestone. The alluvium is underlain by limestone or calcareous shale at a depth of 5 feet or more. The largest acreage of this soil is on the low terraces of the Little Pigeon and West Fork Little Pigeon Rivers and the larger creeks in the southeastern part of the county. The soil is closely associated with the Staser, Hamblen, Prader, Whitesburg, Cotaco, Hayter, Ramsey, Dandridge, and other Sequatchie soils.

Profile description:

0 to 10 inches, dark grayish-brown to brown very friable mellow silt loam.
10 to 30 inches, yellowish-brown friable light clay loam or silty clay loam.
30 inches +, yellowish-brown to brownish-yellow friable clay loam faintly splotched with gray, yellow, and brown; contains numerous slate and quartzite cobbles and gravel in most places.

Some areas included with this soil, as mapped, are only imperfectly or moderately well drained and the subsoils are predominantly brownish yellow in color. Other areas included are loam or fine sandy loam in texture. In use and management these variations do not differ greatly from the soil described.

The soil is nearly neutral to slightly acid and apparently well supplied with organic matter and most plant nutrients. Locally there are a few cobbles on the surface and throughout the soil, but not enough to interfere materially with tillage. The soil can be tilled over a fairly wide range of moisture conditions without injury. Plant roots penetrate the soil readily. Soil air and moisture circulate freely. The water-supplying capacity is high. Both runoff and internal drainage are medium.

Use and management.—All of this soil is cleared and used rather intensively for crops. Some of it is in rotation pasture but very little is in permanent pasture. A wide variety of crops is grown, but systematic rotations are not commonly used. Tobacco and truck crops are given moderate to heavy applications of complete fertilizer. Corn and small grains get small applications. Hay crops may receive some phosphate fertilizer but generally they are not fertilized.

The soil is very well suited to most of the common crops of the county, including tobacco (pl. 6, *A*), red clover, and truck crops. Good crop yields are commonly obtained without fertilization or systematic crop rotation, but the soil responds to good management that includes proper crop rotation and fertilization (pl. 6, *B*). A short rotation that has a deep-rooted legume to supply the needed nitrogen is desirable on most farms.

This soil is suited to intensive use for row crops if the organic-matter and fertility levels are maintained by using crop residues, green manure, barnyard manure, and commercial fertilizers. The soil does not have enough phosphorus and potash for continued high yields. The content of lime is generally adequate, but the soil should be tested before such exacting crops as alfalfa and red clover are grown. This First-class soil is in management group 3.

Sequoia silty clay loam, eroded undulating phase (2 to 5 percent slopes) (Se).—This well-drained soil was derived from materials weathered from interbedded shale and limestone. The shale is generally acid, at least in the upper part. Although this soil has parent rock similar to that underlying the related Armuchee soils, it differs in having a gentle slope, distinct surface soil and subsoil layers, and a greater depth to bedrock. A part of the original surface soil has been lost by erosion. Most of this soil is in the Sequoia-Hamblen-Whitesburg soil association, but some is in the Dandridge-Hamblen-Whitesburg and Armuchee-Litz-Farragut.

Profile description:

0 to 6 inches, brownish-gray to grayish-yellow friable silty clay loam.
6 to 24 inches, yellowish-red to reddish-yellow very firm (plastic to very plastic and sticky when wet) silty clay with moderate medium blocky structure.
24 inches +, reddish-yellow to brownish-yellow firm plastic silty clay splotched with yellow and gray; contains a few fragments of yellow and olive-green shale; bedrock at depths of 2 to 4 feet in most places.

The present surface layer consists of the remnants of the original surface soil mixed with the upper part of the subsoil. Consequently, it varies from silty clay loam to silt loam in texture and from brownish gray to yellowish red in color.

Some areas are included that are less well drained than usual; these have a yellowish-brown or brownish-yellow subsoil. A few

areas of this soil are derived from calcareous shale and others from acid shale.

The soil is strongly acid throughout and is low in supply of organic matter. It is well drained; but because of the unfavorable consistence of the subsoil, penetration of water and roots is slow.

Use and management.—Most of the soil is used for production of field crops common to the area, but part is used for pasture. Some areas are idle and some are wooded. Systematic crop rotation is not a common practice, although many kinds of crops are grown. Fertilization is light except for tobacco and truck crops, which are generally heavily fertilized with a complete fertilizer. Crop yields vary considerably and depend to a large extent on the amount and distribution of rainfall.

This soil is well suited to most of the common field crops and pasture. Because of the impaired permeability of the subsoil, however, there is a tendency toward extreme wet and dry conditions and variable yields of most crops.

Restricted absorption of water naturally increases runoff and susceptibility to erosion. A crop rotation of moderate length that includes legumes and grasses is needed to maintain the soil on most farms. Deep-rooted crops such as alfalfa should be grown periodically, where feasible, in order to improve the permeability of the subsoil. Tillage should be on the contour where possible. Terraces and other engineering measures may help to control runoff and erosion; but because of the unfavorable consistence of the subsoil, the practicability of terracing is doubtful. The soil is deficient in lime, phosphorus, and nitrogen for high yields of most crops and may, in places, be slightly deficient in potash. This Second-class soil is in management group 4.

Sequoia silt loam, rolling phase (5 to 12 percent slopes) (Sc).—This is a well-drained moderately deep soil of the uplands that is underlain by interbedded shale and limestone. It differs from Sequoia silty clay loam, eroded undulating phase, in being uneroded and in having stronger slopes.

This soil has a brownish-gray friable silt loam surface soil about 8 inches thick. The upper 1 or 2 inches is stained dark gray with organic matter. The subsoil is yellowish-red to reddish-yellow very firm silty clay. Bedrock is at depths of 2 to 4 feet. Practically all of the soil is in the Sequoia-Hamblen-Whitesburg and Dandridge-Hamblen-Whitesburg soil associations.

Use and management.—All of this soil is in forest, chiefly hardwoods but some pines. It is physically suitable for crops and pasture, but many of the areas are small and not easily accessible. If it is cleared, the use and management will be similar to that for Sequoia silty clay loam, eroded rolling phase. This Second-class soil is in management group 7.

Sequoia silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Sd).—This is a moderately deep well-drained soil derived from materials weathered from interbedded shale and limestone. It differs from Sequoia silty clay loam, eroded undulating phase, chiefly in having stronger slopes. Furthermore, it is more variable in depth and has more bedrock outcrops.

The surface layer is brownish-gray to grayish-yellow friable silty clay loam. The subsoil is yellowish-red to reddish-yellow very firm silty clay. Although variable, the depth to bedrock is generally between 2 and 4 feet. Small severely eroded spots are common and conspicuous because of exposure of the subsoil.

This soil is typically on ridge slopes in the Sequoia-Hamblen-Whitesburg soil association and on narrow winding ridge crests in the Dandridge-Hamblen-Whitesburg soil association.

Use and management.—All of this soil has been cleared and used for crops and pasture. An appreciable acreage is now idle. Practically all the common crops of the county are grown, but systematic rotations are not used. Tobacco and truck crops are generally heavily fertilized with a complete fertilizer, but other crops usually receive light applications. Crop and pasture yields are extremely variable.

The soil is suitable for most of the crops grown in the area. Fertilization is required for the successful growth of many crops and is essential for such crops as alfalfa and red clover. Lime, phosphorus, and possibly potash are required for these deep-rooted legumes. Crops respond well to applications of phosphate and nitrogen in most areas and to potash in many.

Owing to the stronger slope and more rapid runoff, this soil is more erosive than Sequoia silty clay loam, eroded undulating phase. A longer rotation that includes more close-growing crops will be necessary on most farms. Alfalfa and other deep-rooted legumes should have an important place in the rotations. All necessary tillage should be on the contour. Terraces, diversion ditches, and other engineering devices may help to control runoff and erosion. Because of the unfavorable consistence of the subsoil, however, the practicability of terracing this soil is doubtful. This Third-class soil is in management group 7.

Sequoia silty clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Sf).—This soil differs from Sequoia silty clay loam, eroded rolling phase, chiefly in being severely eroded. Erosion has removed most of the original surface soil and, in places, part of the subsoil. Shallow gullies that cannot be obliterated by tillage are common; some are uncrossable with heavy farm machinery. Erosion has not been uniform, however, and many intergully areas still have a considerable part of the original surface soil.

Like the other Sequoia soils, this soil is well-drained and moderately deep and was derived from materials weathered from interbedded shale and limestone. The present surface layer ranges in color from grayish yellow to reddish yellow. The surface texture is dominantly silty clay loam but is silt loam in some less seriously eroded areas. In other areas where erosion has been extreme, it is silty clay. The subsoil is yellowish-red to reddish-yellow very firm silty clay. The depth to bedrock is variable but is generally between 2 and 4 feet. The soil is confined mainly to the Sequoia-Hamblen-Whitesburg and Dandridge-Hamblen-Whitesburg soil associations.

Use and management.—All of this soil has been cleared and used for crops and pasture. A very large part is now idle or in unimproved pasture. Crop and pasture yields are very low under present management.

Chiefly because of greater erosion, this soil is greatly inferior to the other Sequoia soils for the production of crops. The tilth is especially

unfavorable. The soil is highly susceptible to puddling and clodding and has a narrow moisture range for safe tilling. A rather hard crust tends to form on the surface when the soil dries after heavy rains. This crust sometimes greatly interferes with the sprouting of small-seeded crops and makes their establishment difficult. Most of the original surface soil is lost, and the heavy subsoil retards the downward penetration of roots. Runoff is necessarily great, especially after heavy rains. Effective control of runoff and erosion is difficult. This Fourth-class soil is in management group 10.

In its present condition, this soil is considered better suited to pasture or more or less permanent hay crops than to crops requiring tillage. After an extended period in hay or pasture, the soil would probably again become suitable for cultivated crops grown under good management. The growing of alfalfa and other deep-rooted plants and of fibrous-rooted plants such as grasses should be especially beneficial. The roots of such crops improve the physical condition of the soil. Lime, phosphate, and possibly potash will be needed to establish and maintain good pastures. A good sod-forming pasture mixture that includes legumes should be used. Careful control of grazing is necessary, especially during dry periods.

Staser fine sandy loam (0 to 3 percent slopes) (Sg).—This is a brown well-drained sandy soil of the stream bottoms. The parent material consists of recent general alluvium washed chiefly from Dandridge and Ramsey soils. The alluvium is composed chiefly of materials derived from sandstone, shale, slate, and quartzite. In some places it also contains materials from limestone. The soil differs from Hamblen fine sandy loam chiefly in being better drained and consequently free of mottlings to a greater depth. It is on nearly level flood plains in practically all parts of the county except in the limestone valleys (pl. 7, *A*). It is closely associated with Hamblen, Sequatchie, Allen, and Jefferson soils.

Profile description:

0 to 14 inches, grayish-brown to light-brown very friable or loose fine sandy loam.
14 to 24 inches, yellowish-brown friable heavy loam or fine sandy loam.
24 inches +, brownish-yellow or grayish-yellow sandy loam splotched with gray below about 36 inches.

The soil is slightly acid in most places but is medium to strongly acid in some. It is apparently moderately high in content of organic matter and most plant nutrients. Plant roots penetrate the soil easily and air and water circulate freely. Water is readily absorbed and fairly well retained. Runoff is slow but internal drainage is medium. Most of the soil is subject to overflow. Some gravel and cobbles are on the surface and throughout the profile but not in sufficient quantities to interfere materially with tillage.

Use and management.—Practically all of this soil has been cleared and cultivated. It is used chiefly for corn, and in many places continuously for that crop (pl. 7, *B*). Hay crops are grown to some extent, and a small acreage of small grains and truck crops is also grown. Fertilizers are not ordinarily applied except on truck crops.

This soil is well suited to intensive use for crop production. The susceptibility to flooding restricts its use suitability, but the floods help maintain fertility by depositing material high in organic matter and plant nutrients.

The soil is well suited to corn and many hay crops. Small grains are susceptible to lodging, late maturity, and disease on this soil. Although the productivity is relatively high, increased yields can be expected from the application of phosphates and nitrogen and the use of a short rotation that includes a legume. This Second-class soil is in management group 1.

Staser silt loam (0 to 3 percent slopes) (Sh).—This is a brown well-drained soil of the stream bottoms. It differs from Staser fine sandy loam in being slightly heavier in texture throughout the profile. Like that soil, it consists of recent general alluvium composed chiefly of materials derived from quartzite, sandstone, shale, and slate. Some material from limestone is included in places.

The soil is grayish-brown to brown very friable silt loam to a depth of 12 to 20 inches. This is underlain by slightly heavier textured yellowish-brown to grayish-brown silt loam material, slightly mottled in most places with gray, brown, and yellow below about 30 inches.

This soil occurs in all parts of the county except some of the limestone valleys. It is confined, however, mainly to the Dandridge-Hamblen-Whitesburg and Staser-Hamblen-Sequatchie soil associations.

Use and management.—Practically all of this soil is cleared and cultivated. It is used chiefly for corn. Some is in pasture, chiefly rotation pasture, and a small acreage is used for hay, small grains, and truck crops. Fertilizers are not generally used except on the truck crops.

The soil is suited to intensive use for row crops. The susceptibility to flooding largely restricts the use to corn, truck, and other summer-growing crops. Some areas are successfully used for small grains and perennial or biennial hay crops, however. It will be necessary to maintain the organic matter and fertility level of areas not subject to beneficial silting. This can be done by the use of crop residues, green manure, barnyard manure, and commercial fertilizers. A short crop rotation that includes a legume is desirable on many farms. This Second-class soil is in management group 1.

State silt loam (2 to 7 percent slopes) (Sk).—This is a well-drained brown soil of the low stream terraces. The parent material consists of old alluvium washed chiefly from uplands underlain by granite and gneiss. This soil is similar to Sequatchie silt loam in many characteristics but differs in parent material. In this county the soil is underlain chiefly by calcareous shale and to a lesser extent by limestone.

The soil is on nearly level or gently sloping low terraces, chiefly along the French Broad River. A considerable acreage is included that has a slope range of from 5 to 10 percent. The soil is closely associated with Congaree, Cumberland, Waynesboro, and Buncombe soils.

Profile description:

0 to 10 inches, brown to grayish-brown very friable silt loam.
10 to 32 inches, yellowish-brown to brownish-yellow friable clay loam or silty clay loam with a weak medium blocky structure.
32 inches +, brownish-yellow clay loam; material generally is stratified and consists of variable coarse-textured materials in many places.

The soil is slightly to medium acid and apparently well supplied with organic matter. It is moderately high in most plant nutrients.

A few cobbles and some pebbles are on the surface and throughout the soil in many places but they do not interfere materially with tillage. The soil is very permeable; plant roots penetrate all parts easily, and soil air and water circulate freely. Rainfall is readily absorbed and well retained. Runoff is slow to medium and internal drainage is medium. The entire soil contains a moderate amount of small mica flakes.

Use and management.—Practically all of this soil has been cleared and used for crops or pasture. About 30 percent is now used for corn, 20 percent for small grains, 35 percent for hay and pasture, and 10 percent for other crops (including tobacco and vegetables). About 5 percent is idle. Crops commonly are not rotated systematically, but a few farmers follow a 3-year rotation of corn, small grains, and hay. Tobacco and truck crops receive moderate to heavy applications of a complete fertilizer on most farms, but other crops receive only light applications. The use of lime and phosphate on hay crops and pasture has become more common recently.

This soil is well suited to practically all the common crops of the area. It is one of the more productive soils of the county and responds well to good management. It is somewhat deficient in lime and phosphate, and possibly potash in some places, for continued high yields of many crops. The need for nitrogen will depend largely on the crop grown and the past cropping system. The soil presumably can be maintained under a short rotation that includes a deep-rooted legume. Because of slow runoff, the problem of runoff control is negligible. This First-class soil is in management group 3.

Stony colluvium (Jefferson soil material) (5 to 25 percent slopes) (Sl).—This is extremely stony land consisting of colluvial or local alluvial deposits. The soil material has washed or rolled from Ramsey soils of the mountain uplands and is similar to that from which the Jefferson and Barbourville soils were formed. Stones or cobbles, on the surface and throughout the soil, prevent practical tillage. The stones are of various sizes and may range up to several feet across. Some are somewhat rounded; others are more or less angular.

This land type occupies small alluvial or colluvial fans and sloping areas at the base of steep mountain slopes. It is widely distributed in the mountainous section of the county in close association with Ramsey soils.

Use and management.—This land type is unsuited to crops and poorly suited to pasture. Fair pastures can be obtained, but the control of weeds is difficult. Pastures are improved if adequate amounts of lime and phosphate are applied. This Fifth-class soil is in management group 18.

Stony hilly land (Dunmore and Talbott soil materials) (5 to 25 percent slopes) (Sm).—This stony hilly land is commonly referred to as rockland or limestone rockland. In most places outcroppings and ledges of limestone bedrock occupy from 10 to 50 percent of the surface. The soil material between the rocks is similar to that of the Dunmore or Talbott soils.[7] It varies from silt loam to silty clay in

[7] Talbott soils are not mapped in Sevier County. They developed over argillaceous limestone and are acid in reaction. They are similar to Dewey soils in color but have tougher and more compact subsoils that are more or less mottled as a result of moderately slow internal drainage. They vary considerably in depth to bedrock, and outcrops are frequent.

texture and from a few inches to several feet in depth to bedrock. The color ranges from brownish yellow to reddish brown. This land type occurs throughout that part of the county underlain by limestone, but the largest acreage is in the Stony land-Dunmore-Lindside soil association.

Use and management.—Most of this land is cleared and used for pasture; a few small areas are in crops. The rest is in forest in which redcedar is generally conspicuous. Much of this, particularly the steeper and stonier areas, probably should be left in forest. Stoniness largely precludes use of this land for cultivated crops. The land produces good early spring pasture. Bluegrass does well and is at its best in spring, early in summer, and in fall. Lime is necessary for good growth of pasture plants in many areas, and phosphate would improve the growth almost everywhere. The rocky surface, which prevents the use of mowing machines, is a real handicap in controlling weeds. This Fourth-class soil is in management group 12.

Stony steep land (Dunmore and Talbott soil materials) (25 to 60 percent slopes) (Sn).—This land type is locally known as limestone land. It is characterized by numerous ledges and outcroppings of limestone, which occupy from 20 to 70 percent of the surface. The soil material covering the rocks and between the ledges and outcroppings is shallow, or from a few inches to about 3 feet in depth. This material ranges from brownish yellow to reddish brown. Some of this stony steep land is in the Stony land-Dunmore-Lindside soil association, but the larger part is in the Dunmore-Greendale-Stony land association.

Use and management.—More than 80 percent of this land type is estimated to be in forest. Much of the forest consists of a sparse growth of drought-resistant species, mostly redcedar. Forestry is considered the best use under prevailing conditions. This Fifth-class soil is in management group 20.

Tyler silt loam (0 to 3 percent slopes) (Ta).—This is a gray poorly to imperfectly drained soil of the stream terraces. It is on nearly level or depressional positions, and has formed from old alluvium washed from Dandridge, Litz, Ramsey, and Muskingum soils. It is closely associated with Monongahela soil and differs chiefly in being more poorly drained. Surface drainage is slow or very slow, and internal drainage is very slow. The native vegetation consisted mainly of water-tolerant trees. This soil is widely distributed in the county but is mainly in the Holston-Nolichucky-Tyler soil association.

Profile description:

0 to 10 inches, gray to yellowish-gray friable silt loam.
10 to 17 inches, grayish-yellow to pale-yellow friable silty clay loam splotched with gray and yellow.
17 to 48 inches +, compact silty clay or silty clay loam highly mottled with yellow and gray; in most places the material below about 40 inches is less compact.

This soil is strongly to very strongly acid and low in organic matter, natural fertility, and productivity. The compact claypan layer is relatively impermeable to air, roots, and water. The layers above the claypan are saturated with water a large part of the year. The soil has a low water-holding capacity, however, and crops are injured by extended wet or dry seasons. Although most areas are poorly drained, a few are very poorly drained.

Use and management.—Most of Tyler silt loam is used for permanent pasture and forest. Corn, hay, and sorghum are grown on a few areas, but yields are low. The pasture vegetation consists mainly of water-tolerant species. Artificial drainage has been attempted in places by bedding and open ditches.

In its present condition this soil is probably best suited to pasture and hay. Several summer crops, such as corn, sorghum, and soybeans, are grown with varying degrees of success. Artificial drainage might be expected to broaden the use suitability and increase the average yields of crops now grown, but the soil is difficult to drain adequately. Tile drainage cannot be expected to be effective because of the compact layer in the subsoil. Open ditches, bedding, and row direction, as well as diversion ditches or terraces on the adjacent soils, would be effective in removing surface water in many places.

The lime and fertilizer requirements are high, but response to amendments may be less than on the associated Holston soils. The poor drainage and the relatively impermeable claypan would limit the response to fertilizers. Nevertheless, pastures and hay crops can be improved by the use of lime and phosphorus and possibly potash. This Fourth-class soil is in management group 17.

Waynesboro loam, undulating phase (2 to 5 percent slopes) (We).—This is an undulating well-drained friable soil on old high stream terraces. Like the Nolichucky soils, it has formed from old general alluvium derived from uplands underlain mainly by sandstone, quartzite, slate, and shale. The alluvium, however, contained materials from other rocks, including limestone. This soil is somewhat coarser textured, more friable, and generally lighter colored than the Cumberland soils. Practically all of it is eroded. The native vegetation was a hardwood forest of oak, hickory, maple, and yellow-poplar. Most of the acreage is in the Cumberland-Waynesboro-Congaree soil association.

Profile description:

0 to 10 inches, light-brown to grayish-brown very friable loam.
10 to 40 inches, light-red to yellowish-red firm to friable clay loam, silty clay loam, or light silty clay.
40 inches +, yellowish-red to reddish-yellow friable sandy clay or sandy clay loam splotched with yellow, gray, and brown; this layer ranges in thickness from a few inches to as much as 10 feet; underlain by limestone bedrock or material weathered from limestone.

Most of this phase has lost a small part of the original surface soil, including the thin surface layer of higher organic-matter content. A few areas included have lost a considerable part of the surface soil. Some areas are shallow over limestone residuum and are generally heavier in texture and less friable in the lower parts of the profile than the soil described.

This soil is medium to strongly acid and apparently has a moderate supply of mineral plant nutrients and organic matter. It is permeable to air, roots, and water. Moisture circulates freely, but the soil has a high water-holding capacity. Some cobbles and gravel are on the surface and throughout the profile in many places, but they do not interfere materially with tillage. Runoff is slow to medium and internal drainage is medium.

Use and management.—All areas have been cleared and are used for crops and pasture. Corn, small grains, lespedeza, red clover,

tobacco, and vegetable crops are most commonly grown. Fertilization, mainly with phosphorus, is light on small grains and corn. Tobacco and vegetable crops receive moderate to heavy applications of a complete fertilizer. Lime has been used but in insufficient amounts for most crops.

This soil is well suited to all the common crops of the county, including alfalfa and red clover. It is adapted to moderately intensive use. Row crops can be grown in the rotation one-half the time but should never be grown more than 2 years in succession. Lime and phosphorus are necessary for the successful growth of alfalfa and red clover and other deep-rooted legumes. Favorable response is obtained from the use of phosphorus on practically all crops and from nitrogen on all except legumes and crops immediately following. Tillage should be on the contour and winter cover crops should follow all intertilled crops. This First-class soil is in management group 3.

Waynesboro loam, rolling phase (5 to 12 percent slopes) (Wd).—This is a red friable well-drained soil of the high stream terraces. It was derived from old general alluvium washed from uplands underlain mainly by sandstone, quartzite, slate, and shale. In places the alluvium contained some limestone material. This soil differs from Waynesboro loam, undulating phase, in being more strongly sloping and in being uneroded. It has a grayish-brown friable loam surface soil. The upper 1 to 2 inches of this layer are stained dark grayish brown with organic matter in most places. The subsoil consists of light-red to yellowish-red firm to friable clay loam or silty clay loam. The soil is on high terraces, chiefly of the French Broad and Little Pigeon Rivers, in the Cumberland-Waynesboro-Congaree soil association.

Use and management.—All of this soil is in forest consisting mainly of oak, hickory, maple, and some yellow-poplar. The soil would be easy to work, fairly easy to conserve, and productive of most of the common crops of the county if it were cleared. The areas, however, are generally small and not well located in relation to other cropland. If cleared, the use and management would be similar to that for Waynesboro loam, eroded rolling phase. This Second-class soil is in management group 6.

Waynesboro loam, eroded rolling phase (5 to 12 percent slopes) (Wc).—This is a red well-drained soil on high stream terraces. The parent material has washed mainly from Ramsey and Dandridge soils but includes some material from a wide variety of soils. This soil differs from Waynesboro loam, undulating phase, in being somewhat more eroded and in having a stronger slope. A considerable part of the original surface soil has been lost, and the present surface layer contains an admixture of subsoil material. The amount of mixing is quite variable, however, and the present surface soil is highly variable in depth, color, and texture. The color of the surface soil varies from light-brown or grayish-brown to yellowish red, and the texture from loam to clay loam. The subsoil consists of light-red to yellowish-red firm to friable clay loam or silty clay loam. Small severely eroded spots are conspicuous because of exposures of the subsoil. Shallow gullies are common in such areas. The soil is mainly on terraces of

the French Broad and Little Pigeon Rivers in the Cumberland-Waynesboro-Congaree soil association.

Use and management.—All of this soil is cleared and cultivated. Very little is abandoned or idle. Probably less than 10 percent is in permanent pasture, and the rest is used for growing corn, small grain, hay, and miscellaneous crops. A wide variety of crops is grown, but generally not in a systematic rotation. Fertilization is light except on tobacco and truck crops.

The soil is well suited to all the crops common to the area, including crops with such exacting requirements as alfalfa. Management requirements are more exacting than for Waynesboro loam, undulating phase, chiefly because of the stronger slope. The crop rotation will need to be longer, but fertilizer and lime requirements will be similar. A row crop should not be grown in the rotation more than once every 3 or 4 years, and a legume should be included, preferably a deep-rooted one. The soil is susceptible to erosion when not under a vegetative cover; consequently, a cover crop should follow all intertilled crops. Contour tillage and properly constructed and maintained terraces are needed. This Second-class soil is in management group 6.

Waynesboro loam, eroded hilly phase (12 to 25 percent slopes) (Wb).—This is a red friable well-drained soil on old stream terraces. The old alluvium from which the soil is derived has washed from uplands underlain mainly by sandstone, quartzite, slate, and shale. The alluvium included some materials from limestone in most places.

This phase differs from Waynesboro loam, undulating phase, mainly in having a stronger slope. A part of the original surface soil has been removed by erosion and a grayish-brown or light-brown to yellowish-red friable loam or clay loam surface layer has been left. The subsoil is light-red to yellowish-red firm to friable clay loam or silty clay loam. The depth of the alluvial material is variable, but is more than 2 feet deep everywhere, and more than 10 feet in some places.

The soil is associated mainly with other Waynesboro soils and with Cumberland, Nolichucky, Dunmore, Fullerton, Dewey, and Decatur soils. It is largely confined to high terraces along the French Broad and Little Pigeon Rivers.

Use and management.—About 10 percent of this soil is still in forest and differs from other areas in not being eroded. The rest is used for crops and pasture or is idle. Use and management are the same as for Waynesboro loam, eroded rolling phase, but a greater part of this eroded hilly phase is idle or in unimproved pasture.

This soil is not well suited to crops that require tillage but is well suited to pastures. It is rather difficult to cultivate and conserve because of strong slope and susceptibility to erosion. It is moderately fertile, has a moderate water-supplying capacity, and is rather productive of close-growing crops and pasture if adequately fertilized.

If the soil is used for pasture, the addition of lime and phosphorus, the seeding of a good pasture mixture, and the careful control of grazing will be the chief management requirements. Where it is used for intertilled crops, water control is a major problem. A rotation consisting chiefly of close-growing crops, including legumes, is desirable. Fertilization will be similar to that for Waynesboro loam, undulating phase. Contour tillage and contour stripcropping are desirable where feasible. This Third-class soil is in management group 11.

Waynesboro clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Wa).—The severe erosion on this soil differentiates it from Waynesboro loam, eroded hilly phase. Most of the original surface soil and, in places, part of the subsoil have been lost as a result of erosion. Shallow gullies are common, and some not crossable with heavy machinery occur in a few places. A part of the original surface soil remains on some of the intergully areas and is mixed with the subsoil in the plow layer. The present plow layer consists of light-brown to yellowish-red friable clay loam. The subsoil is light-red to yellowish-red firm to friable clay loam or silty clay loam. This inextensive soil is confined mainly to high terraces along the French Broad and Little Pigeon Rivers.

Use and management.—A considerable part of the soil is in pasture, largely unimproved, some is used for crops, and a very large part is idle or abandoned. Both crop and pasture yields are very low.

Chiefly because of greater injury by erosion, this soil is less suitable for crops and pasture than the eroded hilly phase of Waynesboro loam. Ordinarily the soil is better suited to permanent pasture than to field crops. Lime and phosphate are essential for the establishment and maintenance of good pastures. Excellent pastures can be obtained eventually if the soil is properly treated. After the soil is kept for several years in well-managed pasture, its use for crops may be feasible and desirable on some farms. A long rotation consisting chiefly of close-growing crops will be needed. All tillage should be on the contour, and contour stripcropping may be desirable on the longer slopes. A cover crop should follow the intertilled crop. All crops will need to be properly fertilized to maintain yields and keep protective cover on the land. This Fourth-class soil is in management group 12.

Whitesburg silt loam (2 to 7 percent slopes) (Wf).—This is an imperfectly drained grayish-brown soil of the very gently to gently sloping colluvial lands. It consists of colluvium and local alluvium from Dandridge soils and is at the base of slopes, on small alluvial-colluvial fans, and along narrow intermittent drainageways (pl. 8, *A*). External drainage is good. Internal drainage is only fair, although adequate for most crops commonly grown. The native vegetation consists chiefly of hardwoods, including a variety of oaks, some hickory, and maple and yellow-poplar.

Whitesburg silt loam is widely distributed throughout the Dandridge-Hamblen-Whitesburg and Sequoia-Hamblen-Whitesburg soil associations. Individual areas are small; a few are fan-shaped but most are narrow strips along intermittent drains. They are associated mainly with Dandridge and Hamblen soils.

Profile description:

0 to 12 inches, grayish-brown friable silt loam.
12 to 24 inches, yellowish-brown friable heavy silt loam or silty clay loam faintly mottled with olive and gray.
24 inches +, brownish-yellow firm dense silty clay or silty clay loam profusely mottled with olive, gray, and dark brown; in some places calcareous shale is at a depth of 30 inches but in most places it is at a greater depth.

The soil varies from place to place, chiefly in color and depth of the surface layer. In most places this layer is grayish brown, light brown, or brown but in some it is light grayish brown. The soil is uniform in color and texture to a depth of as much as 2 feet in some areas.

Whitesburg silt loam is slightly acid and apparently fairly well supplied with organic matter and mineral plant nutrients. It is permeable to air, roots, and moisture but the subsoil is saturated with water in the rainy seasons. The soil has a high water-supplying capacity.

Use and management.—This soil is used for the common field crops of the area, and relatively high yields are usually obtained. The principal crops are corn, vegetables, small grains, hay, and tobacco. Lime is not generally used, and only tobacco and vegetable crops are fertilized. A few tracts of this soil are idle, but these are generally away from other soils suitable for crops or pasture.

The soil is not exacting in management requirements. It can be used rather intensively for corn and other suited crops, provided the organic matter and fertility levels are maintained by the use of crop residues, green manure, barnyard manure, and commercial fertilizers. A short rotation, such as a corn-legume-hay, is desirable on most farms. Tobacco and alfalfa are not well suited under the present drainage conditions. Small grains can be grown, but they have a tendency to lodge.

The soil is not subject to erosion, but in some places, it is subject to injury from excessive depositions from the slopes above. Lime is not a general requirement for hay or other crops, but phosphorus is generally needed, especially for legumes. Nitrogen may be beneficial under intensive usage, especially if legumes are not included in the rotation. Good tilth is easily maintained. Pastures are productive on this soil, but they need occasional fertilization with phosphorus. This Second-class soil is in management group 2.

USE AND MANAGEMENT[8] OF IMPORTANT GROUPS OF SOILS

Evaluation of the workability, conservability, and productivity[9] of a soil may indicate its suitability for the major uses—crops that require tillage, permanent pasture, or forest. But the soils suited to any one of these broad uses may differ and are therefore suited to different crops and need different kinds of management. This is true of the soils of Sevier County, which differ one from another in one or more physical characteristics. However, certain groups of soils require nearly the same management practices. Therefore, in order to save repetition, soils that are much alike in characteristics that affect their management requirements are grouped and discussed together.

As few farms include only one kind of soil or even a group of soils that will respond equally to one kind of management, the uses and

[8] The term "management" refers to such practices as (1) choice and rotation of crops, (2) application of soil amendments, such as lime, commercial fertilizers, manure, and crop residues, (3) tillage practices, and (4) engineering practices for the control of water on the land.

[9] Workability refers to the ease of tillage, harvesting, and other field operations. Texture, structure, consistence, stoniness, and degree of slope are important properties that affect workability. Conservability refers to the ease of maintenance or improvement of productivity and workability of the soil. Productivity as used here refers to the capacity of a soil to produce crops and pasture plants. This capacity is dependent not only upon the proper supply of nutrients but also upon air and water relations that will make possible the efficient use of these nutrients by plants.

349399—56——8

management systems suggested here cannot always be applied without adjustment to a particular farm. They are, however, believed to be generally suited to the soils for which they are given. They will therefore be of help to farmers in choosing uses and practices that fit their particular circumstances, or to the county agricultural agent, in helping them make their choices once the soils on the farm are known.

The management requirements of soils of each management group are discussed with respect to two broad uses: (1) Crops that require tillage, and (2) permanent pasture. They are discussed in terms of one or more rotations that are considered well suited to the soils. The management of the soil for one crop of the rotation generally has an effect on the production of other crops in the rotation. Management requirements of the soil for each crop are therefore dependent not only on the properties of the soil and characteristics of the crop but also on the management that has been practiced on other crops in the rotation.

The management practices described indicate, in a general way, the kind of management needed to get the yields given in columns B of table 24. Different combinations of management practices may be used to attain the same objective. The proper choice depends upon conditions on the particular farm. For example, nitrogen may be maintained by the use of legumes, manure, commercial fertilizer, or combinations of the three. The best method for maintaining nitrogen depends on the type of farm as well as on soil conditions.

The following management groups are based on similarities of management requirements for crops that require tillage. In order to avoid a second grouping for pasture, management requirements for permanent pasture are also discussed for the same groups. These requirements are generally similar for the soils of each group.

MANAGEMENT GROUP 1—NEARLY LEVEL, WELL-DRAINED AND IMPERFECTLY DRAINED SOILS OF BOTTOM LANDS

The soils of management group 1 are good to excellent for crops and pasture. They are well suited to intensive use for crop production, but this use is limited by susceptibility to periodic flooding. Some of the soils are further limited by imperfect drainage. All the soils, except possibly the Buncombe, are relatively fertile and produce comparatively high yields of suited crops without the use of amendments. They are relatively well supplied with lime, organic matter, and plant nutrients, which are replenished periodically by additions of fresh sediments. Moisture conditions are favorable for the growth of plants most of the time. Practically all soils of this group have favorable tilth that is easily maintained.

These soils are very well suited to corn and the summer annual hay crops. They are poorly suited to alfalfa, although this crop is grown successfully in places. Red clover is apparently better suited. Generally small grains are more susceptible to lodging and disease and mature later on these soils than on soils of the uplands. Tobacco also appears to be poorly suited; but cabbage, green beans, and many vegetable crops are very well suited to most of these soils.

The soils of management group 1 and characteristics that affect their management requirements are given in table 4.

TABLE 4.—*Productivity, workability, conservability, and land class of soils of management group 1, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Buncombe loamy fine sand	Medium	Good	Good	3
Congaree loam	Very high	Very good	Excellent	1
Hamblen silt loam	High	Good	Good	2
Hamblen fine sandy loam	do	do	do	2
Lindside silt loam	do	do	do	2
Staser silt loam	Very high	Very good	Excellent	2
Staser fine sandy loam	High	do	do	2

Management requirements.—The selection of suitable crops is very important. Although such crops can be successfully grown almost continuously, a short rotation is desirable on most farms. A corn-hay rotation should be well suited, especially on the imperfectly drained soils. A corn-wheat-red clover rotation is successful on the well-drained soils on many farms. Growing winter legumes, such as crimson clover, and plowing them under as green manures in the spring should prove beneficial, particularly where corn is grown every summer. Vegetable crops (cabbage or green beans, for example) could be substituted for the corn in the suggested rotations.

Although good crop yields are obtained without amendments, some fertilization is required to maintain high yields under intensive usage. Most of the soils are very responsive to fertilization. Use of lime and phosphate is generally needed to establish and maintain red clover. A good response can be expected from the use of liberal amounts of phosphate on practically all crops. A moderate application of potash may be needed, but this need will largely depend on the crop grown and the previous cropping system. Nitrogen fertilizers may be necessary under continuous cropping, but a legume in the rotation generally supplies an adequate amount for high yields of all crops in the rotation.

Special tillage or cropping practices for the maintenance of tilth or for water control are not generally necessary. The soils can be tilled over a wide range of moisture conditions without serious injury. They are not ordinarily susceptible to erosion, but it may be necessary to build up streambanks in places to prevent scouring. Artificial drainage would no doubt increase yields on the imperfectly drained soils of the group, but the advisability of drainage and the kind of drains to use on any particular area will depend on the cost, the feasibility of drainage from an engineering standpoint, and the kinds and amounts of other soils on the farm.

Even though the soils of this group are very well suited to pasture, they are too well suited to more intensive use to be used much for this purpose. Because they generally remain moist and productive throughout hot dry periods, they are especially valuable for pasture. When these soils are used for pasture, the management consists principally of supplying amendments, chiefly lime and phosphate, to suitable pasture plants. Proper control of grazing is also required. Weed control is not a serious problem on properly fertilized and

grazed pastures, but mowing may be necessary to remove excess herbage and undesirable plants.

MANAGEMENT GROUP 2—UNDULATING AND ROLLING YOUNG SOILS OF COLLUVIAL LANDS

The soils of management group 2 are good to excellent for crops and pasture. They are suited to intensive use for crop production and, with the exception of the Hollywood soil, are well suited to practically all the common crops grown in the county. They have a wider range in suitability than soils of management group 1, mainly because they are not ordinarily susceptible to flooding. They do, however, receive some sediments from the adjacent slopes that tend to replenish plant nutrients and organic matter. The content of organic matter and plant nutrients is moderately high to high, and the water-holding capacity is high. All are deep soils with moisture conditions favorable for growing plants. Most of them are well drained, but some are imperfectly drained and have unfavorable moisture conditions for plant growth in wet seasons. Except for the Hollywood soil, good tilth is easily maintained and tillage can be carried on over a fairly wide range of moisture conditions without injury to the soils.

These soils are suited to a large number of crops. They are well suited to corn and hay but are not especially well suited to small grains, which tend to lodge. Alfalfa is successfully grown, but there is some evidence that it is better suited to such soils of the uplands as the Decatur and Dunmore. The soils of this management group, with the exception of Hollywood silty clay loam, are very well suited to tobacco, red clover, and most vegetable crops. Hollywood silty clay loam, included with this management group largely because of its small acreage, differs in use and management. It is used principally for hay crops and rotation pasture, although some corn, soybeans, and sorghums are produced. Alfalfa and tobacco ordinarily are not grown on this soil.

The soils of management group 2 and characteristics that affect their management requirements are given in table 5.

Management requirements.—Although good crop yields are obtained on the soils of this management group under almost continuous cropping to row crops, a short rotation is desirable on most farms. A rotation of corn-wheat-red clover-tobacco appears to be well suited. Almost any of the vegetable crops can be substituted for the corn or tobacco, and oats or barley for the wheat. Alfalfa can be substituted for the red clover, but the rotation would have to be lengthened. On some farms it may be necessary to use these soils almost continuously for growing row crops. On these farms a rotation such as tobacco-crimson clover is advisable. Corn, potatoes, cabbage, or green beans may be substituted for the tobacco.

Although these soils are high in fertility in comparison to other soils of the county, they still give an excellent response to fertilization. Nitrogen is a general fertilizer requirement except where it is supplied by legumes. Phosphate is also generally required for high yields of most crops. Potash is less likely to be deficient, but it may be required for some crops. Although none of the soils are especially low in lime, most of them will require it for the successful growth of

TABLE 5.—*Productivity, workability, conservability, and land class of soils of management group 2, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Barbourville silt loam:				
Undulating phase	High	Excellent	Excellent	2
Rolling phase	do	do	Very good	2
Barbourville stony fine sandy loam, rolling phase.	Medium	Fair	do	3
Barbourville-Cotaco fine sandy loams.	do	Excellent	Excellent	2
Cotaco silt loam:				
Undulating phase	do	Good	Good	3
Rolling phase	do	do	Fair	3
Emory silt loam:				
Undulating phase	Very high	Excellent	Excellent	1
Rolling phase	High	Very good	Very good	2
Greendale and Pace silt loams:				
Undulating phases	do	Excellent	do	2
Rolling phases	do	Very good	Good	2
Hollywood silty clay loam	Medium	Fair	Very good	3
Whitesburg silt loam	High	Very good	do	2

red clover and alfalfa. Yields of other crops will also be increased by use of lime.

No special attention is ordinarily required for either tillage or for water control. Runoff control is not a problem except in a few places where some of the soils receive excess runoff from the slopes above. In such places there is danger of injury from erosion and also from heavy deposition of eroded material. Diversion of the runoff from such slopes may be desirable.

These soils are highly productive of pasture. They are especially valuable for this use because they remain moist and productive throughout hot dry periods. Phosphate is the chief requirement for pastures on these soils, although lime will probably be needed, especially on the Barbourville, Cotaco, and Greendale soils. Proper control of grazing is necessary. Occasional mowing may be required to remove excess herbage and undesirable plants.

MANAGEMENT GROUP 3—UNDULATING DEEP FRIABLE RED AND BROWN SOILS OF TERRACES AND COLLUVIAL LANDS

The soils of management group 3 are good to excellent for crops and pasture. All are relatively high in fertility, easy to work and conserve, and productive of most of the crops commonly grown. They have mild slopes and are not seriously eroded or susceptible to serious erosion. As compared with soils of the uplands, the content of organic matter and plant nutrients is moderate to high and moisture conditions are favorable for plant growth. The soils are not stony and tilth conditions are very good to excellent.

These soils are well suited to practically all of the crops commonly grown in the area. They are especially well suited to such vegetables as cabbage and green beans and to potatoes and tobacco. If these soils are properly fertilized and limed, alfalfa and red clover are

successfully grown. The soils of this group are not so well suited to corn as those of management groups 1 and 2, although better suited than most soils of the upland.

The soils of management group 3 and characteristics that affect their management requirements are given in table 6.

TABLE 6.—*Productivity, workability, conservability, and land class of soils of management group 3, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Cumberland silt loam, undulating phase.	High	Very good	Very good	1
Hayter silt loam, undulating phase.	do	Excellent	do	1
Nolichucky loam, undulating phase.	Medium	Very good	Good	2
Sequatchie silt loam	Very high	Excellent	Very good	1
Sequatchie fine sandy loam	High	do	do	2
State silt loam	do	do	do	1
Waynesboro loam, undulating phase.	do	do	do	1

Management requirements.—The soils of this group are suited to rather intensive cropping. When other management requirements are met, these soils apparently can be conserved and their productivity maintained or increased under a rotation that includes a row crop every other year or every third year, provided the rotation also includes a legume. In planning the choice and rotation of crops, it should be kept in mind that these soils are well suited to such exacting deep-rooted legumes as alfalfa and red clover. A rotation of corn-small grains-red clover and grass should be well suited. Any of the truck crops or tobacco can be substituted for the corn. Another cropping system that appears to be well suited consists of an intertilled crop followed by a small grain and lespedeza. Winter cover crops and green-manure crops are useful for conserving soil moisture, improving tilth, and supplying nitrogen and humus.

The soils of this group are generally slightly to moderately deficient in lime, phosphorus, nitrogen, and possibly potash for high yields of most of the crops commonly grown. However, the crop response to fertilization is excellent. Moderate applications of lime and phosphate are necessary for the successful growth of alfalfa and red clover and greatly increase the yields of other legumes, especially lespedeza. Nitrogen is required for high yields of nearly all crops except legumes and the crops that immediately follow them. Most crops respond to phosphate. The Sequatchie, Nolichucky, and Waynesboro soils commonly require potassium fertilizers, especially for the deep-rooted legumes. The other soils apparently have enough potassium for most crops. Large amounts of high-grade complete fertilizers are needed on vegetable crops, tobacco, or potatoes. Properly conserved manure is an excellent source of both nitrogen and potash, but it should be supplemented with phosphate.

MANAGEMENT GROUP 4—UNDULATING DEEP AND MODERATELY DEEP PLASTIC RED OR REDDISH-YELLOW SOILS OF UPLANDS

Management group 4 consists of fine-textured predominantly red soils of the uplands that have developed from the residuum of relatively high-grade limestone or interbedded limestone and shale. All are well-drained, generally 3 to 5 feet or more deep over bedrock, and are medium to strongly acid. All have firm plastic subsoils. They are susceptible to erosion, and most areas have lost part of the surface soil. Compared with other cropped soils of the uplands, they are relatively high in organic matter, plant nutrients, and water-supplying capacity. The present content of organic matter and plant nutrients, especially nitrogen, depends largely on the past cropping system and the amount of soil lost through erosion.

These soils are well suited to practically all of the crops commonly grown. They are very well suited to most hay crops, especially alfalfa, but are not so well suited to corn, tobacco, and truck crops as the soils of group 3.

The soils of management group 4 and characteristics that affect their management requirements are given in table 7.

TABLE 7.—*Productivity, workability, conservability, and land class of soils of management group 4, Sevier County, Tenn.*

Soils	Productivity	Workability	Conserv-ability	Land class
Decatur silty clay loam, eroded undulating phase.	High	Very good	Very good	1
Dewey silty clay loam, eroded undulating phase.	do	do	do	1
Farragut silty clay loam, eroded undulating phase.	do	do	do	1
Sequoia silty clay loam, eroded undulating phase.	Medium	Good	Good	2

Management requirements.—The soils of this group are suited to a wide variety of crops. It is important, however, to grow the selected crops in the proper rotation in order to maintain or increase productivity. Row crops should be alternated with close-growing crops, and deep-rooted crops should be grown periodically. The rotation, however, can be short if other management practices are good. A row crop may be safely grown once every 3 years. A rotation consisting of corn, small grain, and red clover, or of corn, small grain, and alfalfa for 3 or 4 years, appears to be well suited to these soils. A winter cover crop should follow all clean-cultivated crops. Grass needs to be grown at intervals to help maintain organic matter. If a grass is not included in the rotation, green-manure crops are needed.

Fertilizers and lime are required for continued medium to high yields of crops on these soils. Lime and phosphate are especially necessary for legumes and grasses. Nitrogen is a general requirement except where supplied by legumes. Some potash is commonly needed for the deep-rooted legumes.

Moisture conditions limit tillage on the eroded areas, but good tilth is easily maintained on the uneroded soils. Grasses, deep-rooted

legumes, and green-manure crops tend to improve tilth conditions. Fall plowing for tilth improvement is considered a good practice, provided excessive runoff and consequent loss of soil material can be prevented. Contour tillage aids in conserving soil moisture and soil material. Terracing should not be necessary if management is otherwise good.

These soils are very well suited to pasture; but because they have a lower moisture supply, especially in summer, they are not so good for pasture as the soils of group 1 or group 2. Good pastures can be established without amendments, except on the more severely eroded spots. Barnyard manure and nitrogen fertilizers help establish the stand on such spots. After the pasture is established, the legumes in the pasture mixture should supply most of the needed nitrogen, but lime and phosphate are required for continued high yields. Other needed management practices are clipping to control undesirable plant growth and the control of grazing.

MANAGEMENT GROUP 5—UNDULATING FRIABLE YELLOW SOILS OF TERRACES AND COLLUVIAL LANDS

The soils of management group 5 are poor to good for crops and fair to very good for pasture. All except the Monongahela are deep friable well-drained soils with slopes ranging from about 2 to 5 percent. They are very permeable to air, roots, and water. The Monongahela soil is imperfectly drained, is less permeable, and has a lower water-holding capacity than the well-drained soils. Rainfall is readily absorbed by the soils of this management group and fairly well retained. The water-holding capacity is moderate, and the content of plant nutrients ranges from low to medium. None except Jefferson stony fine sandy loam, undulating phase, has sufficient stones in the plow layer to interfere materially with tillage, although some cobbles or pebbles are in all.

These soils are suited to a wide variety of crops, including corn, wheat, oats, barley, tobacco, and many vegetables. If properly fertilized, such crops as red clover and alfalfa are successfully grown. Because of imperfect drainage, the Monongahela soil is more limited in use than the well-drained members. For example, this soil is not well suited to alfalfa.

The soils of management group 5 and characteristics that affect their management requirements are given in table 8.

TABLE 8.—*Productivity, workability, conservability, and land class of soils of management group 5, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Holston loam, undulating phase.	Low	Excellent	Good	2
Jefferson silt loam, undulating phase.	do	do	do	2
Jefferson stony fine sandy loam, undulating phase.	do	Good	do	3
Monongahela silt loam	do	do	Fair	3

Management requirements.—The soils of this management group are much more exacting in their requirements than those of group 3, although they occur on similar slopes. Longer rotations and heavier fertilization are required. If other management practices are good, the soils can be maintained in a 3- to 4-year rotation. A good rotation is corn the first year, small grain the second, clover and orchardgrass for 2 or 3 years, and then tobacco followed by crimson clover. Almost any of the other row crops commonly grown can be substituted for either the corn or tobacco in this rotation. By lengthening the rotation, alfalfa could be used in place of the red clover. It is important that a cover crop follow all intertilled crops.

These soils are very deficient in lime, phosphorus, potash, and nitrogen, but they vary considerably in the degree of deficiency. The legume crops, especially alfalfa and clover, require lime, potash, and phosphorus; but if they are inoculated, nitrogen is not needed. An inoculated legume crop, especially if it is turned under, will generally supply an adequate amount of nitrogen for other crops in a rotation. All crops respond well to applications of phosphorus. Truck crops and tobacco need a complete fertilizer. Properly conserved manure is a good source of nitrogen and potash, but it should be supplemented with a phosphate fertilizer to obtain a balance of plant nutrients.

Good tilth is easily maintained on these soils, and tillage operations can be carried on over a fairly wide range of moisture conditions. The stones on the surface and in the plow layer of Jefferson stony fine sandy loam, undulating phase, interfere with tillage.

The soils of this management group are somewhat susceptible to erosion. Contour tillage should be practiced wherever feasible. Terraces or other engineering devices for runoff control are not ordinarily necessary.

These soils are not productive of pasture without fertilization. Supplying amendments, mainly lime and phosphate and possibly potash, to suitable pasture plants is the principal pasture management needed. Proper control of grazing is also necessary. Although weed control is not a serious problem on pastures that receive adequate amendments and are properly grazed, occasional mowing may be necessary.

MANAGEMENT GROUP 6—ROLLING NONSTONY DEEP FRIABLE RED AND BROWN SOILS OF TERRACES, COLLUVIAL LANDS, AND UPLANDS

The soils of this group are poor to good for crops and fair to very good for pasture. They are moderately easy to work and conserve but vary considerably in productivity. All are deep friable well-drained soils with slopes ranging from about 5 to 12 percent. They are very permeable to air, roots, and water. Rainfall is readily absorbed, the water-holding capacity is moderate to moderately high, and the plant-nutrient content is medium to high. None of these soils have sufficient stones in the plow layer to interfere materially with tillage, although all contain some cobbles, gravel, or chert.

These soils are suited to many crops, including corn, wheat, oats, barley, tobacco, and vegetables. Red clover and alfalfa are successfully grown if the soils are properly fertilized.

The soils of management group 6 and characteristics that affect their management requirements are given in table 9.

TABLE 9.—*Productivity, workability, conservability, and land class of soils of management group 6, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Hayter silt loam, eroded rolling phase.	Medium	Very good	Good	2
Fullerton silt loam:				
Rolling phase	do	do	do	2
Eroded rolling phase	do	do	do	2
Nolichucky loam:				
Rolling phase	do	do	Fair	3
Eroded rolling phase	do	do	do	3
Waynesboro loam:				
Rolling phase	High	do	Good	2
Eroded rolling phase	do	do	do	2

Management requirements.—The soils of this management group have much more exacting management requirements than those of groups 1 to 5. Longer rotations, heavier fertilization, and better water-control measures are required. If other management practices are good, the soils can be maintained in a 4- to 6-year rotation. A suitable rotation consists of corn, a small grain, clover and orchardgrass for 3 years, and then tobacco followed by crimson clover. Other row crops commonly grown can be substituted for either the corn or the tobacco. If the rotation is lengthened, alfalfa could replace the red clover. It is important to have a cover crop follow all intertilled crops.

These soils are deficient in lime, phosphorus, and nitrogen, but they vary considerably in the degree of deficiency. The Nolichucky soils are much more deficient than the other members of the group and are likely to be highly deficient in potash. The legume crops, especially alfalfa and clover, require lime and phosphorus but do not need nitrogen if they are inoculated. Potash will also be required for the deep-rooted legumes on most of these soils. An inoculated legume crop will generally supply enough nitrogen for other crops in a rotation, especially if turned under. All crops respond well to applications of phosphorus. Truck crops and tobacco need a complete fertilizer. Properly conserved manure is a good source of nitrogen and potash but it should be supplemented with a phosphate fertilizer.

These soils can be tilled over a fairly wide range of moisture conditions, and good tilth is easily maintained. They are moderately susceptible to erosion, but runoff and erosion control should not be serious problems if other management practices are good. Contour tillage should be practiced wherever feasible. Contour stripcropping may be advisable on the long slopes. Terraces or other engineering devices for runoff control are not necessary unless a shorter rotation than that suggested is used. The soils are deep and permeable. Generally they have regular slopes and should be suitable for terraces if satisfactory outlets are available.

These soils are well suited to pasture. Pasture management consists chiefly of supplying amendments, mainly lime and phosphate, to suitable pasture plants. Proper control of grazing is also necessary.

Weed control is not a serious problem on pastures given adequate amendments and properly grazed, but an occasional mowing may be necessary.

MANAGEMENT GROUP 7—ROLLING PLASTIC RED TO REDDISH-YELLOW SOILS OF UPLANDS AND TERRACES

This group includes fine-textured, reddish-brown to reddish-yellow soils of the uplands and terraces. They have developed from materials weathered from relatively high-grade limestone or interbedded limestone and shale. All are well drained, moderately deep or deep over bedrock, and medium to strongly acid. All have firm plastic subsoils. These soils are on mild slopes that rarely exceed 12 percent and are relatively free of stones. They are susceptible to erosion, and most areas have lost a part of the surface soil. Compared with other cropped soils of the uplands and terraces, the soils of this group are relatively high in organic matter, plant nutrients, and water-supplying capacity. The present content of organic matter and plant nutrients, especially nitrogen, depends largely on the past cropping system and loss of soil material by erosion.

The soils of management group 7 and characteristics that affect their management requirements are given in table 10.

TABLE 10.—*Productivity, workability, conservability, and land class of soils of management group 7, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Cumberland silty clay loam, eroded rolling phase.	High	Good	Good	2
Decatur silty clay loam, eroded rolling phase.	do	do	do	2
Dewey silt loam, rolling phase	Very high	Very good	do	1
Dewey silty clay loam, eroded rolling phase.	High	Good	do	2
Dunmore silt loam, rolling phase.	Medium	do	do	2
Dunmore silty clay loam, eroded rolling phase.	do	Fair	Fair	2
Farragut silty clay loam, eroded rolling phase.	do	Good	Good	2
Sequoia silt loam, rolling phase	do	do	Fair	2
Sequoia silty clay loam, eroded rolling phase.	do	do	do	3

These soils are well suited to practically all of the common crops, but are not so well suited to corn, tobacco, and truck crops as the soils of group 2. They are very well suited to most hay crops, especially alfalfa.

Management requirements.—Chiefly because of the stronger slope and greater susceptibility to erosion, the soils of this group cannot be used as intensively as those of group 4. A longer rotation with more close-growing crops will be required to maintain or increase the productivity of the soils. A row crop may be safely grown once every 4 to 6 years, if the soil is properly fertilized and otherwise well managed. A rotation consisting of corn, a small grain, and alfalfa for 4 years

appears to be very well suited to these soils. Deep-rooted crops are beneficial. A winter cover crop should follow all clean-cultivated crops. Grass should be grown periodically to help maintain organic matter. If a grass is not included in the rotation, green manuring may be needed.

These soils do not have enough lime, phosphorus, and nitrogen for continued high yields of most crops. Lime and phosphate are needed, especially for legumes and grasses. Nitrogen is required except where supplied by legumes. Generally, potash is needed for the deep-rooted legumes but is not limiting for other crops.

The soil can be tilled in only a limited range of moisture conditions on the eroded areas, but good tilth is easily maintained on the uneroded soils. Grasses, deep-rooted legumes, and green-manure crops tend to improve tilth. Fall plowing may improve tilth, but erosion is difficult to prevent on fall-plowed fields. Contour tillage aids materially in conserving soil moisture and soil material.

Terracing is generally not advisable on the fine-textured soils of this group and should not be necessary if management is otherwise good. Stripcropping, however, may be required on the longer slopes.

These soils are very well suited to pasture but are not so productive as the soils of group 1 or group 2. Good pastures can be established without amendments, but response to lime and phosphate is excellent. Pasture is somewhat difficult to establish. Applications of barnyard manure and nitrogen fertilizers aid greatly in establishing the stand on eroded spots. After the pasture is established, the legumes in the pasture mixture should supply most of the nitrogen needed for high yields. Other management practices include clipping to control undesirable plants and grazing control.

MANAGEMENT GROUP 8—ROLLING NONSTONY DEEP FRIABLE YELLOW SOILS OF COLLUVIAL LANDS AND TERRACES

All of the soils in this group are acid in reaction and low in fertility and productivity. They are deep friable soils with a moderate water-holding capacity. They are relatively free of stones, and tilth is generally good. All have some stones on the surface and throughout the profile, but not enough to interfere with tillage. Slopes are comparatively mild (between 5 and 12 percent) but are strong enough to cause some erosion. Part of the surface soil in areas under cultivation has been lost, and the finer textured subsurface layers are exposed in places. Consequently, the moisture range for tillage has been narrowed, especially on the severely eroded Jefferson soil. Holston loam, rolling phase, and Jefferson silt loam, rolling phase, are virtually uneroded.

The soils of this management group have adequate surface and internal drainage for most crops. Except for Jefferson silty clay loam, severely eroded rolling phase, which is largely suited only to pasture or forest, the soils are suited to a wide variety of crops, including corn, wheat, oats, barley, tobacco, and many vegetables. If properly fertilized, such crops as alfalfa and red clover can be successfully grown. Most of the soils are probably better suited to small grains than to corn.

The soils of management group 8 and characteristics that affect their management requirements are given in table 11.

TABLE 11.—*Productivity, workability, conservability, and land class of soils of management group 8, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Holston loam:				
Rolling phase	Medium	Very good	Good	3
Eroded rolling phase	Low	do	Fair	3
Jefferson fine sandy loam, eroded rolling phase.	do	do	do	3
Jefferson silt loam:				
Rolling phase	Medium	do	do	3
Eroded rolling phase	Low	do	do	3
Jefferson silty clay loam, severely eroded rolling phase.	Very low	Good	Poor	4

Management requirements.—These soils require more exacting management than those of group 5, chiefly because of the stronger slopes and somewhat greater losses through erosion. More care to prevent further erosion, and longer rotations that include more close-growing crops are necessary. If other management practices are good, these soils can be maintained in a 4- to 6-year rotation. A rotation consisting of corn, a small grain, clover and orchardgrass for 3 years, and tobacco followed by crimson clover is well suited. Almost any of the other row crops commonly grown can be substituted for either the corn or tobacco in this rotation. A rotation consisting of corn, a small grain, and alfalfa for 4 years is suitable if a very high level of fertility is maintained. It is important that a cover crop follow all intertilled crops.

The soils of this management group are similar to those of group 5 in fertilizer requirements, but generally somewhat larger applications are needed for comparable yields. They do not have enough lime, phosphorus, potash, and nitrogen to produce high yields of most crops, but they vary considerably in degree of deficiency. The legume crops, especially deep-rooted legumes, require lime and phosphorus and generally potassium; but if they are inoculated, nitrogen is not needed. These crops will generally supply enough nitrogen for the other crops in the rotation. All crops respond well to phosphate fertilizers, and truck crops and tobacco need heavy applications of a complete fertilizer.

These soils can be tilled over a fairly wide range of moisture conditions, and good tilth is easily maintained. If rotations such as those suggested above are followed and fertilization is adequate, runoff and erosion control should not be serious problems. All tillage should be on the contour, and stripcropping may be advisable on the long slopes. Terraces or other engineering devices for runoff control should not be necessary unless a shorter rotation than that suggested is to be used. The soils of this group are deep and permeable and generally have regular slopes. Terraces should be effective for control of runoff on these soils, if suitable outlets are available.

These soils are suited to pasture. Moderate to large amounts of lime and phosphate, applied to suitable pasture plants, are necessary to produce high yields. Furthermore, moderate applications of

potash will likely be needed to establish the pasture stand. Other requirements are proper control of grazing and occasional mowing to help control weeds.

MANAGEMENT GROUP 9—ROLLING STONY AND CHERTY FRIABLE YELLOWISH-RED AND YELLOW SOILS OF COLLUVIAL LANDS AND UPLANDS

The soils of management group 9 are poor to fair for crops and fair to good for pasture. They are suited to crops, but the many stones, chert, or cobbles on the surface and throughout the profile interfere with tillage. All are deep well-drained soils moderate to low in plant nutrients, organic matter, and water-holding capacity and medium to strongly acid. All except some areas of the Fullerton soils are permeable to air, roots, and water.

These soils are suited to most of the crops of the county, but their suitability is somewhat limited by stoniness and droughtiness. They are well suited to early vegetable crops and fairly well suited to crops such as crimson clover, red clover, and the small grains. They are not so well suited to crops that mature late in summer or early in fall.

The soils of management group 9 and characteristics that affect their management requirements are given in table 12.

TABLE 12.—*Productivity, workability, conservability, and land class of soils of management group 9, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Allen stony fine sandy loam, eroded rolling phase.	Medium	Fair	Fair	3
Fullerton cherty silt loam:				
Rolling phase	do	do	Good	3
Eroded rolling phase	do	do	do	3
Jefferson stony fine sandy loam:				
Rolling phase	Low	do	Fair	3
Eroded rolling phase	do	do	do	3

Management requirements.—Because of the difficulty of tilling, many farmers prefer for these soils a long rotation such as corn, wheat, and pasture for 3 to 5 years. If a more intensive use is necessary, a rotation of corn, a small grain, and red clover and grass for 3 years is suitable. Any of the commonly grown row crops can be substituted for the corn. It may be desirable to use these soils largely for pasture on many farms.

Practically all of the soils of this group are deficient in lime, phosphorus, and nitrogen for high yields of most crops. Soils such as the Jefferson and Allen are also likely to be very deficient in potash. Lime, phosphate, and potash are essential for the successful growth of alfalfa and red clover. Practically all crops will make a very good response to phosphate fertilizers. Nitrogen is also essential for high yields of all except possibly the legume crops. Potash is not so likely to be limiting, except for such crops as alfalfa and potatoes, but probably will be needed for all crops on Allen and Jefferson soils. Barnyard manure is an excellent source of nitrogen, potash, and organic matter.

These soils are susceptible to erosion; tillage should be on the contour where feasible. Terraces should not be necessary if fertilization is adequate and rotations similar to those suggested are used. The removal of loose stones will improve workability but generally is not practical except for very small areas.

The soils of this group are fair to good for pasture. To establish and maintain high-yielding pastures of good quality, moderate to heavy applications of lime, phosphate, and potassium are generally required. A pasture mixture consisting of bluegrass, orchardgrass, redtop, white clover, hop clover, and lespedeza is well suited to these soils. Other management practices are proper control of grazing and mowing to remove excess herbage and control weeds.

MANAGEMENT GROUP 10—SEVERELY ERODED ROLLING DEEP AND MODERATELY DEEP PLASTIC RED TO REDDISH-YELLOW SOILS OF UPLANDS AND TERRACES

The soils of management group 10 differ from those of group 7 chiefly in being severely eroded. Most of the original surface layer and, in many places, a part of the subsoil have been removed by erosion. Shallow gullies are common. The soils are generally 5 feet or more thick, but erosion has exposed bedrock in many places. These fine-textured soils are low in fertility and are medium or strongly acid. The organic-matter and plant-nutrient content and the water-holding capacity have been greatly lowered. Slopes range between 5 and 12 percent. The surface layers absorb water slowly, and moisture movement within the soils is moderately slow. The range of moisture conditions favorable for tillage is narrow, and good tilth is maintained with difficulty. These soils are very susceptible to further erosion because of the rolling relief and the slow infiltration of moisture.

Suitability for crops is limited. The soils are poorly suited to row crops and tobacco but are fairly well suited to small grains, pasture, and hay crops, especially the deep-rooted legumes.

The soils of management group 10 and characteristics that affect their management requirements are given in table 13.

TABLE 13.—*Productivity, workability, conservability, and land class of soils of management group 10, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Cumberland silty clay loam, severely eroded rolling phase.	Low	Fair	Fair	3
Dunmore silty clay loam, severely eroded rolling phase.	do	do	do	3
Decatur silty clay loam, severely eroded rolling phase.	do	do	do	3
Dewey silty clay loam, severely eroded rolling phase.	do	do	do	3
Farragut silty clay loam, severely eroded rolling phase.	do	do	do	3
Fullerton silty clay loam, severely eroded rolling phase.	do	Good	do	3
Sequoia silty clay loam, severely eroded rolling phase.	do	Fair	Poor	4

Management requirements.—The main management problems are (1) the improvement of the physical condition so that the soils absorb and hold an adequate supply of water for plant growth, (2) the improvement of tilth conditions, and (3) the control of runoff and erosion. Proper choice and rotation of crops, the addition of organic matter, and care in tillage are general requirements. Deep-rooted legume crops can be used effectively on these soils to improve the physical condition and help maintain supplies of organic matter and nitrogen. Alfalfa, sweetclover, and lespedeza sericea are suitable for this purpose. Green-manure crops, including crimson clover, vetch, and sweetclover, are also useful.

Probably one of the better cropping systems consists of a small grain for 1 year, followed by a leguminous hay crop or legume-and-grass pasture for 4 or 5 years. A 1-year rotation of a small grain and lespedeza might also be used. The use of such a cropping system depends on the type of farming, the amount of arable land, and the availability of necessary equipment. This short rotation generally is not desirable until the productivity of the soil has been restored through the addition of plant nutrients and organic matter. If a row crop must be grown on these soils, it should always be followed by a cover crop.

Any good management program for these soils will include the use of lime and fertilizers. The soils are very deficient in nitrogen and phosphorus for practically all crops and generally deficient in potash for deep-rooted legumes. Manure supplies plant nutrients and improves the tilth and water-absorbing properties of the soil. Lime is essential for the maintenance of such crops as alfalfa or red clover.

Control of runoff and erosion is important in the management of these soils. Contour tillage should be practiced wherever feasible, and a cover of close-growing crops is desirable. If the soils are tilled in the fall, they need cover crops to protect them during the winter and to supply organic matter when turned under in the spring. Terracing is generally not advisable on the soils of this group that have fine-textured subsoils, but stripcropping may be advisable on the longer slopes.

Good tilth is difficult to maintain. Organic matter incorporated in the soil helps maintain good tilth. Cultivation should be kept at a minimum and tillage restricted to the narrow range of favorable moisture conditions.

Where these soils are used for pasture and the pasture is already well established, the requirements consist chiefly of the periodic application of lime and phosphate and mowing to control weeds. If fertilization is adequate, grazing is properly controlled, and weeds are systematically eradicated, reseeding ordinarily should not be necessary. On the contrary, the pastures can be expected to improve with age.

Where the pastures are not yet established, they are difficult to start, largely because of the unfavorable tilth, tendency to clod and bake, slow absorption of moisture, and extreme lack of organic matter. Lime and phosphate are necessary and potash may be needed in getting desirable vegetation established. Nitrogen may also help. Pasture mixtures should contain a considerable proportion of drought-resistant plants. A good practice is to seed alfalfa or sericea on prop-

erly fertilized fields, graze the fields after the pastures are well established, and seed a pasture mixture on the stubble. Applications of barnyard manure are very helpful in establishing plants on the severely eroded areas.

MANAGEMENT GROUP 11—HILLY NONSTONY RED TO REDDISH-YELLOW SOILS OF UPLANDS, TERRACES, AND COLLUVIAL LANDS

The soils of management group 11 are poor to fair for crops and fair to very good for pasture. They differ from soils of groups 6 and 7 chiefly in having stronger slopes, which range from 12 to 25 percent. Because of their stronger slopes, these soils are more difficult to till and to conserve and require more careful management. They are moderately deep well-drained soils that differ greatly in permeability. Supplies of organic matter and plant nutrients are generally moderate, but they vary according to past cropping practices and degree of erosion. The soils of this management group have a moderately high water-holding capacity. Stones are not numerous enough to interfere with tillage, although all of the soils have some cobbles, stones, or gravel.

These soils are well suited to many crops, including corn, wheat, oats, barley, tobacco, and vegetables. If properly fertilized, alfalfa and red clover are successfully grown. Nevertheless, the exacting conservation requirements may greatly limit the choice of crops and the frequency with which a given crop can be grown.

The soils of management group 11 and the characteristics that affect their management requirements are given in table 14.

TABLE 14.—*Productivity, workability, conservability, and land class of soils of management group 11, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Cumberland silt loam, hilly phase.	Medium	Good	Fair	3
Cumberland silty clay loam, eroded hilly phase.	do	Fair	do	3
Decatur silty clay loam, eroded hilly phase.	do	do	Poor	3
Dewey silty clay loam, eroded hilly phase.	do	do	do	3
Dunmore silt loam, hilly phase	do	do	do	3
Dunmore silty clay loam, eroded hilly phase.	do	do	do	3
Fullerton silt loam:				
Hilly phase	do	Good	Fair	3
Eroded hilly phase	do	Fair	do	3
Hayter silt loam, eroded hilly phase.	do	Good	do	3
Waynesboro loam, eroded hilly phase.	do	do	do	3

Management requirements.—Most of these soils are quite exacting in management requirements. They need good tillage, proper and adequate fertilization, and a long rotation that consists chiefly of close-growing crops. A rotation suitable for most areas is corn, a

small grain, and red clover and orchardgrass for 4 years. A rotation consisting of barley (or other small grain) and red clover and orchardgrass for 3 years probably would give greater protection from erosion. A small grain crop seeded in contour furrows and followed by lespedeza is a successful rotation used by a few farmers.

These soils are deficient in lime, phosphorus, and nitrogen, but they vary considerably in degree of deficiency. The legume crops, especially the deep-rooted ones, require lime and phosphorus but no nitrogen if they are inoculated. Potash may also be needed for the deep-rooted crops as well as for such crops as Irish potatoes. All crops respond well to phosphate fertilizer. Truck crops and tobacco require heavy applications of a complete fertilizer.

The uneroded soils can be tilled over a wide range of moisture conditions, and good tilth is easily maintained. The eroded phases, especially of the Decatur, Dunmore, and Dewey soils, are subject to puddling and clodding and can be tilled only over a narrow range of moisture conditions. The growing of grasses, deep-rooted legumes, and green-manure crops and the use of barnyard manure will improve tilth. Surface runoff and loss of soil material by erosion is difficult to control. This loss can be held at a reasonable level by using a long rotation consisting chiefly of close-growing crops such as those suggested above and by practicing contour tillage. Contour stripcropping may be advisable on the longer slopes. Where contour tillage or stripcropping is not feasible because of very irregular slopes, the omission of row crops altogether should be considered.

These soils are well suited to pasture, probably their best use on many farms. The pasture management consists mainly of supplying amendments, chiefly lime and phosphate, to suitable pasture plants. Pasture stands are somewhat difficult to establish on the more severely eroded spots. Applications of barnyard manure aid greatly in establishing the stand on these galled spots. Applications of nitrogen fertilizers also help. After the pasture is established, however, the legumes in the pasture mixture should supply most of the nitrogen needed for high yields. Grazing should be controlled so as to maintain a good sod at all times. On pastures that receive adequate amendments and are properly grazed, weed control is not a serious problem, but an occasional clipping may be necessary.

MANAGEMENT GROUP 12—SEVERELY ERODED HILLY NONSTONY RED TO YELLOWISH-RED SOILS OF UPLANDS AND TERRACES AND STONY HILLY LAND (DUNMORE AND TALBOTT SOIL MATERIALS)

The well-drained soils of management group 12 differ from those of group 11 chiefly in being severely eroded. Most of the original surface layers and, in many places, a part of the subsoil have been removed by erosion. Shallow gullies are common. Although the soils are generally 5 feet or more in depth, erosion has exposed bedrock in many places. The supply of organic matter, the supply of plant nutrients, and the water-holding capacity have been greatly lowered by erosion. Good tilth is difficult to maintain, and the soils can be worked over a very narrow range of moisture conditions.

These soils are considered poorly suited to crops requiring tillage, owing to poor tilth, strong slopes, and extreme susceptibility to further erosion. They are probably best used for pasture on most farms.

The soils of management group 12 and characteristics that affect their management requirements are given in table 15.

TABLE 15.—*Productivity, workability, conservability, and land class of soils of management group 12, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Cumberland silty clay loam, severely eroded hilly phase.	Low	Poor	Poor	4
Decatur silty clay loam, severely eroded hilly phase.	do	do	Very poor	4
Dewey silty clay loam, severely eroded hilly phase.	do	do	do	4
Dunmore silty clay loam, severely eroded hilly phase.	do	do	do	4
Farragut silty clay loam, severely eroded hilly phase.	do	do	do	4
Fullerton silty clay loam, severely eroded hilly phase.	do	do	Poor	4
Waynesboro clay loam, severely eroded hilly phase.	do	Fair	do	4
Stony hilly land (Dunmore and Talbott soil materials).	do	Very poor	do	4

Management requirements.—Where these soils are used for pasture and the pasture is already well established, management requirements are chiefly the periodic application of lime and phosphate and mowing to control weeds. Occasional reseeding may be necessary. If the fertilization is adequate, grazing is properly controlled, and weeds are systematically eradicated, reseeding ordinarily should not be necessary. On the contrary, the pastures can be expected to improve with age. Management is difficult on areas where the pastures are not yet established, largely because of their unfavorable tilth, tendency to clod and bake, slow moisture absorption, and extreme deficiency in organic matter.

Lime and phosphate are necessary, and potash may be necessary for establishing desirable vegetation. Nitrogen may also help. Pasture mixtures should contain a considerable proportion of drought-resistant plants. A good practice, especially on the Decatur, Dewey, and Dunmore soils, is to seed alfalfa or lespedeza sericea on properly fertilized fields, graze them after they are well established, and seed the pasture mixture on the stubble. Applications of barnyard manure are very helpful in establishing plants on the galled areas.

If these soils are to be used for crops requiring tillage, a use to which they are poorly suited, exacting management requirements must be met. A plant cover is necessary all or nearly all the time, and row crops should be avoided altogether. Biennial and perennial close-growing crops should be selected in preference to annual crops that require yearly preparation of the seedbed. Grasses and legumes should be the chief crops in the rotation. It is essential that cultivation be on the contour. Because of the strong slopes and fine-textured slowly permeable subsoils, terracing is not likely to be practicable. Contour ditches or diversion ditches may be beneficial in some places. Fertilization, the addition of organic matter, and liming are also essential.

MANAGEMENT GROUP 13—HILLY DEEP NONSTONY FRIABLE YELLOW SOILS OF TERRACES AND COLLUVIAL LANDS

The soils of management group 13 are poor to fair for crops and fair to good for pasture. They differ from the soils of group 8 chiefly in having steeper slopes that range from 12 to 25 percent in gradient. These deep relatively permeable well-drained soils are low in natural fertility. The content of organic matter and plant nutrients is moderate to low, and the water-holding capacity is low. The soils absorb water readily and permit free circulation of soil air and moisture and easy penetration of plant roots. All of the soils of this group have some gravel and cobbles on the surface and throughout the profile, but none have enough to affect tillage.

The exacting management requirements of these soils limit somewhat the choice of crops and the frequency with which they can be grown. Fertilization is generally necessary for successful growth of most crops and is essential for alfalfa and red clover. Moisture conditions are not generally favorable for tobacco or vegetable crops.

The soils of management group 13 and characteristics that affect their management requirements are given in table 16.

TABLE 16.—*Productivity, workability, conservability, and land class of soils of management group 13, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Holston loam, eroded hilly phase.	Low	Good	Poor	4
Jefferson fine sandy loam, eroded hilly phase.	do	do	do	4
Jefferson silt loam:				
Hilly phase	Medium	do	do	4
Eroded hilly phase	Low	do	do	4
Jefferson silty clay loam, severely eroded hilly phase.	Very low	Poor	Very poor	5
Nolichucky loam:				
Hilly phase	Medium	Good	Poor	4
Eroded hilly phase	do	do	do	4

Management requirements.—On most farms these soils are probably best used for semipermanent hay crops or pasture. To maintain or increase the productivity, a long, properly fertilized rotation consisting chiefly of close-growing crops is required. If management practices are good, a row crop probably can be grown once in 5 or 6 years. It is especially important that a cover crop, preferably a legume, follow the intertilled crop. Where the soils are kept in sod crops most of the time, erosion is prevented, soil moisture is conserved, and the supplies of nitrogen and humus are increased or maintained.

These soils, like those of management group 8, are low in nitrogen, phosphorus, potash, and lime and require similar fertilization. Small grains, as well as grass crops, require complete fertilizers for high yields. Legumes or legume-grass mixtures require phosphorus and potash but no nitrogen if properly inoculated. Lime is necessary to obtain good stands of legumes. It also improves the yields and

quality of other crops in the rotation. Barnyard manure in adequate quantities is an excellent source of nitrogen, potash, and organic matter. Amendments should be applied to meet the needs of a particular crop rather than in large amounts at long intervals.

Tillage of these soils is moderately difficult because of the strong slopes, but good tilth is fairly easily maintained and tillage can be carried on over a fairly wide range of moisture conditions. In order to control erosion and conserve moisture, careful choice, rotation, and fertilization of crops are needed, and usually other special practices. All tillage should be on the contour. Where it is necessary to grow row crops because of lack of better soils on the farm, some system of stripcropping probably will be advisable. Generally terraces are not feasible on the strong slopes of these soils.

This group of soils is suited to pasture, but less well suited than those of group 8. Management requirements for pasture are very similar to those of group 8. They are concerned chiefly with supplying needed amendments to suitable pasture mixtures, controlling grazing, and eradicating weeds.

MANAGEMENT GROUP 14—HILLY DEEP STONY AND CHERTY FRIABLE YELLOWISH-RED AND YELLOW SOILS OF COLLUVIAL LANDS AND UPLANDS

The soils of management group 14 differ from those of group 9 chiefly in having steeper slopes of about 12 to 25 percent. They are permeable and well-drained. The chert, cobbles, or gravel in these soils, however, interfere materially with tillage and in some places almost prevent it. Because of hilly relief and stoniness, soils of this group have poor to very poor workability and are therefore not generally considered suitable for crops. All have low moisture supplies for plant growth and most are low in natural fertility. They are therefore not naturally productive of pasture plants but are probably best used for it on most farms.

The soils of management group 14 and characteristics that affect their management requirements are given in table 17.

TABLE 17.—*Productivity, workability, conservability, and land class of soils of management group 14, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Allen stony fine sandy loam, eroded hilly phase.	Low	Poor	Fair	4
Fullerton cherty silt loam:				
Hilly phase	do	do	do	4
Eroded hilly phase	do	do	do	4
Fullerton cherty silty clay loam, severely eroded hilly phase.	Very low	Very poor	Poor	5
Jefferson stony fine sandy loam:				
Hilly phase	Low	Poor	Very poor	4
Eroded hilly phase	do	do	do	4
Severely eroded hilly phase.	Very low	Very poor	do	5

Management requirements.—To establish and maintain good pastures on these soils will require moderate to heavy applications of lime and phosphate and possibly potash. A pasture mixture including bluegrass, orchardgrass, white clover, hop clover, and lespedeza is well suited. If these soils are properly fertilized and grazed, weeds may be controlled. Owing to the stoniness and strong slopes, mowing is a very difficult and ineffective means of weed control for most areas. A good practice is to grow an intertilled crop such as corn once in every 8 or 10 years, if weeds are crowding out the desirable pasture plants.

On some farms it may be necessary and desirable to use these soils for crops. If so, the management will be similar to that for the soils of group 9. However, the rotation will need to be longer and include more close-growing crops, and contour tillage will be more important. Contour stripcropping will make possible a more intensive cropping system.

MANAGEMENT GROUP 15—HILLY AND ROLLING SHALLOW SHALY SOILS OF UPLANDS UNDERLAIN BY CALCAREOUS SHALE OR INTERBEDDED LIMESTONE AND SHALE

Because of extreme susceptibility to injury from erosion, very low moisture supplies, and hilly relief, the soils of management group 15 are poorly or very poorly suited to tilled crops. The rolling phases are chiefly on narrow winding ridge crests surrounded by hilly and steep slopes and generally cannot be feasibly used for crops. Fair pastures can be maintained, however, under careful management. The uneroded soils of this group are not deep, and the eroded soils generally consist of a mixture of soil material and partially weathered shale only a few inches thick. All the soils are well supplied with lime and potash in most places, but are low in phosphorus and nitrogen. The Litz soils in the complex and, in some places the Armuchee soils, are strongly acid. The soils of this management group have a low to very low water-holding capacity.

The soils of management group 15 and characteristics that affect management requirements are given in table 18.

TABLE 18.—*Productivity, workability, conservability, and land class of soils of management group 15, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Armuchee silty clay loam:				
Eroded hilly phase	Low	Fair	Very poor	4
Severely eroded hilly phase.	Very low	Poor	do	4
Dandridge silt loam, hilly phase.	Medium	Fair	Poor	4
Dandridge shaly silt loam:				
Eroded hilly phase	Low	do	do	4
Eroded rolling phase	do	Good	Fair	3
Dandridge and Litz silt loams, hilly phases.	do	Fair	Poor	4
Dandridge and Litz shaly silt loams:				
Eroded hilly phases	Very low	Poor	do	4
Eroded rolling phases	Low	Good	Fair	3

Management requirements.—Although these soils are naturally productive of fair pasturage, they respond to good management. Liberal applications of phosphorus will be needed at frequent intervals. The Litz soils need lime. The other soils should be tested before lime is applied. An initial application of potash may be necessary, but if droppings are scattered, it will not be needed after the pasture is well established. Nitrogen may be needed if the proportion of legumes in the mixture is low. Barnyard manure, applied especially on the galled spots, and nitrogen will aid in establishing pastures.

Since pastures on these soils are subject to injury from droughts, grazing must be carefully controlled, especially during dry periods. Emergency pastures are advisable for the dry summer and early fall months. Subsoiling on the contour to a depth between 15 and 20 inches will decrease runoff and increase water-holding capacity on the eroded Dandridge soils. This practice is not generally used on the Armuchee and many areas of the Litz soils because of the hard rock outcrops. Controlled grazing and the use of amendments are largely effective in keeping down weeds, although clipping may be necessary.

MANAGEMENT GROUP 16—HILLY AND ROLLING SHALLOW SOILS OF UPLANDS UNDERLAIN BY ACID SHALE, SLATE, AND QUARTZITE

Management group 19 includes stony or shaly soils, chiefly of the mountains. The stones on the surface and in the plow layer materially interfere with tillage in many areas and prevent it in some. Because of strong slopes, low fertility, low water-holding capacity, and susceptibility to erosion, the soils of this group are poorly to very poorly suited to crops that require tillage. Generally they are not naturally productive of pasture plants, although the different soils vary somewhat in this respect.

The soils of management group 16 and characteristics that affect their management requirements are given in table 19.

TABLE 19.—*Productivity, workability, conservability, and land class of soils of management group 16, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Litz shaly silt loam, eroded rolling phase.	Very low	Fair	Poor	4
Litz silt loam, hilly phase	do	Poor	Very poor	5
Litz shaly silt loam, eroded hilly phase.	do	do	do	5
Ramsey shaly silt loam:				
Hilly phase	Low	do	Poor	4
Eroded hilly phase	do	do	do	4
Ramsey stony fine sandy loam, hilly phase.	Very low	do	do	4

Management requirements.—Fair to good pastures can be established and maintained on these soils by good management. The pasture management consists chiefly of supplying amendments and controlling grazing and weeds. Lime and phosphate are general requirements for good yields on all the soils. Potash may be needed in establishing

pastures on the Ramsey soils, especially on the stony fine sandy loam, but should not be needed on the other soils. Nitrogen may be required on pastures that have a low proportion of legumes in the pasture mixture or in establishing new pastures. If properly fertilized, the soils are suited to bluegrass, orchardgrass, redtop, white clover, hop clover, and lespedeza. Weeds can be controlled by regulated grazing on most well fertilized pastures. The growing of an intertilled crop at 7 to 10 year intervals, however, may be necessary to eliminate weeds on some pastures. Unless well managed, these soils are probably best used for forestry on many farms.

MANAGEMENT GROUP 17—NEARLY LEVEL POORLY DRAINED GRAY SOILS OF BOTTOM LANDS AND TERRACES

The soils of this group are poorly suited to crops, but they are fair to good for pasture. They are poorly drained and are in nearly level to slightly depressed areas. The Prader soil is on stream bottoms that are subject to flooding, and the Roanoke and Tyler soils are on stream terraces. The Prader soil varies considerably both in fertility and reaction. The Roanoke and Tyler soils are low in fertility and strongly to very strongly acid.

Under natural drainage, these soils are poorly suited to crops requiring tillage. They are suitable for pasture, although the Roanoke and Tyler soils have low productivity for pasture plants. These soils would be suitable for crops requiring tillage if adequately drained; but the draining of the Roanoke and Tyler soils is difficult and of doubtful practicability.

The soils of management group 17 and characteristics that affect management requirements are given in table 20.

TABLE 20.—*Productivity, workability, conservability, and land class of soils of management group 17, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Prader silt loam	Low	Fair	Fair	4
Roanoke silt loam	do	do	do	4
Tyler silt loam	do	do	do	4

Management requirements.—These soils furnish a fair quantity of pasture throughout the spring, summer, and fall, but the quality is only poor to fair. Improvement of moisture conditions is the first requirement of good pasture management. Open ditches, bedding, and diversions would improve drainage considerably in most places. Tiling would probably be effective on the Prader soil, but not on the Roanoke and Tyler soils, because of their claypans. After drainage has been improved, seedings of bluegrass, white clover, redtop, and lespedeza will grow well, especially if lime and phosphate are used where needed. Redtop and lespedeza are grown successfully without amendments, but the pastures are of lower quality. Weeds should be controlled by grazing and mowing.

Although poorly suited to crops requiring tillage, these soils may be used to grow crops that can be planted late in spring or early in summer and harvested in fall. Sorghum and soybeans are well suited to such use. If these soils are effectively drained, their use and management would be similar to that of the imperfectly drained soils of management group 1, although crop yields would not be expected to be so high.

MANAGEMENT GROUP 18—HILLY AND ROLLING VERY STONY DEEP YELLOW SOILS OF COLLUVIAL LANDS AND STONY COLLUVIUM (JEFFERSON SOIL MATERIAL)

The soils of management group 18 differ from those of group 14 chiefly in being more stony. They are deep permeable well-drained soils but all contain stones, cobbles, or gravel that prevent tillage in most places. Mainly because of the poor workability of these soils caused by rolling and hilly relief and stoniness, they are not generally considered suitable for crops. All have low moisture supplies for plants and low fertility; consequently, they are not naturally productive of pasture plants. Unless there is a great demand for additional pasture, these soils can probably be best used for forestry. If needed, they can be used for pasture on most farms.

The soils of management group 18 and characteristics that affect their management requirements are given in table 21.

TABLE 21.—*Productivity, workability, conservability, and land class of soils of management group 18, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Jefferson very stony fine sandy loam:				
Rolling phase	Very low	Very poor	Fair	4
Eroded rolling phase	do	do	do	4
Hilly phase	do	do	Poor	4
Eroded hilly phase	do	do	do	4
Stony colluvium (Jefferson soil material)	do	do	Fair	5

Management requirements.—To establish and maintain good pastures on these soils will require moderate to heavy applications of lime, phosphate, and possibly potash. After the proper amendments have been added, a pasture mixture consisting of bluegrass, orchardgrass, white clover, hop clover, and lespedeza is well suited. Other management practices are control of grazing and eradication of weeds. Weeds can be controlled on properly fertilized and grazed areas. Because of extreme stoniness, however, mowing is very difficult or impossible and is ineffective for weed control.

On some farms, it may be feasible to improve the workability of the soils by removing the surface stones. This is practical, however, only on small patches used for garden or truck crops.

MANAGEMENT GROUP 19—STEEP SOILS OF UPLANDS

The soils of management group 19 are very poorly suited to crops and poorly or very poorly suited to pasture. In addition to steep slopes, most of these soils have other unfavorable properties such as stoniness, shallowness, low fertility, or severe erosion. The soils vary greatly in depth to bedrock, content of plant nutrients, content of organic matter, and water-holding capacity. On most farms, they are probably best used for forestry.

The soils of management group 19 and characteristics that affect their management requirements are given in table 22.

TABLE 22.—*Productivity, workability, conservability, and land class of soils of management group 19, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Armuchee silt loam, steep phase.	Low	Very poor	Very poor	4
Armuchee silty clay loam, severely eroded steep phase.	Very low	do	do	5
Dandridge silt loam, steep phase.	Low	do	do	4
Dandridge shaly silt loam, eroded steep phase.	do	do	do	4
Dandridge and Litz silt loams, steep phases.	Very low	do	do	5
Dandridge and Litz shaly silt loams, eroded steep phases.	do	do	do	5
Decatur silty clay loam, eroded steep phase.	Medium	do	do	4
Dunmore silty clay loam, eroded steep phase.	Low	do	do	4
Fullerton cherty silt loam:				
Steep phase	do	do	Poor	4
Eroded steep phase	do	do	do	4
Fullerton cherty silty clay loam, severely eroded steep phase.	Very low	do	Very poor	5
Muskingum-Lehew loams, steep phases.	do	do	do	5
Ramsey shaly silt loam:				
Steep phase	do	do	do	5
Eroded steep phase	do	do	do	5
Ramsey stony fine sandy loam:				
Steep phase	do	do	do	5
Eroded steep phase	do	do	do	5

Management requirements.—A notable part of these soils is in forest at present, and, in general, a program of reforestation should be carried out on the remaining acreage. In some places a suitable forest cover will establish itself if it is properly protected against fire and grazing by livestock; in others planting will be necessary.

Some management practices used in forest production are the following: (1) Maintenance of a full stand of desirable species, (2) systematic cutting and weeding of trees, (3) harvesting of the mature

trees in such a manner that desirable species may succeed them, and (4) control, so far as possible, of fires, browsing, trampling, and damage from other causes. Practices in the first three groups are strictly those of forest management, whereas those of the last group pertain both to soil and forest management. For a more detailed discussion of reforestation and forest management, see the section on forests.

Although these soils are not well suited to crops and pasture, small areas are being used for them. Where tilled crops are grown, adequate liming and fertilizing and every reasonable supporting practice for water control are needed. Amendments and careful selection and rotation of crops are especially needed to encourage heavy vegetation. Stripcropping is generally advisable.

To maintain pastures, additions of lime and fertilizers, particularly phosphorus, and other good management practices are required. Legumes should make up a considerable part of the pasture sod. It is difficult to apply amendments and also to control weeds in many places, chiefly because of the steep slopes, stoniness ,and inaccessibility.

MANAGEMENT GROUP 20—VERY STEEP SOILS OF UPLANDS AND MISCELLANEOUS LAND TYPES

The soils of management group 20 have undesirable characteristics, such as extreme stoniness, very steep slopes, or severe gullying, that largely prevent their use for either crops or pasture. A large part of these soils is in forest at present, and in general the remaining acreage should be reforested. For a discussion of reforestation and forest management, see management group 19 and the section on forests.

TABLE 23.—*Productivity, workability, conservability, and land class of soils of management group 20, Sevier County, Tenn.*

Soils	Productivity	Workability	Conservability	Land class
Ramsey stony fine sandy loam, very steep phase.	Very low	Very poor	Very poor	5
Ramsey shaly silt loam, very steep phase.	do	do	do	5
Rough gullied land:				
Dandridge soil material	do	do	do	5
Limestone material	do	do	do	5
Ramsey and Litz soil materials.	do	do	do	5
Rough mountainous land (Ramsey soil material).	do	do	do	5
Stony steep land (Dunmore and Talbott soil materials).	Low	do	do	5

ESTIMATED YIELDS

The average crop yields that may be expected over a period of years on the soils of the county under common management (columns A), and good management (columns B) are given in table 24. Comparison of yields on the different soils of the county under the same level of management, or on the same soils under the two different levels, may be made from this table.

TABLE 24.—*Average acre yields of crops that may be expected over a period of years on the soils of Sevier County, Tenn., under common management (columns A)*[1] *and good management (columns B)*[2]

[Blank spaces indicate that the crop is not commonly grown and the soil is unsuited to its production under management specified]

Soils	Corn		Wheat		Oats		Lespedeza		Red clover		Tobacco		Pasture		Management group
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days*[3]	*Cow-acre-days*[3]	
Allen stony fine sandy loam:															
Eroded rolling phase	25	40	9	16	18	30	0.8	1.1	1.1	1.5	825	1,275	55	100	9
Eroded hilly phase	18	30	6	14	12	25	.6	.9	.8	.2	-----	(4)	45	90	14
Armuchee silty clay loam:															
Eroded hilly phase	-----	-----	-----	-----	-----	-----	.4	.6	-----	-----	-----	-----	35	80	15
Severely eroded hilly phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	65	15
Armuchee silt loam, steep phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	(4)	65	19
Armuchee silty clay loam, severely eroded steep phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	19
Barbourville silt loam:															
Undulating phase	32	60	14	20	25	40	1.0	1.6	1.3	1.7	1,200	1,800	80	130	2
Rolling phase	30	55	12	18	23	35	.8	1.5	1.2	1.5	1,100	1,700	75	125	2
Barbourville stony fine sandy loam, rolling phase	25	45	12	18	20	35	.7	1.2	1.0	1.3	1,000	1,500	60	110	2
Barbourville-Cotaco fine sandy loams	30	55	14	20	25	35	1.0	1.5	(4)	(4)	1,200	1,800	70	115	2
Buncombe loamy fine sand	15	30	5	10	10	25	.5	.8	.7	.9	-----	-----	15	45	1
Congaree loam	45	70	15	20	35	50	1.3	1.8	1.5	2.0	1,500	1,900	110	135	1
Cotaco silt loam:															
Undulating phase	25	50	10	16	20	30	.8	1.3	-----	1.4	1,000	1,400	90	115	2
Rolling phase	20	40	8	15	16	28	.6	1.0	1.0	1.4	800	1,200	65	105	2
Cumberland silty clay loam:															
Eroded rolling phase	30	55	16	26	35	55	1.1	1.5	1.4	1.9	1,400	1,800	65	115	7
Severely eroded rolling phase	15	35	7	16	16	38	.6	1.2	.7	1.6	-----	-----	45	95	10
Cumberland silt loam:															
Undulating phase	35	60	18	28	40	60	1.2	1.6	1.5	2.0	1,500	2,000	70	125	3
Hilly phase	28	45	14	23	25	45	1.0	1.4	1.3	1.8	(4)	(4)	60	105	11

Cumberland silty clay loam:															
Eroded hilly phase	25	40	13	21	20	40	.9	1.3	1.3	1.7	-----	(4)	50	100	11
Severely eroded hilly phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.3	-----	-----	30	80	12
Dandridge silt loam, steep phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	(4)	75	19
Dandridge shaly silt loam, eroded steep phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	30	70	19
Dandridge silt loam, hilly phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	(4)	85	15
Dandridge shaly silt loam:															
Eroded hilly phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	35	80	15
Eroded rolling phase	13	18	5	10	15	25	.5	.8	.7	1.1	300	750	45	90	15
Dandridge and Litz silt loams, steep phases	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	(4)	60	19
Dandridge and Litz shaly silt loams, eroded steep phases	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	20	55	19
Dandridge and Litz silt loams, hilly phases	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	(4)	70	15
Dandridge and Litz shaly silt loams:															
Eroded hilly phases	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	25	65	15
Eroded rolling phases	12	18	5	10	12	23	.4	.8	(4)	1.0	(4)	700	40	80	15
Decatur silty clay loam:															
Eroded rolling phase	30	55	16	26	35	55	1.1	1.5	1.4	1.9	1,400	1,800	65	115	7
Severely eroded rolling phase	13	30	6	14	15	33	.5	1.1	.6	1.5	-----	-----	40	90	10
Eroded undulating phase	35	60	18	28	40	60	1.2	1.6	1.5	2.0	1,500	2,000	70	130	4
Eroded hilly phase	25	40	13	21	20	40	.9	1.3	1.3	1.7	-----	(4)	55	105	11
Severely eroded hilly phase	-----	-----	-----	-----	-----	-----	.5	1.0	-----	1.3	-----	-----	30	80	12
Eroded steep phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	45	85	19
Dewey silt loam, rolling phase	(4)	55	(4)	26	(4)	55	(4)	1.5	(4)	1.8	(4)	1,900	(4)	125	7
Dewey silty clay loam:															
Eroded rolling phase	28	53	15	24	30	50	1.0	1.4	1.3	1.7	1,300	1,800	60	115	7
Severely eroded rolling phase	13	30	6	14	15	33	.5	1.1	.6	1.5	-----	-----	40	90	10
Eroded undulating phase	33	55	16	26	35	55	1.1	1.5	1.4	1.8	1,400	1,900	65	130	4
Eroded hilly phase	25	40	13	21	20	40	.9	1.3	1.3	1.7	-----	(4)	55	105	11
Severely eroded hilly phase	-----	-----	-----	-----	-----	-----	.5	1.0	-----	1.3	-----	-----	30	80	12
Dunmore silt loam, rolling phase	(4)	50	(4)	20	(4)	45	(4)	1.4	(4)	1.7	(4)	1,600	(4)	110	7
Dunmore silty clay loam:															
Eroded rolling phase	30	45	12	18	22	40	.8	1.3	1.1	1.6	1,000	1,500	50	105	7
Severely eroded rolling phase	10	25	5	13	10	25	.5	1.1	.5	1.4	-----	-----	35	85	10
Dunmore silt loam, hilly phase	(4)	40	(4)	18	(4)	38	(4)	1.2	(4)	1.6	(4)	(4)	(4)	100	11
Dunmore silty clay loam:															
Eroded hilly phase	23	35	11	16	20	35	.6	1.0	1.0	1.4	-----	(4)	40	90	11
Severely eroded hilly phase	-----	-----	-----	-----	-----	-----	.4	.9	-----	1.2	-----	-----	25	70	12
Eroded steep phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	30	70	19

See footnotes at end of table.

TABLE 24.—*Average acre yields of crops that may be expected over a period of years on the soils of Sevier County, Tenn., under common management (columns A)*[1] *and good management (columns B)*[2]—Continued

Soils	Corn		Wheat		Oats		Lespedeza		Red clover		Tobacco		Pasture		Management group
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days*	*Cow-acre-days*	
Emory silt loam:															
Undulating phase	45	65	20	29	40	55	1.2	1.8	1.6	2.0	1,800	2,225	110	140	2
Rolling phase	40	60	18	25	35	50	1.1	1.7	1.5	1.9	1,600	2,000	100	130	2
Farragut silty clay loam:															
Eroded rolling phase	28	53	15	24	30	50	1.0	1.4	1.3	1.7	1,300	1,800	60	110	7
Severely eroded rolling phase	13	30	6	14	15	33	.5	1.1	.6	1.5	-----	-----	40	90	10
Eroded undulating phase	33	55	16	26	35	55	1.1	1.5	1.4	1.8	1,400	1,900	65	125	4
Severely eroded hilly phase	-----	-----	-----	-----	-----	-----	.5	1.0	-----	1.3	-----	-----	30	80	12
Fullerton silt loam:															
Hilly phase	(4)	38	(4)	18	(4)	35	(4)	1.2	(4)	1.6	(4)	(4)	(4)	105	11
Eroded hilly phase	23	35	11	19	18	35	.7	1.2	1.0	1.5	-----	(4)	55	100	11
Fullerton silty clay loam, severely eroded hilly phase	-----	-----	-----	-----	-----	-----	.5	1.0	-----	1.3	-----	-----	30	80	12
Fullerton silt loam:															
Rolling phase	(4)	48	(4)	21	(4)	43	(4)	1.3	(4)	1.7	(4)	1,500	(4)	110	6
Eroded rolling phase	30	45	13	20	25	40	.8	1.3	1.2	1.6	1,000	1,400	55	105	6
Fullerton silty clay loam, severely eroded rolling phase	12	30	6	14	15	30	.5	1.1	.6	1.5	-----	-----	40	85	10
Fullerton cherty silt loam:															
Rolling phase	(4)	45	(4)	20	(4)	40	(4)	1.3	(4)	1.7	(4)	1,400	(4)	105	9
Eroded rolling phase	28	42	12	18	23	38	.7	1.2	1.2	1.5	900	1,300	50	100	9
Hilly phase	(4)	30	(4)	15	(4)	28	(4)	1.0	(4)	1.3	-----	-----	(4)	100	14
Eroded hilly phase	20	30	8	15	13	28	.6	1.0	.9	1.3	-----	-----	50	95	14
Fullerton cherty silty clay loam, severely eroded hilly phase	-----	-----	-----	-----	-----	-----	.4	.9	-----	1.1	-----	-----	25	75	14
Fullerton cherty silt loam:															
Steep phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	40	90	19
Eroded steep phase	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	80	19

Fullerton cherty silty clay loam, severely eroded steep phase															19
Greendale and Pace silt loams:															
Undulating phases	40	55	18	24	33	43	1.1	1.6	1.4	1.8	1,650	2,100	80	125	2
Rolling phases	35	50	16	22	30	40	1.0	1.5	1.4	1.7	1,450	1,900	70	115	2
Hamblen silt loam	40	60		(1)		(1)	1.0	1.6		(1)		(1)	110	135	1
Hamblen fine sandy loam	30	55		(1)		(1)	.9	1.5		(1)		(1)	100	125	1
Hayter silt loam:															
Undulating phase	35	50	16	23	25	40	1.0	1.5	1.3	1.8	1,400	1,800	70	115	3
Eroded rolling phase	30	45	14	20	25	40	.8	1.3	1.1	1.6	1,200	1,600	60	110	6
Eroded hilly phase	23	38	11	19	18	35	.7	1.2	1.0	1.6		(1)	55	105	11
Hollywood silty clay loam	30	45					.7	1.2	1.5	2.0			90	120	2
Holston loam:															
Undulating phase	23	43	10	18	20	33	.8	1.2	1.2	1.6	750	1,425	50	100	5
Rolling phase	(1)	40	(1)	20	(1)	33	(1)	1.2	(1)	1.6	(1)	1,400	(1)	95	8
Eroded rolling phase	18	38	9	16	18	30	.7	1.1	1.0	1.5	650	1,100	45	90	8
Eroded hilly phase	14	25	7	14	13	25	.6	1.0	.8	1.3		(1)	45	85	13
Jefferson fine sandy loam:															
Eroded rolling phase	18	35	8	15	16	28	.6	1.0	1.0	1.4	600	1,000	45	95	8
Eroded hilly phase	14	25	7	14	13	25	.6	1.0	.8	1.3		(1)	45	85	13
Jefferson stony fine sandy loam:															
Undulating phase	15	35	7	15	13	30	.6	1.1	.9	1.4	450	900	45	95	5
Rolling phase	(1)	35	(1)	15	(1)	30	(1)	1.1	(1)	1.4	(1)	900	(1)	90	9
Eroded rolling phase	14	33	6	14	12	28	.5	1.0	.8	1.3	400	850	40	85	9
Hilly phase								.9					(1)	85	14
Eroded hilly phase								.8					35	80	14
Severely eroded hilly phase														55	14
Jefferson very stony fine sandy loam:															
Rolling phase													30	60	18
Eroded rolling phase													25	55	18
Hilly phase													(1)	55	18
Eroded hilly phase													20	50	18
Jefferson silt loam:															
Undulating phase	25	45	10	18	25	40	.8	1.2	1.2	1.6	750	1,425	50	100	5
Rolling phase	(1)	40	(1)	16	(1)	35	(1)	1.1	(1)	1.5	(1)	1,200	(1)	95	8
Eroded rolling phase	18	38	8	15	16	30	.6	1.0	.9	1.4	600	1,100	40	90	8
Jefferson silty clay loam, severely eroded rolling phase				12		20	.3	.7		1.0			30	75	8
Jefferson silt loam:															
Hilly phase	(1)	30	(1)	15	(1)	30	(1)	1.0	(1)	1.4	(1)	(1)	(1)	90	13
Eroded hilly phase	14	25	7	14	13	25	.6	.9	.8	1.3		(1)	40	85	13

See footnotes at end of table.

TABLE 24.—*Average acre yields of crops that may be expected over a period of years on the soils of Sevier County, Tenn., under common management (columns A)*[1] *and good management (columns B)*[2]—Continued

Soils	Corn		Wheat		Oats		Lespedeza		Red clover		Tobacco		Pasture		Management group
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days*	*Cow-acre-days*	
Jefferson silty clay loam, severely eroded hilly phase								.6		.8			30	70	13
Lindside silt loam	45	63		(4)		(4)	1.2	1.6		(4)		(4)	115	140	1
Litz shaly silt loam, eroded rolling phase													30	80	16
Litz silt loam, hilly phase													(4)	75	16
Litz shaly silt loam, eroded hilly phase														70	16
Monongahela silt loam	18	38	8	15	16	28	.6	1.0	1.0	1.4	700	1,200	50	95	5
Muskingum-Lehew loams, steep phases															19
Nolichucky loam:															
Undulating phase	30	48	11	19	23	35	.9	1.2	1.2	1.6	1,000	1,500	55	105	3
Rolling phase	(4)	43	(4)	18	(4)	35	(4)	1.2	(4)	1.6	(4)	1,350	(4)	105	6
Eroded rolling phase	25	40	9	16	18	30	.8	1.1	1.1	1.5	850	1,300	50	100	6
Hilly phase	(4)	30	(4)	16	(4)	30	(4)	1.1	(4)	1.4		(4)	(4)	100	13
Eroded hilly phase	18	28	8	15	13	28	.6	1.0	.9	1.3		(4)	50	95	13
Prader silt loam		33					.6	1.1					40	110	17
Ramsey shaly silt loam:															
Steep phase															19
Eroded steep phase															19
Very steep phase															20
Hilly phase													(4)	60	16
Eroded hilly phase													20	55	16
Ramsey stony fine sandy loam:															
Steep phase															19
Eroded steep phase															19
Very steep phase															20
Hilly phase													20	50	16

Roanoke silt loam		30					.5	1.0					40	90	17
Rough gullied land:															
(Ramsey and Litz soil materials)															20
(Dandridge soil material)															20
(Limestone material)															20
Rough mountainous land (Ramsey soil material)															20
Sequatchie fine sandy loam	35	50	16	23	25	43	1.0	1.4	1.3	1.8	1,400	1,800	65	110	3
Sequatchie silt loam	38	55	18	25	28	45	1.0	1.6	1.4	1.9	1,500	1,900	70	120	3
Sequoia silty clay loam, eroded undulating phase	25	40	12	18	28	45	.8	1.3	1.2	1.6	900	1,300	50	110	4
Sequoia silt loam, rolling phase	(4)	40	(4)	18	(4)	45	(4)	1.3	(4)	1.6	(4)	1,300	(4)	110	7
Sequoia silty clay loam:															
Eroded rolling phase	20	35	9	16	22	40	.7	1.1	1.1	1.5	750	1,200	45	100	7
Severely eroded rolling phase							.3	.5		1.3			25	75	10
Staser fine sandy loam	40	60	14	18	30	45	1.1	1.6	1.3	1.8	1,350	1,725	105	135	1
Staser silt loam	45	65	15	20	30	45	1.2	1.7	1.4	1.9	1,400	1,800	110	140	1
State silt loam	40	60	18	25	30	50	1.0	1.6	1.4	2.0	1,600	2,000	80	125	3
Stony colluvium (Jefferson soil material)													20	50	18
Stony hilly land (Dunmore and Talbott soil materials)													25	60	12
Stony steep land (Dunmore and Talbott soil materials)															20
Tyler silt loam		30					.5	1.0					40	90	17
Waynesboro loam:															
Undulating phase	35	53	18	26	30	50	1.0	1.4	1.4	1.8	1,600	2,000	70	125	3
Rolling phase	(4)	50	(4)	24	(4)	45	(4)	1.3	(4)	1.7	(4)	1,800	(4)	120	6
Eroded rolling phase	30	48	15	23	25	45	.8	1.2	1.2	1.6	1,200	1,600	60	115	6
Eroded hilly phase	23	35	11	19	18	35	.7	1.1	1.0	1.5		(4)	55	100	11
Waynesboro clay loam, severely eroded hilly phase							.5	1.0		1.3			30	80	12
Whitesburg silt loam	40	55	14	20	30	40	1.1	1.6	1.4	1.7	1,050	1,500	90	125	2

[1] For discussion of common management, see the section, Descriptions of the Soils.

[2] For discussion of good management, see the section, Descriptions of the Soils, and the section, Use and Management of Important Groups of Soils.

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

[4] Crop not commonly grown, but soil considered suitable, although less suitable than for crops for which estimates are given.

343396—56—10

The average acre yields given in columns A are those expected under the prevailing practices of soil management. These practices are not the same on all soils nor are they the same for any given soil in different parts of the county or on different farms. It is believed, however, that those discussed under the individual soil description are representative of current management practices.

The yields in columns A are based largely on observations made by members of the soil survey party; on information obtained by interviews with farmers and other agricultural workers who have had experience with the soils and crops of the area; and on comparisons with yield estimates for similar soils in other counties in Tennessee.

The average acre yields given in columns B are those expected under good management. The term "good management" refers to (1) the proper choice and rotation of crops; (2) the correct use of commercial fertilizers, lime, and manure; (3) proper tillage methods; (4) the return of organic matter to the soil; (5) and mechanical means of water control. Such management is designed to maintain productivity or increase it within practical limits, maintain or improve workability, and conserve soil material, plant nutrients, and soil moisture.

On the basis of what is known about the soils of the county, some of the requirements for good management are presented under discussions of individual soils in the section, Descriptions of the Soils, and in the section, Use and Management of Important Groups of Soils. The good management requirements described are felt to have wide application to the kinds of soils for which they are given. But good management for the soils of a particular farm will vary according to their acreage and location on the farm, the types of farm enterprises, the location of the farm in regard to markets and other facilities, and the prices of the different products. The requirements for good management of a particular soil cannot therefore be rigidly defined for application to all farms.

The yields in columns B of table 24 are based largely upon estimates of men who have had experience with the soils and crops. The factors considered in making these estimates are the known deficiencies of the soil and the increases in yields that may be expected when these deficiencies are corrected within practical limits. A comparison of the yields listed in columns B with those in columns A will show what responses may be expected from good management. The better yields may be used as production goals. The means of attaining these goals may vary somewhat, but in general it consists of some combination of the good management practices listed above. Intensive management will bring profitable increases in yields on practically all soils in Sevier County.

LAND CLASSES

On the basis of their relative suitability for agriculture, the soils of Sevier County are grouped into five land classes. The land classes are given for the different soils in tables 4 to 23, and in the map supplement placed inside the jacket that holds this report.

Information obtained from farmers, soil surveyors, extension and experiment station workers, and others who work with the soil was used in placing the soils in these five land classes. Comparisons of

the productivity, workability, and conservability [10] of the soils were made. For example, a farmer knows that some soils on his farm are better suited to farming than others. By comparing soils within a farm and among farms, the soils can be placed in the approximate order of their physical suitability for farming. Rankings for soils for which information based on experience is lacking may be arrived at by comparison with soils of similar productivity, workability, and conservability for which information is available.

This grouping cannot be taken as a recommendation for use. Knowledge of the particular circumstances applying to a specific farm is necessary in making recommendations for land use on that farm.

FIRST-CLASS SOILS

The first-class soils are productive of the common crops of the county. They are good to excellent for crops that require tillage and good to excellent for permanent pasture. These soils are fairly well supplied with organic matter, compared with other soils of the county. All are comparatively well supplied with plant nutrients, but are responsive to fertilization for some crops. Although slightly deficient in lime they contain more than most other soils of the county. All are well drained, but their physical properties are such that they retain an adequate and even supply of moisture for plant growth. Good tilth is easily obtained and maintained, and the range of moisture conditions for tillage is comparatively wide. Their physical properties favor normal circulation of air and moisture, and roots penetrate all parts of the subsoil freely.

These soils do not have any prominent adverse soil conditions. They are almost free of stone and have relief favorable to soil conservation and tillage. None is severely eroded or highly susceptible to erosion. The natural fertility is relatively high and the problem of conserving soil material and fertility is relatively simple. The First-class soils constitute about 1.7 percent of the county.

SECOND-CLASS SOILS

Second-class soils are physically good soils for farming and are at least moderately productive of most of the crops commonly grown in the area. They are fair to good for crops that require tillage and fair to excellent for permanent pasture. Each is moderately deficient in one or more properties that contribute to productivity, workability, or conservability; but none is so seriously deficient in any property that it is poorly suited to tilled crops.

The physical properties of the soils of this land class are at least moderately favorable for tillage, maintenance of good tilth, and normal circulation and retention of moisture. None occupies slopes greater than 12 to 15 percent in gradient, and none has enough stones to interfere seriously with tillage. None is severely eroded.

The deficiencies vary widely among the Second-class soils. Some are fertile but are sloping and moderately eroded; others are almost level and uneroded but have relatively low plant-nutrient content or restricted drainage. The soils of this land class are similar in suitability for agriculture. They differ greatly, however, in the manage-

[10] See footnote 9, p. 113.

ment practices needed to make the best use of their suitabilities, because many different kinds of soils are included in the group. Second-class soils make up about 10.9 percent of the county.

THIRD-CLASS SOILS

Third-class soils are fair soils for agriculture. They are poor to fair for crops that require tillage and are fair to very good for permanent pasture. Each soil is so deficient in workability, conservability, or productivity, or in some combination of the three, that its physical suitability for tilled crops is definitely limited. The soils are limited for such crops by one or more of the following conditions: Low content of plant nutrients; low content of organic matter; low water-holding capacity; undesirable texture, structure, or consistence; strong slope gradient; stoniness; or inadequate natural drainage. Because of the diversity of characteristics among the soils of the group, management requirements vary widely. About 7.9 percent of the county consists of Third-class soils.

FOURTH-CLASS SOILS

Fourth-class soils are poor for crops that require tillage and poor to very good for permanent pasture. They are poor soils for agriculture, mainly because of the limited number of well-suited uses. Some of these soils may be important on farms where soils suited to permanent pasture are in great demand. Each soil of this group is so difficult to work or so difficult to conserve, or both, that the intensive management necessary for its successful use for tilled crops is not feasible under present conditions. Such management may be justified, however, on some farms having a limited acreage of soils well suited to tilled crops.

Fourth-class soils are generally used for pasture on farms having adequate soils well suited to crops. A considerable acreage, however, is used for crops, mainly on farms that do not have enough soil better suited to crops to satisfy farm needs. The management practiced in Sevier County on cropped areas of these soils is generally not adequate for good soil conservation. As among the Third-class soils, management requirements, both for crops that require tillage and for pasture, vary widely among these soils.

The Fourth-class soils occupy about 11.8 percent of the county.

FIFTH-CLASS SOILS

Fifth-class soils are very poorly suited to agriculture. They are very poor for crops that require tillage and poor to very poor for permanent pasture. Each soil of this group is so difficult to work, so difficult to conserve, so low in productivity, or has such combinations of these unfavorable properties, that the intensity of management required for successful production of tilled crops is not feasible. Each soil is so low in plant nutrients or has such poor moisture supplies, or both, that common pasture plants produce very little feed.

These soils are apparently best suited to forest under present conditions, even though they are less productive of forests than soils of any of the preceding groups. Existing conditions in the locality or on the farm unit may require the use of some of these soils for pasture or for crops in spite of their poor suitability.

About 67.7 percent of the county consists of Fifth-class soils.

SOIL ASSOCIATIONS

Each soil occurs in a characteristic position in the landscape, usually in association with one or more other soils, and forms a rather characteristic geographic pattern. For example, the Fullerton soils on the cherty ridges of the uplands are generally associated with the Greendale soils. Likewise, the Staser soils of the bottom lands are generally associated with the Hamblen soils of the bottom lands and the Sequatchie soils of the low stream terraces.

A generalized map that shows the areas dominated by each group of such associated soils has been made. Within these areas, farms are apt to contain some or all of the associated soils. The soils of Sevier County have been placed into 16 soil associations, each of which has fairly well-defined geographic boundaries. A generalized map, prepared from the detailed soil map, shows the geographic distribution of the various soil associations (fig. 3).

A soil association may consist of only a few or of many soils. These soils may be similar or they may represent sharply differing types. In each soil association, however, there is a certain uniformity of soil pattern. The association in which a soil occurs may have a great influence on its present and future use.

Representative farms are often chosen for the demonstration of new or recommended systems of farming. They are also selected for making analyses of the farm business to ascertain what factors have resulted in larger returns. These farms are usually selected to represent a larger group of farms having somewhat similar characteristics, so that what is learned from the analyses or demonstration on a few farms may have application to many. The pattern of soils is one of the factors that make farms differ from one another. Farms, however, cannot be selected to represent individual soil types, because whole farms are rarely found on only one type of soil. But since the farms within a soil association area are likely to have somewhat similar soil patterns, soil association areas are representative of a large group of farms so far as soils are concerned. The soil association area then shows us to what area the results of the demonstration or analyses are likely to be applicable.

1. FULLERTON-GREENDALE-LINDSIDE ASSOCIATION

The Fullerton-Greendale-Lindside association occupies about 2.9 percent of the county. It is confined to the ridge and valley section in the northwestern part of the county and occupies the cherty ridges. The relief is prevailingly rolling to hilly or steep, and drainage is well established. Numerous sinkholes give the association a hummocky or karst relief in places. The Fullerton are by far the most extensive soils in the association; the Greendale and Lindside soils are considerably less extensive but very important to the agriculture of the area. The Fullerton soils occupy most of the rolling to steep upland slopes; the Greendale and Pace soils the gently sloping colluvial areas; the Lindside soil the first bottoms along the streams. Some small areas of Dewey and Decatur soils are on the uplands and a few areas of Emory soils are on the colluvial lands.

This association consists chiefly of Second-, Third-, and Fourth-class soils. The acreage of First- and Fifth-class soils is very small. Nearly all of the area is in small farms and has a rather high rural

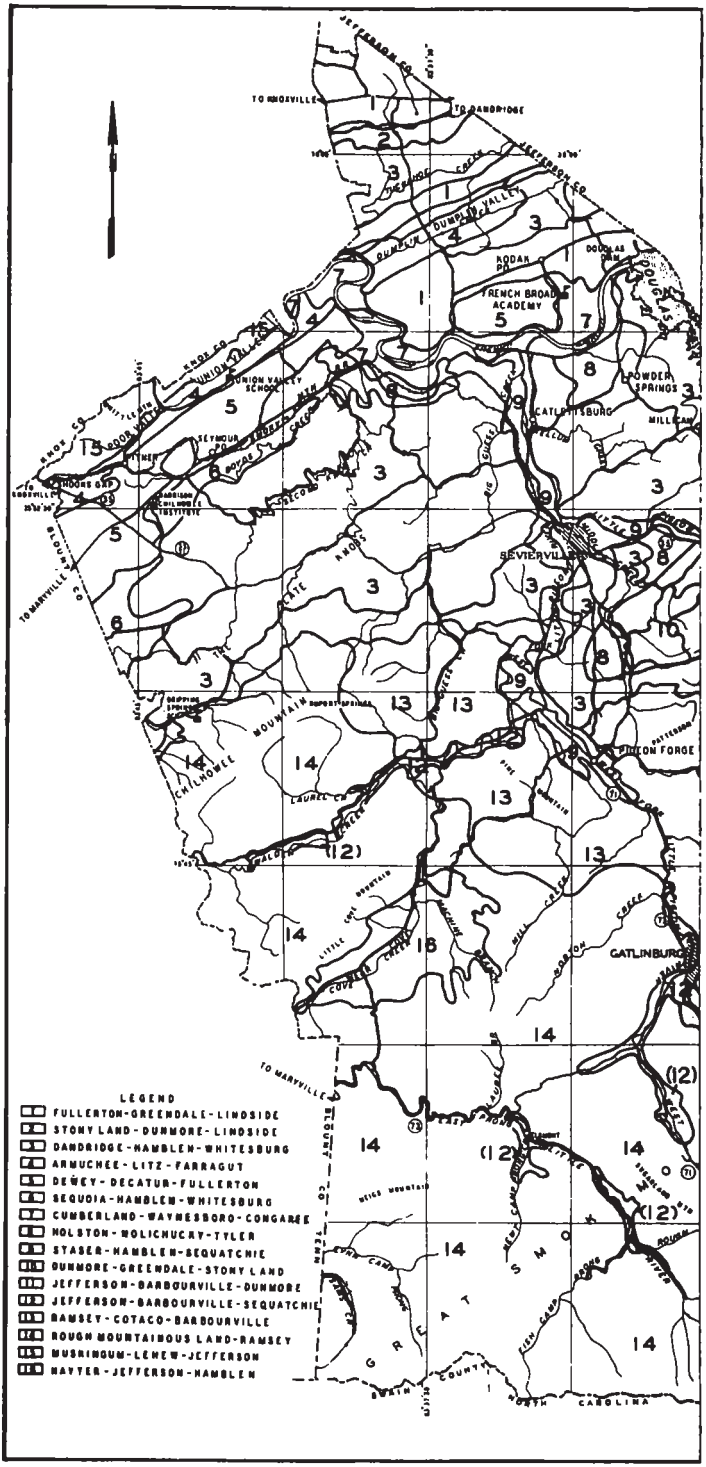
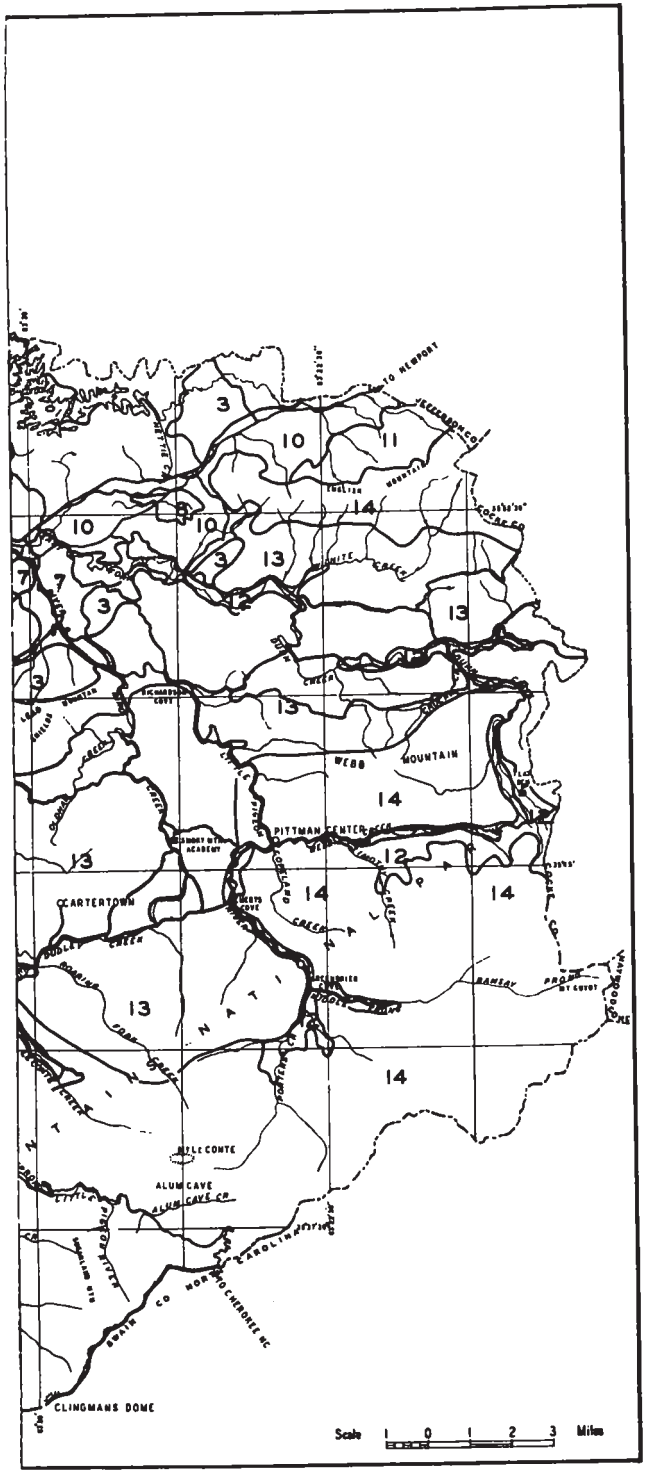


FIGURE 3.—Soil associations



of Sevier County, Tenn.

population. The agriculture is generally highly diversified, but it consists chiefly of the production of grain and livestock for home use. Tobacco, the chief cash crop, is grown in small patches on most farms, mainly on the Greendale soils. The prosperity of farms in this area is greatly influenced by the extent of Greendale and Lindside soils. Where areas of these soils are scarce, the farms are largely of the subsistence type, and tobacco is grown in patches. Where these areas are significantly larger, their greater productivity of corn and hay is generally reflected in the improved condition of the farmstead. As a group, the soils are only moderately productive. They are, however, responsive to management, especially fertilization, and their productivity therefore can be increased where improved management is feasible.

2. STONY LAND-DUNMORE-LINDSIDE ASSOCIATION

The Stony land-Dunmore-Lindside association occupies only about 0.4 percent of the county. It occurs in low-lying valleys in the ridge and valley section of the county. The surface is rolling to hilly and has many sinkholes. The association consists chiefly of stony land that is characterized by limestone outcrops interspersed with less extensive areas of Dunmore and Farragut soils. Stony hilly land (Dunmore and Talbott soil materials) predominates. Small acreages of Litz, Fullerton, and Armuchee soils are included. The Lindside soil is on most of the bottom lands, and Emory soils on the colluvial lands.

Areas of this association are not well suited to farming. A large part of the acreage consists of Fourth-class soils that are too stony to cultivate and are used for permanent pasture. The scattered areas of Dunmore and Farragut soils are predominantly Second- and Third-class soils; the steepest and most rocky areas are Fifth-class soils. The Emory and Lindside soils of the colluvial lands and bottom lands are First- and Second-class soils, and significant areas of these soils greatly influence the type of farming and the prosperity of the farms.

3. DANDRIDGE-HAMBLEN-WHITESBURG ASSOCIATION

The Dandridge-Hamblen-Whitesburg association occupies about 17.1 percent of the county area. It consists chiefly of soils of the Dandridge, Hamblen, and Whitesburg series and occupies practically all of the shale hill section of the county and a part of the ridge and valley section. The area is highly dissected by the irregular dendritic drainage system. It is characterized by rounded knoblike hills, narrow winding ridges, and steep-walled, V-shaped valleys (pl. 8, *B*). The relief is predominantly hilly to steep. Steep and hilly Dandridge soils are on most of the ridge slopes; rolling or hilly Dandridge soils are on the narrow ridge crests. Litz soils, in complex association with the Dandridge soils, are common on many of the upland slopes, especially the higher ridge slopes. The Whitesburg soil is on most of the sloping alluvial-colluvial accumulations at the base of the steep upland slopes, and Hamblen soils are on most of the nearly level flood plains. Small areas of Staser and Prader soils are also on the flood plains.

Practically all of the uplands except the narrow ridge crests are occupied by Fourth-class soils. The colluvial lands and bottom lands

are mainly Second-class soils. Owing to their steep slopes, shallow depth, and high susceptibility to erosion, most of the Dandridge soils are very poorly suited to crops. The relatively small proportion of Whitesburg and Hamblen soils, however, is suited to intensive use for suitable crops. The Hamblen soils are limited in use suitability because of susceptibility to overflow and imperfect drainage. They are well suited to corn and many other feed and forage crops, however.

A subsistence or a small-scale general type of farming is practiced by most farmers on this soil association. The relatively small areas of Hamblen and Whitesburg soils are used intensively for subsistence crops and tobacco, but only a small part of the potential pastureland s used.

4. ARMUCHEE-LITZ-FARRAGUT ASSOCIATION

The Armuchee-Litz-Farragut soil association occupies only 1.5 percent of the county. It occurs in the low-lying valleys of the ridge and valley section. Armuchee, Litz, and Farragut soils predominate, but there is an important acreage of Sequoia, Cotaco, and Hamblen soils and Stony hilly land (Dunmore and Talbott soil materials). The relief is undulating to hilly. In most places Farragut or Sequoia soils are on the undulating and rolling areas in the uplands and Armuchee or Litz soils on the hilly areas. Some Litz soils, however, are on rolling areas. Cotaco soils are on most of the alluvial-colluvial lands, and Hamblen soils are on the stream bottoms.

Differences between the soils of this association affect greatly the suitability for farming within short distances. All the land classes are represented, but the Second-, Third-, and Fourth-class soils predominate. The areas suitable for crops are generally small. The areas of alluvial and colluvial soils are suitable for intensive use for crops, but are limited somewhat in use suitability by imperfect drainage. A subsistence or a small-scale general type of farming is commonly practiced in this area.

5. DEWEY-DECATUR-FULLERTON ASSOCIATION

The Dewey-Decatur-Fullerton association occupies about 2.5 percent of the county and is in the ridge and valley section. Although the Dewey and Decatur soils predominate, Fullerton, Emory, and Lindside soils and Stony hilly land (Dunmore and Talbott soil materials) are of significant extent. The relief, which is characterized by sinkholes, is predominantly undulating to rolling. Drainage is good.

Second-class soils predominate in this association, but First- and Third-class soils are relatively important. All areas of the association are in farms, and a very high proportion of the farmland is in crops and pasture. Farms in this soil association area have a high proportion of well-built and well-maintained farm buildings and fences and are among the most prosperous in the county (pl. 9, *A*). The farms are generally larger than those in the Fullerton-Greendale-Lindside association. The farming is highly diversified, and corn, small grains, livestock, and livestock products are produced for sale as well as for home consumption. Burley tobacco and livestock are the chief products produced for sale. As a group, these soils are productive and physically well suited to the agriculture of the area. They are also responsive to good management.

6. SEQUOIA-HAMBLEN-WHITESBURG ASSOCIATION

The Sequoia-Hamblen-Whitesburg association, which occupies about 1.1 percent of the county, occurs in a relatively smooth narrow valley between the Dandridge-Hamblen-Whitesburg and Dewey-Decatur-Fullerton associations. The relief is undulating to rolling. Sequoia soils are on most of the upland, the Whitesburg soil is on the colluvial-alluvial lands, and Hamblen soils are on the bottom lands. A small acreage of Dandridge soils is on the steeper slopes of the association.

Practically all of this soil association consists of Second- and Third-class soils. Most of the soils of the upland are suited to growing intertilled crops in rotation. The soils of the colluvial and alluvial lands are suited to intensive use but are largely limited to summer crops by imperfect drainage or susceptibility to flooding. Practically all of the soils are well suited to pasture.

The farms of this area are mainly of the small general or subsistence type. Most of the association is cleared and used for crops or pasture. The chief crops are corn, small grains, hay, and tobacco.

7. CUMBERLAND-WAYNESBORO-CONGAREE ASSOCIATION

The Cumberland-Waynesboro-Congaree association occupies about 2.6 percent of the county. It consists of alluvial soils along the French Broad and Little Pigeon Rivers. Most of the soils are on high terraces, but some are on first bottoms and low terraces (pl. 9, *B*). Cumberland and Waynesboro soils are on the undulating to rolling high terraces. Along the French Broad River, the Congaree is the most extensive of the first bottom soils; Buncombe soil is on the natural levees and low ridges that are nearly parallel to the river. State soil occupies the low terraces. The general relief of these first bottoms and terraces is undulating. Along the Little Pigeon River, Staser and Hamblen soils are on the first bottoms and Sequatchie soils are on the low terraces.

The soils on the high terraces are predominantly Second class, but there is also a significant acreage of First- and Third-class soils. Of the soils of the first bottoms, the Congaree soil is First class, the Staser and Hamblen soils Second class, and the Buncombe soil Third class. On the low terraces, Sequatchie silt loam and the State soil are First class and Sequatchie fine sandy loam is Second class.

The farming on the soils of this association is highly diversified. Corn, small grains, vegetables, and livestock, are produced. The chief products sold are burley tobacco, vegetables, livestock, and livestock products. The soils are physically well suited to the agriculture of the area. Although naturally productive of most crops, they respond well to good management.

8. HOLSTON-NOLICHUCKY-TYLER ASSOCIATION

The Holston-Nolichucky-Tyler association, which occupies 1.5 percent of the county, consists mainly of soils of old high stream terraces along the French Broad and Little Pigeon Rivers. These terraces differ from those on which the soils of the Cumberland-Waynesboro-Congaree association occur chiefly in being underlain by shale rather than limestone in most places. The relief is predominantly undulating to rolling. The Holston, Nolichucky, Monon-

gahela, and Tyler are the principal soils in this association. The Nolichucky and Holston soils are the best drained soils of this group and occupy undulating to hilly slopes. The imperfectly drained Monongahela soil is confined to the nearly level to undulating slopes. The poorly drained Tyler soil is on nearly level to slightly depressional areas. A few small tracts of Whitesburg and Greendale soils are on the colluvial areas. Dandridge and in some places Dunmore soils are on the steeper slopes, but the acreage of these soils is small. One small area south of Sevierville is more highly dissected than typical and consists chiefly of Nolichucky soils.

Third-class soils predominate in this association, but there is a significant acreage of Second- and Fourth-class soils. The soils, with the exception of the poorly drained Tyler, are suited to most of the common crops of the county. They are naturally low in fertility, however, and the yields of most crops are low under common management practices. They respond well to good management, especially applications of complete fertilizers; but the response is generally not so great nor so lasting as on the soils of the Cumberland-Waynesboro-Congaree association. The farms on the soils of this association are mainly of the subsistence or small-scale general type, although the type of farming varies greatly.

9. STASER-HAMBLEN-SEQUATCHIE ASSOCIATION

The Staser-Hamblen-Sequatchie association occupies some of the first bottoms and low terraces of the Little Pigeon and West Fork Little Pigeon Rivers. It covers only about 1.4 percent of the total county, but owing to its location and high proportion of productive crop soils, it is very important to the agriculture of the county.

The first bottoms and low terraces have a somewhat undulating general relief. The first bottoms consist of natural levees near the rivers and of other low ridges and intervening swales or sloughs that run nearly parallel to them. Staser, Hamblen, and Prader soils are on the first bottoms, the latter two occurring in the swales or depressed areas. Sequatchie soils are on the low terraces or second bottoms. Practically all of these soils are subject to overflow, although the Sequatchie soils are flooded at very long intervals. Some moderately high terraces, mainly of Holston soils, are also included but the acreage is very small.

As a group, these are probably some of the most fertile and productive soils of the county. However, owing chiefly to periodic overflow and also to the imperfect drainage of the Hamblen and poor drainage of the Prader soil, the soils in this association are somewhat restricted in their suitabilities for crops. They are probably not so well suited to alfalfa and small grains as some of the upland soils, but they are fairly well suited to most of the common crops and especially well suited to corn and some vegetable crops.

An estimated 90 percent of the soil association is cropland. This association is characterized by general farming, but owing to its location, it also has several part-time farms. Because of the long narrow shape of this area, most of the farms include some soils of the adjacent soil associations. The homes, farm buildings, and most of the pastures are not on the bottom lands but on the adjacent high terraces or uplands.

10. DUNMORE-GREENDALE-STONY LAND ASSOCIATION

The Dunmore-Greendale-Stony land association, which occupies about 3.0 percent of the total area of the county, is in the dissected limestone valley area. The area is prevailingly rolling to hilly and has a very irregular dendritic drainage pattern, modified by sinks and subterranean streams (pl. 10, *A*). The ridgetops are narrow and winding; the ridge slopes are short and moderately steep. A thin layer of terrace material covers many of the tops and milder slopes. In most places this material is included with the Dunmore soils, but in some places it is deep enough to form a terrace soil.

Dunmore soils are the most extensive in this association, but there is a considerable acreage of stony land confined mainly to the steeper slopes. Other less extensive soils are the Greendale, Nolichucky, Lindside, Hamblen, and Staser. Greendale and Pace soils are on the colluvial foot slopes and along the intermittent drainageways. The general alluvium along the larger streams is influenced by shale and quartzite materials from the adjacent associations. In these areas the Hamblen and Staser soils are more extensive than the Lindside soil.

Second- and Third-class soils cover an estimated 60 percent of the association, and Fourth-class soils are on most of the rest. The Dunmore soils are well suited to a wide variety of crops; but chiefly because of conservation difficulties, they are not suited to intensive use for intertilled crops. They are very well suited to pasture and hay crops, especially deep-rooted legumes such as alfalfa and red clover. The Greendale, Pace, Lindside, and Hamblen soils are suited to very intensive use. In spite of their limited acreage, they are very important to the agriculture of the farms on which they occur. Most of the stony land type in this association are fairly well suited to pasture. On the soils of the uplands the choice and rotation of crops is very important. Although as a group the soils of this association are comparatively fertile, they are still quite responsive to the proper use of amendments.

Most of the farms on soils of this association are of the small-scale general type. Hay, corn, tobacco, and small grains are the most common crops. Tobacco and livestock products are the important sources of income. There are fewer subsistence and part-time farms than in many of the other soil associations.

11. JEFFERSON-BARBOURVILLE-DUNMORE ASSOCIATION

The Jefferson-Barbourville-Dunmore association, which covers about 0.7 percent of the county, occurs in one area just north of English Mountain. The soils consist of thin colluvial deposits overlying limestone materials. Some of the limestone materials are exposed at the surface in places. The colluvial material, which has washed chiefly from Ramsey soils, occupies the base of steep mountain slopes and spreads out some distance over the adjoining valley. The relief is predominantly hilly. Stony Jefferson and Allen soils are on the colluvial slopes, but the Jefferson soils are much more extensive than the Allen. Dunmore soils are on slopes, chiefly the steeper ones not covered with colluvial material. Barbourville and Cotaco soils are on the young colluvial-alluvial areas at the base of steep slopes or along the narrow intermittent drainageways.

Fourth-class soils dominate this association; Third-class soils are next in acreage. The proportion of Fifth-class soils is very small. Chiefly because of the hilly to steep relief and stoniness of the soils of this association, less than half their acreage is suitable for crops that require tillage. Furthermore, this acreage is rather poor for pasture. Amendments are needed to establish and maintain even fair pastures.

Part-time farms are the most numerous in this soil association. Subsistence crops are grown on most of the suitable soils. The hilly stony soils are mainly in pasture or are idle.

12. JEFFERSON-BARBOURVILLE-SEQUATCHIE ASSOCIATION

The Jefferson-Barbourville-Sequatchie association occupies about 3.0 percent of the total county area. It is in small coves or covelike valleys in mountainous sections. The relief is predominantly undulating to rolling but some is hilly. The association consists chiefly of colluvial and alluvial soils washed or rolled from Ramsey soils of the uplands. Typically, stony Jefferson soils are on the old more strongly sloping colluvial areas; Barbourville soils, mainly stony types, are on the young colluvial areas at the base of slopes and along intermittent drainageways; Staser or Hamblen soils are on the first bottoms; and Sequatchie soils are on the low terraces. Practically all of these soils are sandy and are either loams or fine sandy loams.

Second-class soils are estimated to cover 50 percent of the area and Third- and Fourth-class soils most of the rest. Most of the soils are suited to crops that require tillage. However, stones or gravel interfere materially with tillage on practically all of these soils and in some areas almost prevent it. These soils are suited to a wide variety of crops; most of them are very well suited to vegetables. Those of the first bottoms are somewhat limited in use suitability by susceptibility to flooding. As a group, the soils can be intensively used. In general they are moderately fertile and water control is not a serious problem. However, they are deficient in lime and most plant nutrients for high crop yields. They respond well to good management, and if they are adequately fertilized, practically all the common crops can be successfully grown.

Most of the farms on the soils of this association are of the subsistence type, but there are many farms of the small general type. The amount of cropland per farm is generally very small. Roads, houses, and other farm buildings cover a significant part of the better soils. Most of the cropland is used intensively, chiefly for subsistence crops and tobacco.

13. RAMSEY-COTACO-BARBOURVILLE ASSOCIATION

The Ramsey-Cotaco-Barbourville association is a large area (20.5 percent of the county) in the highly dissected foothills or outlying parts of the Great Smoky Mountains. It consists chiefly of steep Ramsey shaly silt loam soils. A narrow band of colluvial and alluvial soils occurs along practically all of the streams of the irregular dendritic drainage system. The Cotaco soils are most extensive on the colluvial lands, although Barbourville soils are on many of the better drained colluvial areas. There is a very small acreage of first bottom soils, mainly Hamblen. Staser, Hayter, and Jefferson are less extensive soils of the association.

It is estimated that 90 percent of this association consists of Fifth-class soils. Most of the rest are Third-class soils, but there is a significant acreage of Second-class soils in places. Practically all of the Fifth-class and a considerable part of the Third-class soils are in forest.

There are a large number of small subsistence farms on the soils of this association. These farms are mainly along the small drainageways, but include a part of the steep uplands. Practically all of the subsistence crops and tobacco and pasture are grown on the colluvial and alluvial soils. Not all of the Cotaco and Barbourville soils are readily accessible, and many of the cleared areas are very narrow and badly shaded by the steep woodland on either side.

14. ROUGH MOUNTAINOUS LAND-RAMSEY ASSOCIATION

Rough mountainous land-Ramsey association occurs extensively in areas consisting chiefly of steep or very steep Ramsey stony fine sandy loam soils and stony miscellaneous land types. It covers about 39.7 percent of the county. There is a small acreage of Jefferson soils on the colluvial areas, but these soils are generally stony or very stony and are largely isolated by large areas of Fifth-class soils. It is estimated that more than 95 percent of the association is in Fifth-class soils. Practically all of the soils of this association are in forest, a large part of which is in the Great Smoky Mountains National Park. Although unproductive of forest, most of the soils are best used for it. A few small coves that have soils fairly well suited to crops and pasture are included in this association. They are isolated by large areas of Rough mountainous land (Ramsey soil material) in most places, however. Jefferson, Hayter, Cotaco, and Staser soils are common in these areas.

15. MUSKINGUM-LEHEW-JEFFERSON ASSOCIATION

Muskingum-Lehew-Jefferson association covers only about 0.7 percent of the county. It occurs on a high sharp-crested ridge that forms a part of the boundary between Sevier and Knox Counties. The association area also includes the colluvial foot slopes on the northwestern side of Poor and Union Valleys. The steep Muskingum and Lehew soils, which occur in very intricate geographic association, are on practically all of the uplands. Jefferson silt loam soils are at the base of the steep upland slopes and spread out some distance over the valley floor. The Jefferson soils are predominantly undulating to rolling but have some hilly areas. Cotaco, Hamblen, and Staser soils of the young colluvial lands and bottom lands are inextensive but very important to the agriculture of this association.

The uplands consist mainly of Fifth-class soils that are still largely in forest. An estimated 50 percent of the colluvial foot slopes consist of Fourth-class soils; the rest of Second- and Third-class soils. Most of these soils are cleared and have been used for crops and pasture, but a large part is now idle. The farms are largely of the part-time or subsistence type. Much of the acreage of this association is included in larger farms in the Armuchee-Litz-Farragut soil association.

16. HAYTER-JEFFERSON-HAMBLEN ASSOCIATION

This association, which covers 1.2 percent of the county, is entirely within Wear Cove. The area is bowl-shaped and has a topography

typical of coves or covelike valleys. It is completely surrounded by the Rough mountainous land-Ramsey association, and the parent materials for practically all the soils in the cove have washed or rolled from that soil association (pl. 10, *B*). Undulating to rolling Jefferson and Hayter soils are at the base of the steep Ramsey soils in the adjacent uplands and extend a considerable distance over the floor of the cove. Jefferson soils predominate in the northwestern part, and Hayter soils in the southeastern part.

Cove Creek flows through the center and with its tributaries drains the cove. In the upper part of the cove, the soils on its flood plain are the imperfectly drained Hamblen soils and, in the lower part, the poorly drained Prader. There is an important acreage of Sequatchie soils on the low terraces along the creek. Barbourville and Cotaco soils are on the young colluvium at the base of slopes and along the intermittent drainageways. A few areas of Dunmore soils are in the western part of the cove.

An estimated 75 percent of the association consists of Second- and Third-class soils. Most of the rest consists of Fourth-class soils, although there is an important acreage of First-class soil. The soils as a group are well suited to crops and pasture, and a large proportion is suited to intensive use. In general they are moderately fertile, and water control is not a serious problem. They are, however, deficient in lime and most plant nutrients for high crop yields. Under good management that includes adequate and proper fertilization the response is good and most of the common crops can be successfully grown.

A small general type of farming is common. Farm income is derived chiefly from tobacco and livestock or livestock products.

CAPABILITY GROUPS OF SOILS

The capability grouping is an arrangement of soils to show their relative suitability for crops, grazing, forestry, or wildlife and the risks of erosion or other damages when so used. Soils that are nearly level, well drained, free from overflow, fairly fertile, and not otherwise limited are placed in class I. They are widely adaptable. The farmer can use his class I soils for crops without special practices and can choose one of several cropping systems; if he wishes he may use the soil for pasture or for some other purpose.

Soils are placed in class II if they are a little less widely adaptable and thus more limited than those in class I. A gently sloping soil, for example, must be farmed on the contour, kept under vegetation most of the time, or handled in some other manner to control erosion. Other soils may be in class II because they are too droughty, too wet, or too shallow to be in class I.

Class III contains the soils that are suitable for regular cropping but that have more narrow adaptations for use or more stringent management requirements than those in class II. The soils that are even more limited and that have narrower crop adaptations than those of class III, but that are still usable 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 (none in Sevier County) consists of soils not subject to erosion but unsuitable

for cultivation because of standing water or frequency of overflow. Class VI contains soils that are steep or droughty or that have other serious limitations but will produce fairly good amounts of forage or forest products. As a rule class VI soils should not be cultivated, but some of them can safely be disturbed enough to prepare them for planting trees or seeding to longtime pastures. Soils in class VII are more limited than those in class VI. They usually give only fair to poor yields of forage or wood products. Soils in class VIII (none in Sevier County) are so severely limited that they produce little useful vegetation. They may make attractive scenery or may be parts of useful watersheds. Some have value for wildlife.

Subclasses: Since the broad capability classes are based on total suitability of the soils for different uses, one class usually contains different kinds of soils. The kinds of management problems then differ because the soils are different. Class III soils in this county, for example, consist of some rolling soils subject to erosion, some shallow and droughty soils, and some terrace and bottom-land soils limited by excess water. It is convenient to recognize, within the broad classes, capability subclasses based on the dominant limitations. The subclasses used in Sevier County according to these dominant limitations or risks are: Risk of erosion, designated by the symbol (e), excess water (w), and shallowness or droughtiness (s). The subclass is denoted by a small letter following the class number, such as IIe, IIIw, or IIIs.

Capability classes and subclasses in Sevier County

Capability classes and subclasses in Sevier County are given in the following list. The brief description of each subclass gives the general nature of the major soils included.

CLASS I.—Soils that are safe for use under intensive cultivation. without special practices to control runoff or erosion, and that may be expected to produce high yields with good soil and crop management. No subclasses of class I are used.

CLASS II.—Soils that can be used for tilled crops with only slight risk of erosion or with other minor limitations.

IIe: Undulating and rolling soils subject to erosion.

IIw: Imperfectly drained colluvial and alluvial soils.

CLASS III.—Soils that can be used for tilled crops but with moderate risk of erosion or with other limitations.

IIIe: Rolling soils subject to erosion.

IIIs: Shaly soils with limited water-supplying capacity.

IIIw: Imperfectly drained and poorly drained soils that need supplemental drainage.

CLASS IV.—Soils that have severe limitations for cultivation and under that use require extreme care.

IVe: Hilly soils subject to severe erosion.

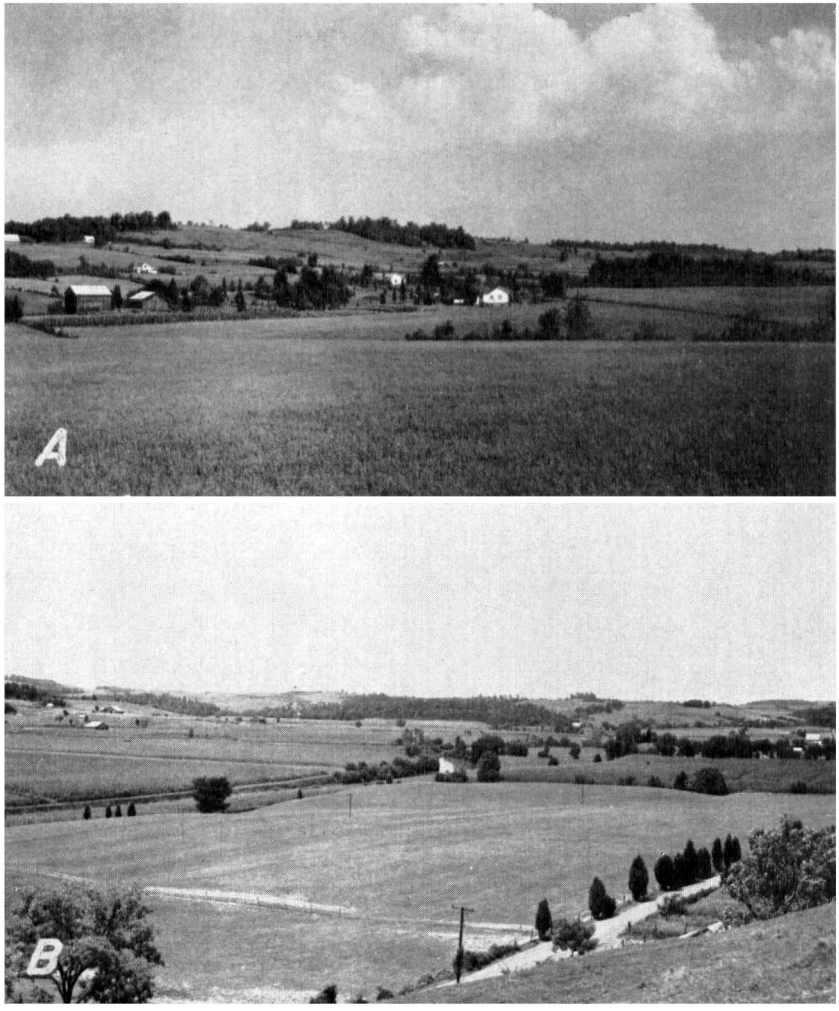
IVs: Rolling and hilly soils with limited water-supplying capacity, depth, or fertility.

IVw: Poorly drained terrace soils.

CLASS VI.—Soils too steep, too eroded, too stony, or too sandy for cultivation, except for occasional use to reseed long-producing forages or for tree planting.

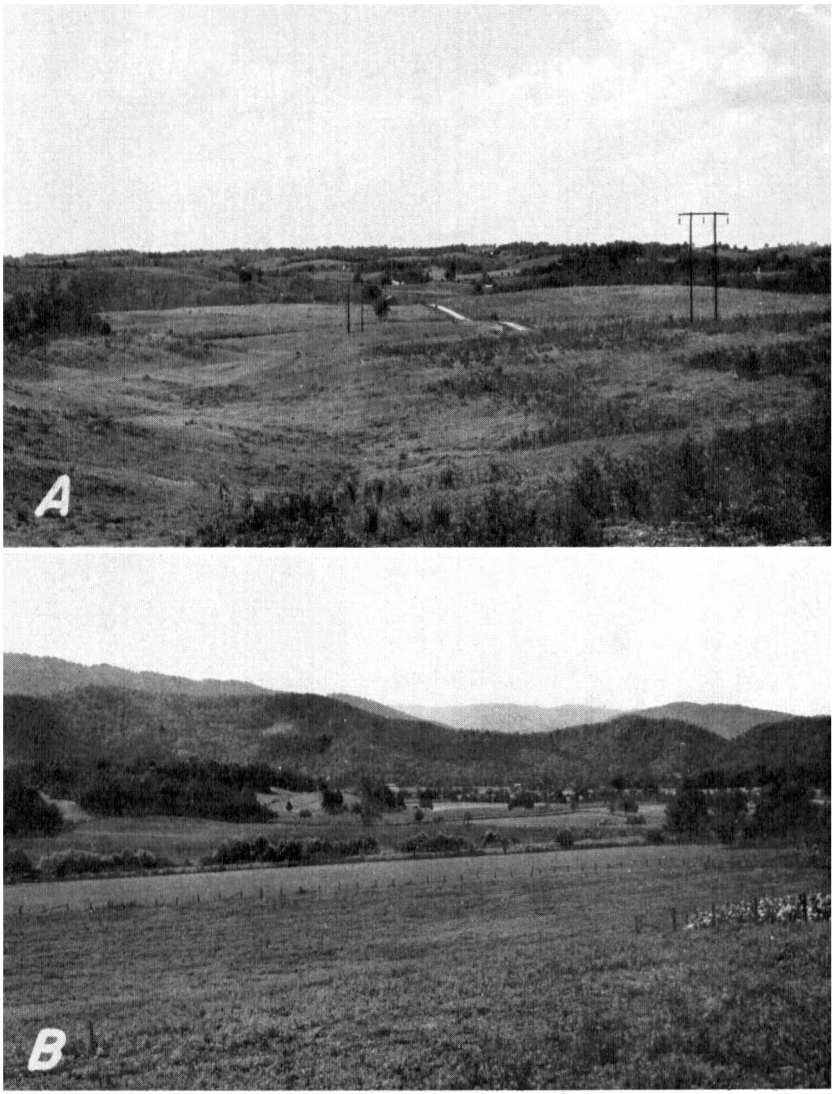
VIe: Hilly and steep soils.

VIs: Rolling, hilly, or stony soils with limited water-supplying capacity, depth, or fertility.



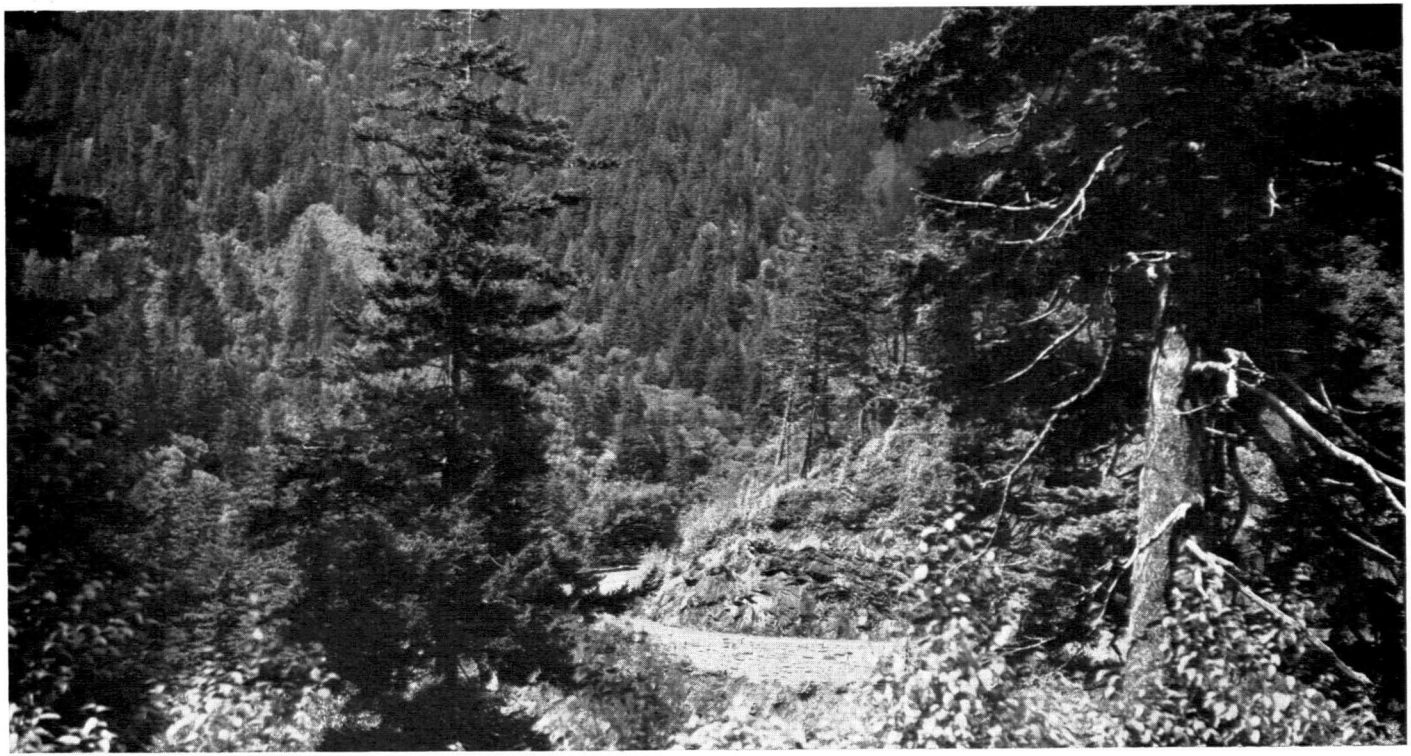
A, Landscape showing prosperous farms typical of those in the Dewey-Decatur-Fullerton soil association.

B, First bottoms and moderately high terraces along the Little Pigeon River. Sequatchie and Holston soils are on the terraces and Staser and Hamblen soils on the first bottoms. Practically all of this land is cleared and used for crops.

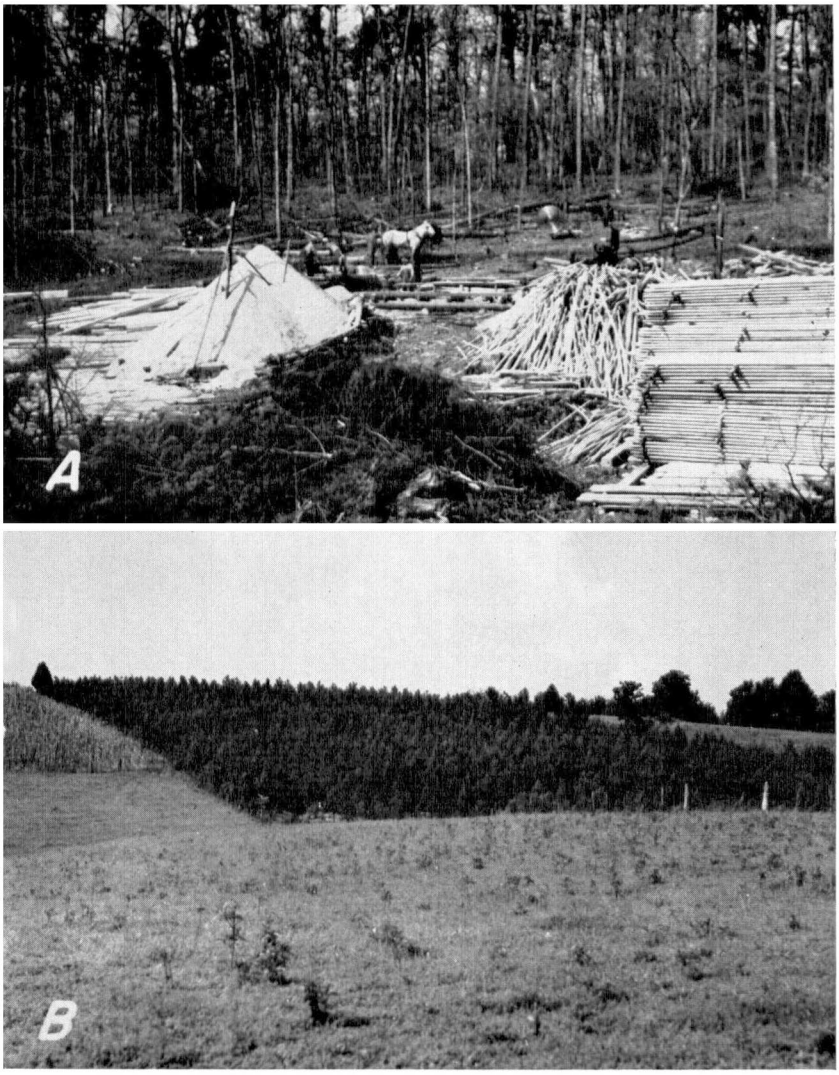


A, View of the Dunmore-Greendale-Stony land soil association, showing prevailingly rolling to hilly relief and the very irregular drainage pattern modified by sinks and subterranean streams.

B, View of the Hayter-Jefferson-Hamblen soil association. This association is entirely within Wear Cove and consists of nearly level to rolling colluvial and alluvial soils completely surrounded by steep or very steep Ramsey soils.



A spruce-fir forest high in the Great Smoky Mountains on Ramsey soils and Rough mountainous land (Ramsey soil material).



A, A small portable sawmill typical of those now used in Sevier County.
B, Vigorous growth of shortleaf pine on severely eroded Dunmore soils and Rough gullied land (limestone material).

CLASS VII.—Soils unsuited to cropping because of erosion or steep slope.

VIIe: Steep, or eroded soils and rough, gullied land.

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

	Capability class and subclass
Allen stony fine sandy loam:	
Eroded hilly phase (Aa)	VIs.
Eroded rolling phase (Ab)	IVs.
Armuchee silt loam, steep phase (Ac)	VIIs.
Armuchee silty clay loam:	
Eroded hilly phase (Ad)	IVs.
Severely eroded hilly phase (Ae)	VIs.
Severely eroded steep phase (Af)	VIIs.
Barbourville-Cotaco fine sandy loams (Ba)	IIe.
Barbourville silt loam:	
Rolling phase (Bb)	IIe.
Undulating phase (Bc)	IIe.
Barbourville stony fine sandy loam, rolling phase (Bd)	IVs.
Buncombe loamy fine sand (Be)	IVs.
Congaree loam (Ca)	I.
Cotaco silt loam:	
Rolling phase (Cb)	IIw.
Undulating phase (Cc)	IIw.
Cumberland silt loam:	
Hilly phase (Cd)	IVe.
Undulating phase (Ce)	IIe.
Cumberland silty clay loam:	
Eroded hilly phase (Cf)	IVe.
Eroded rolling phase (Cg)	IIIe.
Severely eroded hilly phase (Ch)	IVe.
Severely eroded rolling phase (Ck)	IIIe.
Dandridge and Litz shaly silt loams:	
Eroded hilly phases (D)	IVs.
Eroded rolling phases (Da)	IIIs.
Eroded steep phases (Db)	VIIs.
Dandridge and Litz silt loams:	
Hilly phases (Dc)	IVs.
Steep phases (Dd)	VIIs.
Dandridge shaly silt loam:	
Eroded hilly phase (De)	IVs.
Eroded rolling phase (Df)	IIIs.
Eroded steep phase (Dg)	VIIs.
Dandridge silt loam:	
Hilly phase (Dh)	IVs.
Steep phase (Di)	VIIs.
Decatur silty clay loam:	
Eroded hilly phase (Dj)	IVe.
Eroded rolling phase (Dk)	IIIe.
Eroded steep phase (Dl)	VIe.
Eroded undulating phase (Dm)	IIe.
Severely eroded hilly phase (Dn)	IVe.
Severely eroded rolling phase (Do)	IIIe.
Dewey silt loam, rolling phase (Dp)	IIIe.
Dewey silty clay loam:	
Eroded hilly phase (Dq)	IVe.
Eroded rolling phase (Dr)	IIIe.
Eroded undulating phase (Ds)	IIe.
Severely eroded hilly phase (Dt)	IVe.
Severely eroded rolling phase (Du)	IIIe.
Dunmore silt loam:	
Hilly phase (Dv)	IVe.
Rolling phase (Dw)	IIIe.

349399—56——11

	Capability class and subclass
Dunmore silty clay loam:	
Eroded hilly phase (Dx)	IVe.
Eroded rolling phase (Dy)	IIIe.
Eroded steep phase (Dz)	VIe.
Severely eroded hilly phase (D2)	IVe.
Severely eroded rolling phase (D3)	IIIe.
Emory silt loam:	
Rolling phase (Ea)	IIe.
Undulating phase (Eb)	IIe.
Farragut silty clay loam:	
Eroded rolling phase (Fa)	IIIe.
Eroded undulating phase (Fb)	IIe.
Severely eroded hilly phase (Fc)	IVe.
Severely eroded rolling phase (Fd)	IIIe.
Fullerton cherty silt loam:	
Eroded hilly phase (Fe)	IVe.
Eroded rolling phase (Ff)	IIIe.
Eroded steep phase (Fg)	VIIe.
Hilly phase (Fh)	IVe.
Rolling phase (Fk)	IIIe.
Steep phase (Fl)	VIIe.
Fullerton cherty silty clay loam:	
Severely eroded hilly phase (Fm)	VIe.
Severely eroded steep phase (Fn)	VIIe.
Fullerton silt loam:	
Eroded hilly phase (Fo)	IVe.
Eroded rolling phase (Fp)	IIIe.
Hilly phase (Fr)	IVe.
Rolling phase (Fs)	IIIe.
Fullerton silty clay loam:	
Severely eroded hilly phase (Ft)	VIe.
Severely eroded rolling phase (Fu)	IIIe.
Greendale and Pace silt loams:	
Rolling phases (Ga)	IIe.
Undulating phases (Gb)	IIe.
Hamblen fine sandy loam (Ha)	IIw.
Hamblen silt loam (Hb)	IIw.
Hayter silt loam:	
Eroded hilly phase (Hc)	IVe.
Eroded rolling phase (Hd)	IIIe.
Undulating phase (He)	IIe.
Hollywood silty clay loam (Hf)	IIIw.
Holston loam:	
Eroded hilly phase (Hg)	IVe.
Eroded rolling phase (Hh)	IIIe.
Rolling phase (Hk)	IIIe.
Undulating phase (Hl)	IIe.
Jefferson fine sandy loam:	
Eroded hilly phase (Ja)	IVe.
Eroded rolling phase (Jb)	IIIe.
Jefferson silt loam:	
Eroded hilly phase (Jc)	IVe.
Eroded rolling phase (Jd)	IIIe.
Hilly phase (Je)	IVe.
Rolling phase (Jf)	IIIe.
Undulating phase (Jg)	IIe.
Jefferson silty clay loam:	
Severely eroded hilly phase (Jh)	VIe.
Severely eroded rolling phase (Jk)	IVe.
Jefferson stony fine sandy loam:	
Eroded hilly phase (Jl)	VIs.
Eroded rolling phase (Jm)	IVs.
Hilly phase (Jn)	VIs.
Rolling phase (Jo)	IVs.
Severely eroded hilly phase (Jp)	VIs.
Undulating phase (Jr)	IVs.

	Capability class and subclass
Jefferson very stony fine sandy loam:	
Eroded hilly phase (Js)	VIIs.
Eroded rolling phase (Jt)	VIs.
Hilly phase (Ju)	VIIs.
Rolling phase (Jv)	VIs.
Lindside silt loam (La)	IIw.
Litz shaly silt loam:	
Eroded hilly phase (Lb)	VIs.
Eroded rolling phase (Lc)	IIIs.
Litz silt loam, hilly phase (Ld)	VIs.
Monongahela silt loam (Ma)	IIe.
Muskingum-Lehew loams, steep phases (Mb)	VIIs.
Nolichucky loam:	
Eroded hilly phase (Na)	IVe.
Eroded rolling phase (Nb)	IIIe.
Hilly phase (Nc)	IVe.
Rolling phase (Nd)	IIIe.
Undulating phase (Ne)	IIe.
Prader silt loam (Pa)	IIIw.
Ramsey shaly silt loam:	
Eroded hilly phase (Ra)	IVs.
Eroded steep phase (Rb)	VIIs.
Hilly phase (Rc)	IVs.
Steep phase (Rd)	VIIs.
Very steep phase (Re)	VIIs.
Ramsey stony fine sandy loam:	
Eroded steep phase (Rf)	VIIs.
Hilly phase (Rg)	VIs.
Steep phase (Rh)	VIIs.
Very steep phase (Rk)	VIIs.
Roanoke silt loam (Rl)	IVw.
Rough gullied land:	
Dandridge soil material (Rm)	VIIe.
Limestone material (Rn)	VIIe.
Ramsey and Litz soil materials (Ro)	VIIe.
Rough mountainous land (Ramsey soil material) (Rp)	VIIs.
Sequatchie fine sandy loam (Sa)	IIe.
Sequatchie silt loam (Sb)	IIe.
Sequoia silt loam, rolling phase (Sc)	IIIe.
Sequoia silty clay loam:	
Eroded rolling phase (Sd)	IIIe.
Eroded undulating phase (Se)	IIe.
Severely eroded rolling phase (Sf)	IVe.
Staser fine sandy loam (Sg)	I.
Staser silt loam (Sh)	I.
State silt loam (Sk)	IIe.
Stony colluvium (Jefferson soil material) (Sl)	VIIs.
Stony hilly land (Dunmore and Talbott soil materials) (Sm)	VIIs.
Stony steep land (Dunmore and Talbott soil materials) (Sn)	VIIs.
Tyler silt loam (Ta)	IIIw.
Waynesboro clay loam, severely eroded hilly phase (Wa)	VIe.
Waynesboro loam:	
Eroded hilly phase (Wb)	IVe.
Eroded rolling phase (Wc)	IIIe.
Rolling phase (Wd)	IIIe.
Undulating phase (We)	IIe.
Whitesburg silt loam (Wf)	IIw.

ADDITIONAL FACTS ABOUT SEVIER COUNTY

INDUSTRIES

The county has few industries besides agriculture. Of these, milling, canning, and furniture and hosiery manufacturing are the most

important. Many of the people in the mountainous section of the county are engaged in home industries, which include weaving and basketmaking. Much of the off-the-farm work, especially in the cannery, is seasonal.

ROADS, RAILWAYS, AND MARKET AND SHIPPING POINTS

The transportation facilities of Sevier County are good. Paved Federal and State highways cross the county. Gravel roads, State or county, are in all areas. These roads are well maintained and provide easily traveled routes to market. A few farms in the less productive districts are not on improved roads. According to the Federal census for 1950, 796 farms were on hard-surfaced roads; 1,466 on gravel roads; and 750 on dirt or unimproved roads. Railway transportation is provided by the Smoky Mountain Railroad that connects Sevierville with Knoxville.

Sevierville, the county seat, is the principal market and shipping point for agricultural products. Knoxville, in Knox County, provides a market for a considerable part of the agricultural products of Sevier County.

COMMUNITY AND FARM HOME IMPROVEMENTS

All communities are provided with schools and churches; and school-bus and rural mail-delivery services extend to practically all parts of the county. Telephone service is available in most places, and electric power facilities have been extended greatly during recent years. According to the 1950 census, of the 3,148 farms reported, 1,882 were served by electricity and 91 had telephones.

LAND USE CHANGES

The great expansion in agriculture in Sevier County took place before 1880, the year of the first complete agricultural census, although there have been several changes since that time. The proportion of land in farms had reached its peak by that time, but the total amount of improved land has continued to increase. About 77 percent of the total county was in farms in 1880, but the proportion decreased to 53.2 percent by 1950. Much of the decrease was caused by the establishment of the Great Smoky Mountains National Park. The number of farms decreased from 3,450 in 1920 to 3,148 in 1950. The average size of farms decreased from 80.0 acres in 1920 to 65.2 in 1950.

CROPS

The acreage of principal crops and the number of fruit trees and grapevines in Sevier County, as reported by the United States census for specific years, appear in table 25.

The data in table 25 show that corn, wheat, and hay have been the important crops throughout the period represented. Since 1919, tobacco has become the most important cash crop in the county. The number of apple and peach trees has been declining for the last three decades. This is partly due to the creation of the Great Smoky Mountains National Park in the chief fruit-producing area of the county (*5*).

TABLE 25.—*Acreage of the principal crops and number of fruit trees and grapevines of bearing age in Sevier County, Tenn., in stated years*

Crop	1919	1929	1939	1949
Corn:	*Acres*	*Acres*	*Acres*	*Acres*
For grain	(1)	28, 805	27, 556	17, 092
For all purposes	(1)	(1)	28, 264	17, 459
Small grains threshed	18, 546	8, 061	10, 328	8, 006
Wheat	14, 867	7, 329	8, 640	4, 872
Oats	3, 172	536	420	2, 844
Barley	15	31	754	266
Rye	492	165	514	24
All hay	15, 741	16, 667	20, 745	23, 091
Timothy and clover, alone or mixed	4, 527	10, 567	4, 589	3, 621
Lespedeza	(1)	(1)	9, 988	14, 214
Alfalfa	16	54	350	1, 247
Other tame grasses	7, 644	3, 942	4, 048	[2] 2, 318
Grains cut green	392	767	701	1, 691
Wild grasses	362	254	404	(1)
Legumes cut for hay	2, 800	1, 083	665	(1)
Silage and coarse forage	8, 062	[3] 1, 255	[3] 708	(1)
Potatoes	574	558	482	[4] 208
Sweetpotatoes and yams	392	294	312	[4] 82
All other vegetables	257	1, 406	1, 174	674
Tobacco	10	657	1, 290	1, 922
	Number [5]	*Number* [5]	*Number* [5]	*Number* [5]
Apple trees	81, 295	74, 143	53, 846	38, 515
Peach trees	31, 801	26, 604	19, 480	7, 455
Pear trees	2, 944	1, 504	2, 292	1, 647
Cherry trees	1, 527	881	3, 027	2, 454
Plum and prune trees	29, 074	3, 148	3, 353	1, 342
Grapevines	5, 010	10, 137	17, 789	5, 381

[1] Not reported.
[2] Other hay cut.
[3] Consists of corn cut for silage, corn cut for fodder, and corn hogged or grazed off.
[4] Does not include acres for farms with less than 15 bushels harvested.
[5] Number in the census year, which is 1 year later than the crop year given at the head of the column.

CORN

Corn exceeds in acreage all other cereals combined, but it has occupied an increasingly smaller proportion of the improved land. It is grown throughout the county on a wide variety of soils and is almost the only crop on some of the bottom lands along streams. It holds first place as a grain feed crop in the county. About twice as much feed per acre is produced in corn as in the small grains. Small grains, however, are ordinarily grown with a hay crop, usually lespedeza, and yields of both forage and grain are produced the same season.

The highest yields of corn are obtained in those districts with the largest proportion of soils on bottom lands and terraces. The lowest yields are in the mountain districts northeast of the National Park where the Ramsey soils are prevalent and in the northern tip of the county where the Fullerton and Dandridge soils occur.

The crop is usually planted April 20 to May 10, although it can be planted until the middle of June. It is common practice to use 125 to 200 pounds of 0–10–4, 4–10–4, or 3–8–5 fertilizer per acre applied by the row. Larger amounts of fertilizer than in earlier years are now being used. The crop is cultivated and hoed during growth to prevent competition from weeds. It is ready to be harvested as silage or cut and shocked from the first to the fifteenth of September, in time to prepare the land for a seeding of small grains or winter-pasture mixture. Neal Paymaster is the most common and formerly the highest yielding variety used in the county, but adapted hybrid varieties have been averaging about 10 percent more grain per acre. Tennessee Hybrids Nos. 10 and 29 and Dixie 33 are the best adapted hybrids to date. Two growers produced certified hybrid seed corn in Sevier County during 1943. Jarvis Golden Prolific and Yellow Paymaster are yellow open-pollinated varieties sometimes grown. Most of the corn crop is harvested for grain.

WHEAT

Wheat has ranked next to corn in cereal crop acreage during the period covered by the census data in table 25. However, the percentage of improved land occupied by wheat has decreased rather steadily since 1920.

Wheat is sown in well-prepared seedbeds about October 10 to 20 and is generally fertilized with 100 to 150 pounds of 0–10–4, 3–8–5, or 0–20–0 fertilizer per acre. Seneca, Thome, and Fulcaster are the most common varieties grown, the first two showing superior yields. Clover, lespedeza, or mixtures of grasses and legumes are commonly sown in the wheat in the fall or spring. The wheat is occasionally used for early spring pasture. The crop is ready for harvest about June 8 to 18, and it is usually threshed and used for food, feed for livestock, or sold from the farm. Combines are coming into use in the less rolling areas of the county, but in the more mountainous areas small acreages are grown for flour and harvested with the cradle.

OATS

Oats were extensively grown in earlier times. With the recent introduction of new winter-hardy, high-yielding varieties, such as the Forkedeer, Fulwin, and Tennex, oats are again gaining favor in the county. There were two producers of certified seed of these new varieties in the county in 1944. Oats furnish good winter pastures. On rich soils they will grow too tall and lodge if not grazed to some extent during the winter. Winter oats are best seeded September 15 to October 1, but the new varieties can be seeded as late as October 20. The crop is ready for harvest June 1 to 15. Some spring oats are still grown in the county. They are seeded about March 1 to 15 and are ready for harvest about June 10 to 20. About one-third of the oat crop was cut and fed unthreshed in 1949, according to United States census data.

BARLEY

Wautauga and Jackson are the varieties of barley most commonly grown. There were five growers of certified barley seed in the county during 1944. Barley produces winter grazing for livestock, winter cover for the soil, and on the suitable soils a good yield of grain for feed. Barley is sown from September 15 to October 7 and is ready to harvest about June 1 to 15.

RYE

Rye has been grown in small acreages in the county for a long time (table 25). It is favored for winter pasturage and grain production under the most unfavorable soil conditions. Balbo is the variety used in this area. It may be sown from September 1 to October 20 and harvested about June 10 to 30.

TOBACCO

The tobacco grown until 1919 was of the dark fire-cured type. Since 1919 burley tobacco has become one of the chief cash crops in the county. According to census data, there has been a steady increase in yield per acre with increased use of fertilizer. No doubt other factors, such as change in types and varieties, have also helped produce this upward trend.

The plants are started in specially prepared gauze-covered beds in protected uncontaminated areas. The beds are usually seeded during February, and the plants are transferred to the field by hand between May 10 and June 15. Deep rich loamy soils are preferred. The fields are carefully prepared, and from 300 to 1,000 pounds of 3–8–5 fertilizer is broadcast before setting the plants. Farm manure is used by 85 percent or more of the growers, and commercial fertilizer is applied almost without exception. In some cases sidedressings of nitrogen fertilizers are used with good results while the plants are small.

Root rots previously caused great difficulty where the crop was grown successively on the same land. This difficulty is avoided by use of resistant varieties such as Kent 16, but rotations are usually practiced for higher yields and quality. Clean cultivation is used. The plants are usually topped at the time of blossoming to cause greater development of the larger lower leaves. The crop is ready for harvest about August 15 to September 15. The plants are cut off close to the ground and allowed to wilt. They are then strung on sticks several feet long and hung in large well-ventilated barns to dry. When they have cured and atmospheric conditions bring the plants into "case," the leaves are stripped, graded, and tied into bunches or "hands." These are carried to the tobacco warehouses and sold at public auctions.

VEGETABLE AND TRUCK CROPS

Vegetable and truck crops grown for home use are of considerable importance. Suitable varieties for this section, and approximate dates of planting and harvesting can be obtained from the Tennessee Agricultural Experiment Station.

In addition to the vegetable and truck crops grown for home use, 674 acres of vegetables were harvested for sale in 1949. Sweet corn, peas, tomatoes, lima beans, and green beans are produced for the canneries at Sevierville, and in Newport in Cocke County. Peas are usually grown in a double cropping system with sweet corn or field corn on the well-drained fertile soils of the bottom lands and low terraces along the Little Pigeon River and its tributaries. The land is prepared and the peas drilled with 400 to 600 pounds of 4–10–4 fertilizer per acre about the last of February. The peas are usually dusted to prevent injury by aphids. After the peas are harvested, about the last of May, the land is prepared again and planted to sweet

corn or field corn. This crop also usually receives about 150 to 200 pounds of 4–10–4 or 0–10–4 fertilizer. Sweet corn is ready to harvest about the last of August.

Sweetpotatoes, Irish potatoes, cantaloups, watermelons, sweet corn, green beans, and other vegetables and truck crops are grown for local and Knoxville markets, particularly in the vicinity of Boyds Creek.

FRUITS AND NUTS

Apples, peaches, pears, plums, cherries, strawberries, blackberries, and raspberries are grown for home use and local sale. A few vineyards are kept in the county, and two commercial apple orchards are located near Gatlinburg. Walnuts, hickory nuts, and pecans grow wild and are cultivated to some extent for home use.

HAY AND FORAGE CROPS

The acreage of hay and forage crops has been increasing rather steadily (table 25).

Since Korean lespedeza was introduced in the United States about 1919, it has become the leading hay and pasture plant in the county. A large acreage is harvested for hay, besides a sizable acreage for seed. Lespedeza makes up a part of nearly every pasture in the county and furnishes the bulk of the forage in many. It is commonly seeded in the small grain crop in the spring and cut for hay or seed in the fall or pastured during the summer. If pastured or cut late for hay or seed, it will reseed itself. Since spring growth begins late, however, the ground is left without growing vegetation. The soil is thus subject to serious leaching and erosion during the winter and spring unless small grains, ryegrass, crimson clover, or other suitable plants are seeded with the lespedeza in the fall.

Surface soils of fields long in lespedeza have been observed to become depleted of available potash. Lespedeza will grow on every soil in the county, but responds well to lime, phosphate, and potash on soils deficient in these plant nutrients. Sericea lespedeza, a perennial, has been grown experimentally in the county but has not become widely used.

In 1949 the hay crop next to lespedeza in acreage was clover and timothy alone or mixed. Among other grass hays grown are mixtures of timothy with red top, other tame grasses, and wild grasses. Ryegrass is finding considerable favor for winter pastures. It is sown in September in mixtures with crimson clover or other grasses and clovers on cornland, lespedeza meadows, or old pastures. The crop may either be pastured in the spring or harvested for hay or seed. If the crop is harvested, the rest of the growth can be pastured or cut for hay later.

Next to lespedeza, red clover is the most extensively grown legume hay crop in Sevier County. Soil requirements are more exacting and, unless lime and phosphate are supplied, good stands are more difficult to produce. Red clover is used in pasture mixtures, and with timothy for hay. A seed crop is occasionally harvested.

Alfalfa is also grown on small acreages throughout the county. It is used primarily as a hay crop and usually yields abundant hay of high quality. It is also used to some extent for pasture. It is even more exacting in soil requirements than red clover but on many soils is more easily established when soil deficiencies are remedied. Soils

are usually well limed and phosphated before seeding alfalfa, and potash is commonly supplied for soils deficient in this amendment. Soils well limed for alfalfa in east Tennessee have frequently showed alfalfa yellow. This condition is most frequently caused by boron deficiency. It is commonly recommended that alfalfa be sown alone late in summer to avoid competition from weeds. Some success, however, has been attained with early spring seedings that were judiciously clipped during the first summer.

MINOR CROPS

Small acreages of soybeans, sweetclover, peanuts, broomcorn, buckwheat, cowpeas, and sorghum are grown in the county. In earlier years, some maple sirup was produced. Sorghum sirup is still made on a small scale for home and local use.

ROTATIONS AND FERTILIZERS

The crop sequence most commonly followed in Sevier County is corn, a small grain, and then a legume or a legume-grass mixture for hay and pasture. The length of time the hay is allowed to stay on the land varies considerably with the soil conditions and the need for grain feed on the farm. Peas, sweet corn, or tobacco may take the place of corn in the crop sequence above. Wheat is the most commonly grown small grain, but oats, barley, and rye are used to some extent, particularly in certain sections of the county. Lespedeza is the most common legume seeded in the small grain, although red clover or a mixture of red clover and timothy is also used. A hay crop is usually harvested the same year the small grain is harvested or is used for pasture. A small grain-lespedeza rotation is also used in some areas.

For winter pasture, crimson clover may be seeded with a small grain after corn, pasture, or hay crops. Small grain may be seeded with lespedeza in the spring for a summer pasture or hay. Ryegrass is also favored for winter pasture and it may be harvested for hay or seed in the spring. Ryegrass may also be seeded with lespedeza and pastured in summer or used as a second hay crop. Sometimes tobacco is planted after a winter cover crop has been plowed under as green manure in the spring. This land may be planted to tobacco again the following year.

Manures, limestone, phosphates, and mixed fertilizers are commonly used in Sevier County. The census data for 1939 show that 1,725 tons of commercial fertilizer and 11,753 tons of lime were purchased in the county during that year. The use of all fertilizers in the county has increased since that time. Further expanded use of fertilizers and lime is needed to achieve the most economical agricultural production.

Commercial fertilizers, ready-mixed and purchased from local agents, are most commonly used. The fertilizers used on truck crops grown for the canneries can be purchased from the cannery, which buys in bulk lots. Ground limestone is commonly hauled from Mascot (in Knox County) or Jefferson City (in Jefferson County), since there is no lime crusher in the county.

Lime and phosphate are normally used on pastures and are applied before seeding lespedeza, alfalfa, or other hay crops. Potash is deficient in places and is applied as muriate of potash where needed. Boron (borax) is commonly supplied to alfalfa either before seeding or to stands that show boron deficiency. Manure and commercial

fertilizers are used most extensively for tobacco and truck crops. From 300 to 1,000 pounds per acre of 3–8–5 is commonly broadcast for tobacco; and 125 to 200 pounds per acre of 0–10–4,[11] 3–8–5, or 4–10–4 is used for corn. Cannery peas receive 400 to 600 pounds of 4–10–4, and the succeeding crop of sweet corn or field corn receives about 200 pounds of this fertilizer or 0–10–4. Mixtures such as 4–10–4 or 3–8–5 are commonly used for other truck crops.

Small grains usually receive 100 to 125 pounds of 0–10–4 or phosphate at seeding time. Use of nitrogen, in addition, seems to be giving good results in many places. Little attention is given to the varying of fertilizer applications according to the different needs of the soils. The amounts applied and mixtures used seldom take into account the nature of the soil.

Manure produced on the farm is a very important fertilizer. It is perishable, however, and requires proper handling. When properly handled and mixed with or used in conjunction with superphosphate, it furnishes a complete fertilizer.

PERMANENT PASTURES

According to the 1949 census, there were 53,829 acres of cropland used for pasture in Sevier County. There was also much permanent open and woodland pasture. Permanent pastures are largely on soils that are either too steep or too stony to be easily cultivated or are very shallow over bedrock. Some soils of the bottom lands that are too poorly drained for cultivation are also used for permanent pasture. Most of the permanent pastures are on Dandridge and Litz soils or the stony land types. The quality of pasture varies according to management, but bluegrass is the chief pasture plant. Where soil amendments have been used, the pastures usually consist of bluegrass, orchardgrass, and clovers. In many untreated pastures, broomsedge is the dominant plant. There is a trend toward better pasture management. Many farmers are now using lime and phosphate.

LIVESTOCK AND LIVESTOCK PRODUCTS

Hay and forage crops, pastures, and most of the grains are marketed through livestock and livestock products, which are the largest source of income in the county. The number of livestock on farms in stated years is shown in table 26.

CATTLE

Of the 18,962 head of cattle in 1950, 7,004 were listed as milk cows. According to the 1950 census, there were 93 dairy farms, but the greater part of the dairy products are produced on subsistence, part-time, and general farms. Dairying is carried on mainly in the valley part of the county, but most farms have one or two dairy cows to supply home needs. Dairy products are sold principally to the specialized dairies that have delivery routes in the urban areas. The dairy cattle are mainly grade Jerseys.

Beef cattle are distributed throughout the county, but the larger herds are in the valley area. Most of the beef cattle are grades of the Hereford, Shorthorn, or Angus breeds. Beef cattle and veal calves are sold chiefly on the Knoxville market.

[11] 0–10–4 (previously 10–0–4) is no longer sold commercially and is being replaced with complete fertilizers or PO_4.

TABLE 26.—*Number of livestock on farms in Sevier County, Tenn., in stated years*

Livestock	1920	1930	1940	1950
Horses	3,594	1,972	[1] 2,277	1,950
Mules	2,722	2,280	[1] 1,986	1,722
Cattle (beef and dairy)	15,712	14,471	[1] 15,402	18,962
Sheep	2,525	4,063	[2] 1,649	1,032
Goats	155	106	[3] 85	([4])
Swine	19,198	10,041	[3] 9,988	11,129
Chickens	171,558	16,191	[3] 124,027	[3] 124,580
Other poultry	7,361	[5] 3,130	[6] 2,388	[7] 196
Bees (hives)	3,536	2,924	2,936	3,063

[1] Over 3 months old.
[2] Over 6 months old.
[3] Over 4 months old.
[4] Not reported.
[5] Other poultry raised 1929 (turkeys, ducks, and geese).
[6] Turkeys, ducks, geese, and guineas.
[7] Turkeys on hand only.

SWINE

Most of the hogs are raised for home use. Those sold are bought mainly by local buyers and shipped to packing plants in Knoxville. Poland China, Chester White, Duroc Jersey, and Hampshire are the most popular breeds.

SHEEP AND GOATS

The Hampshire is the most common breed of sheep. The lambs and wool are generally sold to local buyers. There are very few goats in the county; 155 is the greatest number reported for any census year (1920).

POULTRY

Poultry, chiefly chickens, is an important source of income for most of the farms. White Leghorn, Rhode Island Red, and Plymouth Rock are the most common breeds. Only a few turkeys and ducks are raised. Most of the chickens and eggs are used on the farm or sold locally.

FARM POWER AND MECHANICAL EQUIPMENT

The number of work animals on farms has decreased since 1920. The work animals consist of horses and mules in almost equal numbers. The Percheron is the principal breed of horse. Most of the replacements are raised on the farms of the county.

During the last decade, tractors have replaced many horses and mules in the areas of smoother land. There were 461 tractors and 832 motortrucks on farms in 1950. The tractors are used not only on the home farm; many do work on neighboring farms.

TYPES AND SIZES OF FARMS

According to the 1950 census, the 3,148 farms in Sevier County were classified as follows: 697 field-crop farms, 5 vegetable, 93 dairy, 47 poultry, 308 livestock other than dairy and poultry, 390 general, and 1,608 were miscellaneous and unclassified farms.

In 1950 the farms of the county were classified by size as follows: 377 farms of less than 10 acres; 1,271 farms from 10 to 49 acres; 849 farms from 50 to 99 acres; 472 farms from 100 to 179 acres; 112 farms from 180 to 259 acres; and 67 farms from 260 to more than 1,000 acres.

FARM TENURE

According to the 1950 census, owners and part owners operated 2,528 farms, managers 3, and tenants 617. The proportion of tenancy increased from approximately 28 percent in 1920 to a high of 38 percent in 1930, but decreased to about 20 percent by 1950. The common landlord-tenant agreement is as follows: The landlord furnishes the tenant with a house, all of the work animals and the seed, and the tenant furnishes the labor. Fertilizer costs are usually divided according to the sharing of the crop. Usually the landlord and the tenant share the tobacco crop equally, but the landlord receives two-thirds of the corn and small grain crops and the tenant one-third. The tenants that furnish labor, work animals, implements, seed, and all the fertilizer receive two-thirds of all crops, including tobacco. There is very little land rented for cash.

FORESTS [12]

The entire land area of Sevier County, with the possible exception of the heath balds, was originally forested. As early as 1785, however, settlers were clearing the land for the production of subsistence crops. These early settlers used many forest products, but they could not use all the timber removed from the land. Many of the logs were used for construction of houses and barns and others were split into rails for fences. Sugar was made from the sap of the maple trees that grew in abundance. Tubs, baskets, and barrels were made for general home use. Chairs were usually made of oak or hickory and were bottomed with splints of white oak or slippery elm. Baskets and hampers were woven of white oak or hickory splints.

Land was cleared for cultivation by burning; the trees were generally killed by girdling, then felled, cut into logs, and rolled into piles and burned. Fires would sometimes get beyond control and burn large areas (*18*). About 85,000 acres of Sevier County land had been cleared by 1880. This included the most desirable crop areas that had been among the most productive of forest trees.

An example of early logging was the operation of Swaggerty and Eubank. This firm operated 11 steam sawmills in the eleventh district about 1898. The lumber was largely yellow-poplar and lynn. It was transported from the vicinity of Spruce Flats (Blount County) by 40 wagon teams to a loading point at Catlettsburg, located on the Little Pigeon River near its junction with the French Broad. The lumber was then transported by steamboat to the Knoxville market. Before this large operation, the relatively small amount of lumber produced in this mountainous section was by means of the oldtime sash saw.

Approximately 62 percent of the land area of Sevier County is in forests, of which 31 percent is farm woodland, 20 percent private nonfarm woodland, and 49 percent public forest (*11*). Based on the

[12] This section was prepared by G. B. Shivery, Extension Forester, University of Tennessee.

number of farms reporting woodland in the 1950 census, the average size of farm woodland is about 30 acres.

Of the timber-producing areas, approximately 14 percent is northern hardwoods, 7 percent spruce-fir, 11 percent oak-chestnut, 1 percent hemlock-hardwoods, 15 percent upland hardwoods, 50 percent yellow pine-hardwoods, 1 percent hemlock, and 1 percent cedar-hardwoods, and the pure yellow pine forest type (approximately 690 acres). About 23 percent of the total area in forest is classified as sawtimber, 55 percent as cordwood, and 22 percent as below cordwood. However, 112,780 acres of this forest area is included in the Great Smoky Mountains National Park, which is closed to commercial cutting.

There is some correlation between soil associations and broad forest types, but this correlation is not perfect. Differences in elevation and exposure, as well as differences in soils, have influenced the forest types within the county. The Muskingum-Lehew-Jefferson association is characterized by the yellow pine-hardwoods forest type. This type includes stands of mixed yellow pines and hardwoods in which the percentage of all pines (Virginia pine and an occasional shortleaf pine in this instance) is between 25 and 75 percent of the total dominant and codominant stems. The inextensive farm woodlands on the Dewey-Decatur-Fullerton soil association are also classified as yellow pine-hardwoods. In these woodlands shortleaf pine is conspicuous among high quality hardwoods such as white oak, Northern red oak, Southern red oak, yellow-poplar, blackgum, and dogwood.

The upland hardwoods forest type—principally mixed oaks, hickories, blackgum, dogwood, yellow-poplar, and occasional pines—is common on the Fullerton-Greendale-Lindside soil association. The cedar-hardwoods forest type occurs as local areas on dolomitic bluffs but is not closely correlated with the Stony land-Dunmore-Lindside soil association. It is more prevalent on the shallow shaly soils of the Dandridge-Hamblen-Whitesburg soil association. However, the prevailing forest type on the last-named association is yellow pine-hardwoods, the Virginia pine being most in evidence. Nevertheless, on north and east exposures this forest type locally merges into the upland hardwoods forest type, which is principally mixed oaks, hickories, blackgum, dogwood, sourwood, and occasional Virginia and shortleaf pines. The Cumberland-Waynesboro-Congaree and Holston-Nolichucky-Tyler soil associations, where forested, support the yellow pine-hardwoods forest type that merges into occasional stands of upland hardwoods.

The Ramsey-Cotaco-Barbourville and Rough mountainous land-Ramsey soil associations may well be considered together. On these associations, elevation and exposure are the primary factors determining the forest type. The yellow pine-hardwoods forest type in which Virginia pine is dominant, prevails at lower elevations, including all of Chilhowee Mountain. The hardwoods in this type include such species as white, chestnut, scarlet, Southern red, black, and blackjack oaks, white, pignut, and shagbark hickories, red maple, and blackgum. At higher elevations, 2,000 feet and above, the dominant pine is pitch pine, but some Table-mountain pine is included. This forest type is a serious fire hazard as it occupies dry sites, primarily on south and west exposures.

The spectacular spruce-fir forest type (pl. 11) is found on the crests of the Great Smoky Mountains and on the main ridges or spurs

leading from this chain. These areas include Mount Guyot, Mount Chapman, Wooley Tops, Mount Kephart, the Boulevard to Mount Le Conte, Mount Mingus, Sugarland Mountain to the Chimneys, Mount Collins, and Clingmans Dome to Monteith Ridge northeast of Silers Bald. On old burns and clear-cut areas, pin cherry seeds in with an understory of young red spruce and Fraser fir. Fir predominates in this forest type and a few scattered red spruce are among the older growth on the highest points. The proportion of red spruce increases as elevation decreases. Heath bald is an associated type on main, spur, and finger ridges, especially where topography is very rugged. It consists of mountain-laurel and *Rhododendron catawbiense*, along with highbush blueberry, smilax, red twig leucothoe and scattered red spruce, Fraser fir, yellow birch, or mountain ash. The spruce-fir forest type and the heath balds occur chiefly at elevations above 4,500 feet on all exposures.

The spruce-fir forest type merges into the northern hardwoods forest type at the heads of coves, on cold north-facing slopes and benches, and on the crests of high ridges beyond the spruce range. Key species in the northern hardwoods type are sugar maple, beech, and yellow birch. They are associated with hemlock, red maple, basswood, Northern red oak, black cherry, yellow locust, red spruce, yellow buckeye, cucumber magnolia, white ash, white oak, Fraser fir, and mountain ash. The northern hardwoods forest type occurs chiefly at elevations above 3,500 feet but may occur even as low as 3,000 feet on north-facing slopes.

A variation of the upland hardwoods forest type—cove hardwoods—is in coves and on cool moist slopes at elevations as low as 1,500 feet on the Little Pigeon River, the West Fork Little Pigeon River, and the East Fork Little River. Characteristic species include yellow-poplar, basswood, and hemlock, associated with yellow birch, black birch, red maple, sugar maple, black cherry, umbrella magnolia, cucumber magnolia, blackgum, hickory, white and Northern red oaks, and white, red, and green ash. Because of the general northern exposure of the Great Smoky Mountains chain in this county, the cove hardwoods forest type, which requires considerable moisture, tends to broaden out and extends high up on the ridge slopes and over the ridge crests in places. The most luxuriant growth and the largest timber trees of the Smokies occur in this forest type. Mountain-laurel and *Rhododendron maximum*, 20 to 25 feet in height, form dense thickets and are the principal shrubs in the undergrowth.

The inextensive hemlock forest type, which may occur on spur ridges at elevations between 3,100 and 4,700 feet, is closely associated with the hemlock-hardwoods forest type. The hemlock-hardwoods forest type is common in coves at this elevation. Hemlock comprises 25 to 75 percent of the total dominant stems. Codominant stems consist of Eastern hemlock in various mixtures with beech, sugar maple, yellow and black birch, black cherry, white ash, Northern red oak, white oak, yellow buckeye, and, in places, red spruce and Fraser fir. These two forest types often are transitional between the cove hardwoods type at the lower elevation and the northern hardwoods or spruce-fir forest type at the higher elevation.

The oak-chestnut forest type occupies dry ridges from lowest elevations to more than 5,000 feet on all exposures. Species consist of the different kinds of oak and dead chestnut, in varying mixtures

with the hickories; Virginia and shortleaf pines or pitch and Table-mountain pines, depending on elevation; and yellow locust, sourwood, dogwood, blackgum, black birch, red maple, and occasionally yellow-poplar. On the drier sites, especially after forest fires, dense stands of Virginia, pitch, or Table-mountain pines come in, and the result is small areas of the yellow pine forest type. The oak-chestnut forest type is closely associated with the upland hardwoods and cove hardwoods forest types and is intermingled with the yellow pine-hardwoods.

There are now 4 permanent wood-using industries and 8 portable mills in Sevier County (pl. 12, *A*). In 1942 there were 25 active sawmills; in 1912 there were 19, of which 4 cut more than 1,000 M board feet of lumber per year. There were 14 mills operating in 1909 (*4*). In 1942 the production of lumber amounted to 5,669 M board feet of softwoods and 3,700 M board feet of hardwoods. The 1941 production of cordwood was reported as 3,900 cords of chestnut extract wood and 500 cords of hardwood pulpwood.

National Park Service lands receive adequate protection from fire. Protection of the remaining 124,080 acres of privately owned forest land is the responsibility of the State. At present 69,166 acres are organized for protection. There are two cooperative protection areas, each involving a mobile crew, one in the Pittman Center community and the other in that part of Chilhowee Mountain in Sevier County. In both areas the owners of the lands contribute funds toward the cost of protection. Most of the fires on private lands are the result of carelessness in burning brush but incendiarism is a contributing cause. Lumbering and smokers also cause some forest fires.

The four National Park Service fire lookout towers, which overlook forest land in the Sevier County part of the Great Smoky Mountains National Park, are on Blanket Mountain, Cove Mountain, and Greenbrier Pinnacle within Sevier County and Mount Cammerer in Cocke County.[13] Two State forest fire lookout towers overlook lands in this county. One is a steel tower built under the CCC program on English Mountain at the junction of Sevier, Jefferson, and Cocke Counties. The other is a wooden tower built by the State, in cooperation with the Vestal Lumber Co., on Chilhowee Mountain across the county line in Blount County. Both State and National Park Service suppression forces work closely together and the effective visibility range of all towers is fully utilized.

Fire control is necessary, not only for satisfactory forest production but also to maintain maximum soil porosity and to control erosion. Control of grazing is necessary for similar reasons. The timber-producing capacity is gradually destroyed by the repeated browsing and resulting curtailment of tree reproduction. The natural regeneration of the stand is thus prevented. Compaction of the soil, disturbance of humus, and consequent interference with soil porosity lessen water absorption. Furthermore, according to experiments in Indiana, woodland grazing under intensities of 2, 4, or 6 acres allowed per animal unit, without supplementary feeding, resulted in serious deterioration of the animals over a 6-month season (*2*).

The cutting and removal of timber, woody shrubs, and flowers are prohibited in the Great Smoky Mountains National Park. Cutting

[13] Information provided by the Forestry Division of the State Department of Conservation and the National Park Service.

practices within the county are not in accord with good forest management. A radical change must be made to halt the progressive deterioration of the forest resources. A much greater value must be placed on the potential crop of saw timber trees. The cutover woodland and forest contain much cull timber that hinders the development of these potential crop trees. Farm woodlands can be materially improved by removing such inferior trees for fuel and other minor farm needs or by cutting them for pulpwood or chestnut extract wood. Such improvement involves systematic cutting and use of crooked, short, bushy-topped, unsound, or slow-growing trees and reserving the straight, tall, well-crowned trees, free from defect, for growth into final crop timber.

Second growth stands on eroded and "turned out" land consist largely of Virginia pine, particularly in the valley area. There may be varying proportions of redcedar with the Virginia pine, especially on the heavy soils derived from limestone materials. Pitch pine may also volunteer on some areas. Virginia pine is a prolific producer of seed and has the ability to utilize dry and less favorable sites at relatively low elevations. Cone-bearing trees of this species perform a valuable service in the natural dissemination of seed on severely eroded areas where tree planting would be expensive.

It is necessary on occasions to resort to forest tree planting, particularly on the Fourth- and Fifth-class soils that are severely eroded (pl. 12, *B*). Successful tree planting requires advance preparation, and each situation presents a specific problem. This preparation includes such measures as breaking and mulching galled areas, building simple low check dams of brush in gullies, and plowing contour furrows. Landowners are encouraged to do the entire job; they may use forest tree seedlings provided without cost by the Tennessee Valley Authority. Under this arrangement, through the medium of county agricultural agents, a total of 345 acres involving an average of 2 to 3 acres per individual have been planted.[14] Shortleaf pine and black locust comprise the majority of the 457,710 trees planted outside the national park.

It is of first importance to select species that suit the characteristics of the particular soil. The degree of erosion and other local features such as elevation and exposure should be considered. Although many farmers specify locust because of farm needs for fence posts, pine is usually better suited to the severe growing conditions on lands designated for forest use.

There are many severely eroded soils and gullied land types that can be most economically reclaimed by planting to forest. Rough gullied land (limestone material), Rough gullied land (Dandridge soil material), and Rough gullied land (Ramsey and Litz soil materials) all need reforesting. Black locust does well in gullies in the moist well-aerated soil material accumulated behind the simply constructed check dams. A large proportion of the areas need black locust for the silting basins. Shortleaf pine or, on the most unfavorable sites, Virginia pine is needed for the sheet-eroded areas between gullies. Black locust responds well to cultivation and to fertilization with phosphate fertilizers. These measures are warranted in order to obtain a prompt protective vegetative cover in many places.

[14] Information obtained from the Department of Forestry Relations, Tennessee Valley Authority.

Soils that probably should be reforested on most farms include Fullerton cherty silty clay loam, severely eroded steep phase; Armuchee silty clay loam, severely eroded steep phase; Jefferson stony fine sandy loam, severely eroded hilly phase; Litz shaly silt loam, eroded hilly phase; Ramsey shaly silt loam, eroded hilly phase; Ramsey shaly silt loam, eroded steep phase; Ramsey stony fine sandy loam, eroded steep phase; Stony colluvium (Jefferson soil material); and Stony steep land (Dunmore and Talbott soil materials). Shortleaf pine is well suited to most areas of these soils, but Virginia pine probably should be used on the most severely eroded areas and on dry exposed south and west exposures. Where check dams are used in gullies, black locust can be successfully used. Where limestone rock is in evidence, particularly on Stony steep land (Dunmore and Talbott soil materials), the natural reproduction of redcedar should be encouraged. Black walnut thrives in deep pockets of soil between limestone rocks.

Forest has important indirect benefits aside from production of wood products, especially on areas subject to severe erosion. A protective layer of forest litter absorbs the impact of the falling drops of water. The tiny pores and channels between the soil particles through which the water moves downward are thus preserved. As a result of the action of fungi, bacteria, and tiny animals that consume the litter and each other, a dark-brown colloidal substance called humus is formed. When carried downward into the mineral soil by percolating water, this humus improves both physical structure and fertility. The litter and humus have, in addition, great ability to absorb water directly. Porosity is further aided by the channels left after the decay of dead roots. The soil-binding function of the surface roots is, of course, highly beneficial, and the densest network of roots is found in the lower parts of well-developed litter layers.

Results obtained at the erosion station near Statesville, N. C., show a loss of only 0.002 of a ton of soil and 0.06 percent of rainfall from virgin woods (*15*). Furthermore, a companion woods plot burned twice yearly shows runoff of 11.5 percent and soil loss of 3.08 tons per acre, compared to .06 percent and 0.001 ton per acre respectively on an unburned plot. Similar experiments at Zanesville, Ohio, for a 9-year period on cultivated land, pasture, and woodland show the runoff as 20.6 percent, 13.8 percent, and 3.2 percent respectively, and soil loss per acre as 17.18 tons, 0.10 ton, and 0.01 ton (*16*). Therefore, both erosion control and maximum absorption result from complete forest cover, since soil forested with old growth is more porous and absorbs water much more rapidly than the soil in cultivated fields. Where the forest cover is properly maintained, soil covered with second-growth forest does not lose its porosity unless it is overgrazed or the litter is destroyed by fire (*1*).

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil

349399—56——12

development have acted on the soil material (*13*). The effect that any one of these five factors will have on soil formation at a given point is strongly influenced by the other four factors.

Climate and vegetation are active factors of soil genesis. They act on the parent material accumulated through the weathering of rocks and slowly change it into a natural body with genetically related horizons. The effects of climate and vegetation are conditioned by relief, which influences drainage, the rate of natural erosion, and the kind of vegetation growing on the soil. The nature of the parent material also affects the kind of profile that can be formed and in extreme cases dominates it entirely. Finally, time is needed for the changing of the parent material into a soil profile. The time needed for horizon differentiation may be much or little, but some time is always required. Usually a long period is needed for the development of distinct horizons.

The interrelationships among the factors of soil formation are complex, and it is therefore hard to isolate the effects of any one with certainty. It is possible to find some areas where four of the factors are constant or nearly so, and in such areas the effects of the fifth factor can be partially evaluated. Even in such places the measurements of the one factor are approximations of the actual effects. It is convenient to discuss the five factors and their effects in soil formation separately, but the reader should remember that it is the integration of these factors rather than their simple sum that determines the nature of the soil profile.

FACTORS OF SOIL FORMATION AS RELATED TO SEVIER COUNTY

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

The parent materials formed in place consist of the residuum of sedimentary and metamorphic rocks, and the properties of these rocks are strongly reflected in many of the properties of the soils that have developed from them. The sedimentary rocks consist of limestone, dolomitic limestone, sandstone, conglomerate, and shale. The metamorphic rocks consist of quartzites and slates. Geologically, the rocks are very old; the sedimentary rocks were formed in the early part of the Paleozoic era (*7*). Most of the rock formations are folded and faulted and generally have a decided dip.

Certain soils of the county developed from residual materials are generally associated with particular rock formations or parts of rock formations. The Decatur and Dewey soils are chiefly from the weathered materials of high-grade dolomite or dolomitic limestone of the Knox dolomite formation. The Dunmore and Fullerton soils are also derived from the residuum of dolomitic limestone of the Knox formation. The Muskingum and Lehew soils are associated with the Rome formation. Sequoia, Farragut, and Armuchee soils are derived chiefly from the residuum of Nolichucky and Rogersville shales, although Sequoia soils are also associated with the Athens shale. The Dandridge soils are from the weathered materials of Sevier shale.

The Litz soils are associated with the Rogersville shale, and Nolichucky shale formations. The Ramsey soils are mainly associated with the Wilhite and Pigeon slates and the Cades, Thunderhead, and Clingman conglomerates (*17*).

The kinds of transported rock materials are reflected in some of the properties of the soils derived from them. Soils of the Congaree, State, and Roanoke series are derived from transported materials that consist mainly of granite or gneiss and products of their decomposition. Soils of the Cumberland, Lindside, Emory, Pace, and Greendale series are derived from transported materials originating mainly from limestone or cherty limestone. The soils of Waynesboro, Nolichucky, Holston, Monongahela, Tyler, Jefferson, Allen, Barbourville, and Cotaco series are formed from transported materials consisting chiefly of sandstone, quartzite, and shale or products of their decomposition. The Hayter, Sequatchie, Staser, and Hamblen, and Prader soils are formed from materials washed from sandstone, quartzite, or shale but generally include some materials from limestone or calcareous shale. The Hollywood, Whitesburg, and some areas of the Hamblen soils are almost entirely from materials washed from uplands underlain by calcareous shale.

Although a rather consistent relationship exists between the kinds of parent materials and some of the properties of soils, other soil properties, especially those of regional significance in soil genesis, cannot be correlated with kinds of parent materials and must be attributed to other factors.

Sevier County has a humid temperate climate (see Climate). The valley part of the county has long warm summers, short mild winters, and relatively high rainfall. The mountain areas have cool summers and lower average temperatures throughout the year. Precipitation is heavier and includes considerably more snow than in the valley area. The high rainfall throughout the county favors rather intense leaching of soluble materials and colloidal materials downward in the soil. The soil is frozen for only short periods, especially in the valley area, and to only shallow depths. The amount of weathering and translocation of materials is therefore further intensified.

The climate of the valley section of the county is relatively uniform. Small local differences in climate doubtless exist because of degree of slope and aspect. Perhaps these local differences in climate may be responsible for some of the local variations in soil types. However, the differences in climate over the entire valley section are not great enough to account for broad differences that exist among the soils. On the other hand, it appears that the climate accounts not only for some of the outstanding properties that many of the soils have in common but also for some of the broad differences that exist between mountain and valley soils.

Trees, shrubs, grasses, and other herbaceous plants, micro-organisms, earthworms, and various other forms of plant and animal life live on and in the soil and are active agencies in the soil-forming processes. The nature of the changes that these various biological forces bring about depends, among other things, on the kinds of life and the life processes peculiar to each. The kinds of plants and animals that live on and in the soil are determined by environmental factors, including climate, parent material, relief, age of the soil, and the associated organisms. The influence of climate is most apparent,

though not always most important, in determining the kinds of macroflora that grow on the well-drained well-developed soils. In this way climate exerts a powerful indirect influence on the morphology of soils. Climate and vegetation acting together are the active factors of soil genesis.

A general yellow pine-hardwood forest was on most of the well-drained well-developed soils, although locally there may have been almost pure stands of hardwoods (see section on forests). A spruce-fir forest predominates at high elevations—above about 4,500 feet. Also a few areas at these higher elevations have a natural cover of grasses, alders, or rhododendron. There were probably differences in the density of stands, the relative proportion of species, and the associated ground cover. However, taking the area as a whole, the forests, except at high elevations appear to have been relatively uniform, and it is doubtful if any of the marked differences in properties among the well-drained, well-developed soils are the direct result of differences in vegetative cover.

Most of the trees that grow in this area are moderately deep to deep feeders on plant nutrients in the soil. They are chiefly deciduous trees and shed their leaves annually. The leaves range considerably among species in content of plant nutrients. Generally deciduous trees return somewhat larger amounts of bases and phosphorus to the soil in leaves than coniferous trees. In this way, essential plant nutrients are returned to the upper part of the soil from the lower part and retard the depleting action of percolating waters.

Much organic material is added to the soil in the form of dead leaves, roots, and entire plants. Most of it is added to the A horizon, where it is acted upon by micro-organisms, earthworms, and other forms of life and by direct chemical reactions. In Sevier County, the rate of decomposition of such materials is rather rapid because of favorable temperature and moisture conditions, favorable character of the organic material itself, and presumably favorable micropopulation of the soil. Organic material does not accumulate on well-drained sites in the valley part of the county to the extent that it does in cooler areas of the mountains.

Little is known of the micro-organisms, earthworms, and other population of the soils of the county. The population in the soil is important in its genesis, but the effects have not been adequately determined.

The well-drained, well-developed soils have been formed under relatively similar conditions of climate and vegetation. It is on these soils that climate and vegetation have had a maximum influence, and modification by relief and age are minimum. As a result the soils developed from various kinds of parent materials have many properties that are common to all.

In the virgin condition, all of the well-drained, well-developed soils have a surface layer of organic debris in varying stages of decomposition. All have dark-colored A_1 horizons. The A_2 horizons are lighter in color than either the A_1 or the B. The B horizon is generally uniformly colored yellow, brown, or red and is heavier textured than the A_1 or A_2. The C horizon is variable in color and texture among the different soils, but it is usually light red or yellow mottled with gray or brown.

Analysis of samples of several comparable soils from Jefferson County, Tenn., may be expected to apply to these soils (*6*). The silica content decreased and the alumina and iron contents increased with depth. The content of organic matter was moderate in the A_1 horizon, less in the A_2, and very low in the B and C. The soils were low in bases and phosphorus within the solums. In general the loss from ignition was low, indicating a low content of very tightly held water. The soils were medium, strongly, or very strongly acid throughout the solums. Generally the amount of silt decreased and the amounts of clay and colloid increased with depth from the A_1 horizon through the C horizon. The colloid content of the B horizon was much higher than that of the A_2 horizon. Clay minerals in the profile include all three major types, but the kaolinite group is thought to be the most important.

The characteristics mentioned above are common to all well-developed well-drained soils that have been subjected to similar conditions of climate and vegetation. All soils that exhibit them are called zonal soils. Zonal soils are one of the classes of the highest category (order) in soil classification. They are defined as those great groups of soils having well-developed soil characteristics that reflect the influence of the active factors of soil genesis—climate and living organisms (*13*). In areas in Sevier County where the parent materials have been in place a long time and have not been subject to extreme conditions of relief or of the parent material itself, the soils that have developed have the characteristics of zonal soils.

Azonal soils are another class of the highest category of soil classification. They are defined as a group of soils without well-developed soil characteristics either owing to their youth or to conditions of parent material or relief that prevent the development of zonal soil-profile characteristics (*13*). The relief of azonal soils ranges from nearly level to very steep.

In areas where the parent material has been in place only a short time or is constantly being augmented by new material, as, for example, recently-transported (alluvial) materials, the soils have poorly defined or no genetic horizons. These soils are young and have few or none of the properties of zonal soils and are therefore called azonal soils.

Other azonal soils occur on some steep areas of the uplands where the amount of water that percolates through the soil is relatively small. Here the large amount of water that runs off the soil and the rapid rate of runoff contribute to relatively rapid geologic erosion, and the soils are young. The materials are constantly renewed or mixed, and the changes brought about by vegetation and climate may be so slight that the soils are essentially A–C soils. These soils are characterized by A_1 horizons that are moderately dark to very dark and apparently have a moderately to fairly high content of organic matter; by the absence of a zone of illuviation, or B horizon; and by parent material that is usually lighter in color than the A_1 horizon and that may be similar to, lighter than, or heavier than the A_1 horizon in texture. They may be referred to as A–C soils because of the absence of a B horizon.

On some nearly level areas where both internal and external drainage are restricted or where geologic erosion is very slow, soils whose

materials have been in place a long time have certain well-developed profile characteristics that zonal soils do not have. Such soils are associated geographically with the zonal soils and are called intrazonal soils. They are defined as soils with more or less well-developed soil characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effects of climate and vegetation (*13*). The characteristics of such soils in this area are generally the result of level relief but are influenced greatly by the character of the parent material and the kinds of vegetation that grow in such environments.

Soils of each of the three broad classes—zonal, azonal, and intrazonal—may be derived from similar kinds of parent materials. Within any one of these classes in this area, major differences among soils appear to be closely related to differences in the kinds of parent materials. The chemical and physical nature of the parent material modifies the rate and direction of chemical changes that result from climate and vegetation. The kind of parent material also exerts a pronounced influence on the kinds of vegetation that grow on the soil. The thickness of soils developed from residual materials over the rock from which they were derived is partially the result of the resistance of the rock to weathering, the volume of residue after weathering, and the rate of geologic erosion.

Rocks have contributed to differences among soils also through their effects on relief. The rocks of most of Sevier County are of very old formations that are folded and faulted (*17*). The geologic weathering and erosion of those formations probably largely accounts for the present relief. The higher lands are capped by the more resistant rocks, whereas the valleys are underlain by the less resistant rocks (*3*).

Streams in the ridges and mountains generally have steeper gradients than those in the valleys. As a result of faster stream cutting, most of the soils of the ridges and mountains have steeper slopes than those of the valleys. In this way the character of the rocks has contributed directly to the properties of some soils.

The internal drainage of soils of nearly level relief in the limestone areas is exceptionally good because of good subterranean drainage through caverns and crevices in the sharply dipping rocks. As a result the usual effects of gentle relief on drainage are counteracted and the parent rock becomes the dominant factor causing local differences among the well-developed, well-drained soils derived from residual materials.

CLASSIFICATION OF SOILS

The classification of the soils of Sevier County is given in table 27. The soils are listed according to soil order. The great soil groups under each order are shown, and the various soil series are listed under each soil group. The source and kinds of parent materials and the relief and age of each soil series are shown. Study of this table will enable the reader to understand more easily the genetic relationships of the soils of the area.

RED-YELLOW PODZOLIC SOILS

RED MEMBERS

The red members of the Red-Yellow Podzolic great soil group are a subgroup of zonal soils having thin organic and organic-mineral layers over a yellowish-brown leached layer that rests upon an illuvial red horizon; they developed under a deciduous or mixed forest in a warm-temperate moist climate. The soil-forming processes involved in their development are laterization and podzolization. The red members have these common characteristics, and apparently all have developed under relatively similar conditions of climate and vegetation. All are well drained. Although they range somewhat in degree of maturity, all are sufficiently old to have at least a moderately well-developed Red-Yellow Podzolic soil profile. Relief ranges from level to steep, but differences among the soil profiles are probably not due primarily to differences in slope gradient. Many of the differences among soil profiles can be correlated with the marked differences among parent materials.

Decatur series

The Decatur soils occur on rolling to steep areas of the uplands. They are the darkest red and have the deepest solum of the soils in the valley. The high-grade limestone and dolomite from which they have developed are apparently a little lower in insoluble impurities, especially silica, than those underlying the Dewey and Dunmore soils. Rock outcrops are few except in severely eroded places. The Decatur soils have the darkest A horizon of any well-developed soil in the valley, and this indicates a higher content of organic matter. Since they are the most productive of all the well-developed soils in the valley, it is reasonable to assume that they supported the most luxuriant vegetation. Such vegetation would produce a darker A horizon, inhibit erosion of the surface soil, and develop a friable consistence in the surface soil and subsoil. A description of a typical profile is as follows:

A_2 0 to 10 inches, dark-brown friable silty clay loam with a moderate medium crumb structure.

B_1 10 to 18 inches, brown to slightly reddish-brown friable silty clay loam with a weak fine to medium blocky structure.

B_2 18 to 42 inches, reddish-brown or dark-red friable to firm silty clay with a strong medium to coarse blocky structure; structure faces glossy and darker in color than the crushed material; many dark-gray to black concretions usually less than one-fourth inch in diameter.

B_3 42 to 70 inches, reddish-brown firm to very firm silty clay; structural particles larger and less distinct than in layer above; few weathered soft powdery chert fragments.

C 70 to 90 inches +, reddish-brown to yellowish-brown, plastic silty clay or clay lightly splotched and streaked with red, brown, yellow, and gray; bedrock at depths of 7 to 20 feet in most places.

Dewey series

The Dewey soils have developed from high-grade limestone or dolomitic limestone that is apparently somewhat higher in insoluble impurities, particularly silica, than the rocks underlying the Decatur

TABLE 27.—*Classification of the soil series of Sevier County, Tenn., into higher categories; and important factors that have contributed to differences in soil morphology* [1]

ZONAL SOILS

Great soil group and series	Relief	Parent material	Time [2]
Red-Yellow Podzolic soils:			
Red members:			
		Residuum from—	
Decatur	Undulating to steep	High-grade limestone and high-grade dolomitic limestone.	Long.
Dewey	Undulating to hilly	High-grade dolomitic limestone	Do.
Dunmore	Rolling to steep	Dolomitic limestone	Do.
Fullerton	Undulating to steep	Cherty dolomitic limestone	Do.
Farragut	Undulating to hilly	Limestone containing some thin shale layers	Do.
		Old alluvium from—	
Cumberland	do	Chiefly limestone	Do.
Waynesboro	do	Mainly sandstone, quartzite, slate, and shale	Do.
Nolichucky	do	Sandstone, quartzite, slate, and shale and a small admixture of materials from granite, gneiss, and limestone in most places.	Do.
		Old colluvium from—	
Allen	Rolling to hilly	Sandstone, quartzite, and slate; some limestone	Do.
Yellow members:		Residuum from—	
Sequoia	Undulating to rolling	Interbedded shale and limestone or calcareous shale.	Do.
		Old alluvium from—	
Holston	Undulating to hilly	Quartzite, sandstone, slate, and shale	Long to very long.
Sequatchie	Undulating	Quartzite, sandstone, slate, and shale, and some limestone.	Medium to long.
		Old colluvium from—	
Pace	Undulating to rolling	Cherty limestone	Long to very long.
Jefferson	Undulating to hilly	Sandstone, quartzite, shale, and slate	Medium to long.
Gray-Brown Podzolic soils:		Old alluvium from—	
State	Undulating	Granite and gneiss	Do.
		Old colluvium and local alluvium from—	
Hayter	Undulating to hilly	Chiefly slate and fine-grained quartzite but some limestone or other calcareous source.	Do.

INTRAZONAL SOILS			
Planosols:		Old alluvium from—	
Monongahela	Nearly level to undulating	Quartzite, sandstone, slate, and shale	Very long.
Tyler	Nearly level	Sandstone and shale	Do.
Roanoke	do	Granite and gneiss	Do.
AZONAL SOILS			
Lithosols:		Residuum from—	
Armuchee	Hilly to steep	Shale and limestone, interbedded	Short to medium.
Dandridge	Rolling to steep	Calcareous shale	Do.
Lehew	Steep	Purplish acid shale and sandstone	Do.
Litz	Rolling to hilly	Acid shale with thin lenses of limestone	Do.
Muskingum	Steep	Acid sandstone and shale	Do.
Ramsey	Hilly to very steep	Quartzite, sandstone, and conglomerate or slate and fine-grained quartzite.	Do.
Alluvial soils:		Alluvium from—	
Buncombe	Nearly level	Granite and gneiss	Very short.
Staser	do	Sandstone, shale, slate, and quartzite; some limestone.	Do.
Hamblen	do	do	Do.
Prader	do	do	Do.
Congaree	do	Granite and gneiss	Do.
Lindside	do	Limestone	Do.
Emory	Undulating to rolling	Chiefly high-grade limestone	Short to medium.
Greendale	do	Cherty limestone	Do.
Barbourville	do	Sandstone, quartzite, shale, and slate	Do.
Cotaco	do	do	Do.
Whitesburg	Undulating	Calcareous shale	Do.
Hollywood	Nearly level to undulating	Highly calcareous shale	Do.

[1] Inasmuch as climate and vegetation are relatively uniform, except in a few places, they cannot account for the local differences among the soils.

[2] The relative length of time that the soil material appears to have been in place, considering the degree of profile development as evidence.

soils. They are generally somewhat thicker over bedrock, have slightly stronger relief in many places, and are lighter red throughout the profile than the Decatur; they are also less fertile, and the vegetation, especially the ground cover, is slightly less dense.

These soils are moderately subject to erosion when cultivated; many have a truncated profile as a result of erosion. They are more erosive than the Fullerton and less so than the Decatur and Dunmore soils on similar slopes. They are generally less well supplied with bases than the Decatur and better supplied than the Fullerton soils. It is probable that the major differences between the two series are directly or indirectly the result of differences between the parent materials. Dewey soils are medium to strongly acid.

The following is a typical profile of Dewey silt loam:

A_1 0 to 2 inches, dark-brown or dark grayish-brown mellow very friable silt loam that has a weak fine to medium crumb structure; high in organic matter.

A_2 2 to 12 inches, grayish-brown to light-brown friable silt loam; weak medium crumb structure.

B_1 12 to 20 inches, light-red to yellowish-red friable heavy silty clay loam; medium coarse granular to fine blocky structure; many small round brownish-black concretions.

B_2 20 to 44 inches, red to light-red friable to firm (plastic when wet) silty clay; moderate medium blocky structure; a few small concretions and small chert fragments.

B_3 44 to 60 inches, red friable to firm silty clay or clay; structure particles larger but somewhat less distinct than in layer above (plastic when wet); chert fragments more common and less completely weathered than in layer above.

C 60 to 100 inches, red or yellowish-red friable to firm (plastic when wet) plastic silty clay or clay streaked and splotched with yellow, red, and some gray; considerably more chert fragments than in other horizons; bedrock at depths of 15 to 20 feet in most places.

Dunmore series

The Dunmore soils have formed from residual material derived from the weathering of dolomitic limestone. In some places the limestone contains thin lenses of shaly material. The parent material is apparently relatively low in insoluble impurities. The soils have developed on rolling to steep relief, chiefly under a deciduous forest vegetation. It is reasonable to assume that the soils supported a less luxuriant vegetation than the Dewey and Decatur soils, and this partly accounts for the lighter color of the A horizon. It is probable that the major differences between the Decatur and Dunmore series are directly or indirectly the result of differences between the parent materials.

A description of a representative profile is as follows:

A_1 0 to 2 inches, dark grayish-brown friable silt loam that is apparently high in organic matter; a weak medium crumb structure.

A_2 2 to 10 inches, grayish-brown to brownish-gray friable heavy silt loam with a weak medium crumb structure.

B_1 10 to 14 inches, yellowish-brown friable silty clay loam with a weak medium blocky structure.

B_2 14 to 30 inches, yellowish-brown to yellowish-red firm (plastic when wet) to very plastic silty clay to clay with a strong medium blocky structure; structure faces glossy and reddish in color.

B_3 30 to 38 inches, yellowish-red to reddish-yellow firm (plastic when wet) silty clay or clay, streaked and splotched with yellow.

C 38 to 60 inches +, reddish-yellow to brownish-yellow friable (plastic when wet) silty clay or clay highly splotched with gray and yellow; contains a few small shale fragments and thin layers of shale in various stages of decomposition; the uneven rock floor is at a depth of about 5 feet.

Fullerton series

Fullerton soils have developed from residuum derived chiefly from dolomites or dolomitic limestone high in insoluble materials, chiefly silica. The silica is largely in the form of chert, but locally calcareous sandstone beds have contributed to the parent materials. The parent materials of these soils are similar to those of the Dewey, Dunmore, and Decatur soils but differ in containing a greater amount of insoluble materials. The Fullerton soils commonly occupy higher positions, are deeper, less fertile, less erosive, and more cherty, and have steeper slopes than those soils. Because of their lower susceptibility to erosion and greater volume of residue from rock weathering, they have a thicker mantle of unconsolidated rock material over bedrock than the Dunmore and Decatur soils. This protective mantle, together with the slower weathering of cherty dolomite than of high-grade or dolomitic limestone, may largely account for the higher position of the Fullerton soils on the landscape and their steeper slopes. These soils are medium to strongly acid throughout the profile.

Following is a description of a typical profile of Fullerton silt loam:

A_1 0 to 2 inches, dark-gray silt loam stained dark with organic matter.
A_2 2 to 10 inches, brownish-gray very friable silt loam.
A_3 10 to 14 inches, brownish-yellow to grayish-yellow friable heavy silt loam with a weak medium crumb structure.
B_1 14 to 22 inches, brownish-yellow or yellowish-brown friable silty clay loam with a weak fine to medium blocky structure.
B_2 22 to 40 inches, yellowish-red firm (plastic when wet) silty clay loam or silty clay with a moderate medium blocky structure; crushed material is reddish yellow.
C 40 to 60 inches +, reddish-yellow friable (plastic when wet) silty clay streaked and splotched with gray and brown; few chert fragments in the upper part of this layer but they become more numerous with greater depth; bedrock at a depth of 10 feet or more.

Farragut series

The Farragut soils have developed from the weathered materials of interbedded shale and limestone. Their parent materials differ from those of the Sequoia soils in having a higher proportion of limestone materials and from those of the Dewey and Decatur soils in containing considerable quantities of shale. These soils are shallower over bedrock than the Dewey and Decatur. They have developed on undulating to hilly relief under a forest cover consisting chiefly of oak and hickory. These fertile soils supported a luxuriant vegetation that probably accounts in part for the brown color of the surface soil. The differences between these and the Sequoia or the Decatur soils is apparently due to the differences in parent materials.

A representative profile of Farragut silty clay loam is as follows:

A_2 0 to 8 inches, light-brown or brown friable silty clay loam with a weak medium granular structure.
A_3 8 to 12 inches, light-brown to brown friable silty clay loam with a moderate coarse granular structure.
B_1 12 to 16 inches, brown to light reddish-brown friable silty clay loam with a moderate fine blocky structure.

B_2 16 to 30 inches, reddish-brown firm (plastic when wet) silty clay that has a strong medium to coarse blocky structure.

B_3 30 to 38 inches, reddish-brown or brownish-red firm (very plastic when wet) silty clay or clay; a coarse blocky structure less well developed than in above layer; brownish-black concretions less than one-fourth inch in diameter are common.

C 38 to 48 inches +, brownish-red plastic or very plastic silty clay splotched and streaked with yellow; many partially weathered yellow shale fragments and thin lenses; bedrock at a depth of about 5 feet.

In virgin areas the A_1 horizon is dark grayish-brown very friable silt loam high in organic matter. It is about 2 inches thick.

Cumberland series

Soils of the Cumberland series are well-developed red members of the Red-Yellow Podzolic group. They were formed from very old deposits of alluvium. This alluvium consists mainly of the residue weathered from limestone but in most places includes an admixture of material from sandstone, quartzite, shale, and slate. The relatively high fertility of these soils, together with favorable moisture conditions, appears to have encouraged a heavy forest growth. As a result there is a relatively high content of organic matter in the upper layer. The Cumberland soils resemble the Decatur soils in many properties but are generally deeper and more friable and have cobbles throughout the profile. They are medium to strongly acid throughout.

A representative profile is as follows:

A_1 0 to 2 inches, dark grayish-brown very friable loose silt loam stained dark with organic matter.

A_2 2 to 12 inches, dark-brown to brown friable heavy silt loam with a moderate medium crumb structure.

B_1 12 to 18 inches, light reddish-brown friable silty clay loam with a weak fine to medium blocky structure.

B_2 18 to 40 inches, reddish-brown to dark-red moderately friable to firm heavy silty clay loam or silty clay with a strong medium blocky structure; some cobbles and gravel ½ to 8 inches in diameter.

B_3 40 to 60 inches, yellowish-red to red friable heavy silty clay loam; structure less distinct than in layer above and cobbles more numerous.

C 60 to 96 inches, gravelly or cobbly clay loam or silty clay loam, mainly yellowish red or red but splotched and streaked with yellow and gray.

Waynesboro series

The soils of the Waynesboro series are well-developed red members of the Red-Yellow Podzolic group. They were derived from very old alluvial deposits that consisted of the disintegration products of sandstone, quartzite, slate, and shale but included some limestone and granite material in most places. These soils lack the heaviness of texture and the consistence of the B horizon common to the red members that developed from residuum weathered from limestone. The substratum is pervious to water and permits rather thorough leaching of the profile. The parent material of these soils is low in bases compared with the parent material of soils derived from limestone or from alluvium washed chiefly from limestone. This parent material permits somewhat more rapid development of a mature soil profile than that consisting of limestone residuum. The soil is undulating to hilly and strongly acid to medium acid throughout.

A representative profile is as follows:

A_1 0 to 1 inch, medium-gray to dark-gray very friable loam high in organic matter.

A_2 1 to 10 inches, grayish-brown to light-brown friable loam with a weak fine crumb structure.
B_1 10 to 18 inches, light-brown to light-red friable clay loam with a moderate fine blocky structure.
B_2 18 to 30 inches, light-red or reddish-brown to yellowish-red firm to friable clay loam with a moderate medium blocky structure; cobbles ½ to 8 inches in diameter are common.
B_3 30 to 40 inches, reddish-brown moderately friable clay loam; gravel and cobbles more common than in above layer.
C 40 to 60 inches +, yellowish-red to reddish-yellow moderately friable clay loam or sandy clay loam streaked and splotched with yellow, gray, and brown.

Nolichucky series

The Nolichucky soils have formed from old alluvium. This alluvium consists mainly of residue from sandstone, quartzite, slate, and shale but includes a small admixture of granite and limestone material in most places. The soils have developed on a rolling to hilly relief under a deciduous forest vegetation. Because of the moderately low fertility, they have produced poor forests and consequently have a low content of organic matter in the upper layer. The soils are highly leached and strongly acid. They differ from the Waynesboro soils in being more highly leached and lighter in color throughout the profile.

A representative profile is as follows:

A_1 0 to 1 inch, medium-gray loose fine sandy loam stained with organic matter.
A_2 1 to 8 inches, yellowish-gray very friable loam.
B_1 8 to 18 inches, brownish-yellow or light yellowish-brown friable heavy loam or light clay loam.
B_2 18 to 30 inches, reddish-yellow to yellowish-red friable clay loam with a moderate medium blocky structure.
B_3 30 to 48 inches, yellowish-red firm clay loam to sandy clay with some brownish-yellow streaks.
C 48 inches+, reddish-yellow firm sandy clay loam or clay loam, profusely streaked and splotched with gray and yellow.

Allen series

The Allen soils have developed from colluvial and local alluvial parent materials. These materials were washed mainly from uplands underlain by sandstone, quartzite, conglomerate, and shale but show some limestone influence. Most of the Allen soils are some distance from the slopes from which the major part of their parent materials was washed. Apparently the mountain slopes are being eroded away and the colluvial benches are left some distance out in the valley. As a result the soils do not receive increments of colluvial material. Waters percolate freely in the parent material of these soils, and the supply of bases is sufficiently low to promote rapid development of a mature genetic profile. The Allen soils have rolling to hilly slopes and are medium to strongly acid in reaction.

In many places the yellowish Jefferson soils have developed on parent materials apparently similar to those of the Allen soils. The differences between the two soils can be accounted for at least in part by differences in parent material and age. In Sevier County practically all of the Allen soils are influenced to some extent by calcareous materials. Practically all are underlain at variable depths by limestone or calcareous shale bedrock or are influenced by waters that flow over or through limestone materials. In contrast, practically all of the Jefferson soils are underlain by acid rocks and percolating waters flow only through noncalcareous materials.

A representative profile of Allen stony fine sandy loam is as follows:

A_1 0 to 1 inch, dark-gray loose fine sandy loam stained dark with organic matter.
A_2 1 to 9 inches, grayish-brown to brown friable stony fine sandy loam.
B_1 9 to 18 inches, yellowish-brown to yellowish-red friable light stony sandy clay loam with a weak medium blocky structure.
B_2 18 to 30 inches, red to brownish-red moderately friable stony sandy clay loam or sandy clay with a moderate medium blocky structure.
B_3 30 to 40 inches, brownish-red to yellowish-red friable stony sandy clay loam; structure less distinct than in the layer above.
C 40 to 60 inches+, light-red to yellowish-red friable sandy clay loam streaked and splotched with yellow and gray; numerous partially weathered gray and red sandstone and quartzite fragments.

YELLOW MEMBERS

The yellow members of the Red-Yellow Podzolic great soil group are a subgroup of zonal soils having thin organic and organic-mineral layers over a grayish-yellow leached layer that rests on a yellow horizon. The yellow members in Sevier County have undulating to steep relief. They were developed under a forest vegetation that consisted mainly of deciduous trees and a considerable admixture of pines in some places. There may have been more pines and a somewhat less luxuriant and different kind of undergrowth on the yellow members of the Red-Yellow Podzolic soils than on the red members. Climatic conditions on the soils of the two groups were apparently quite similar. The parent materials of the yellow members were derived from interbedded limestone and shale and from colluvial and terrace materials.

The causes of the development of the pronounced color differences between the yellow members and the red members are not known. However, the yellow members in the county are generally associated with parent materials either lower in bases or less well drained internally than parent materials of the red members.

Sequoia series

The Sequoia soils have developed from residual material derived from the weathering of interbedded shale and limestone or from calcareous shale. The parent material contains less limestone material than that of the Farragut soils. The different parent material and the slower internal drainage apparently account for the differences between the Sequoia and Farragut soils. The parent material is similar to that of the Armuchee soils. The Sequoia soils, however, have a mild relief and A, B, C profiles, whereas the Armuchee have hilly to steep relief and A–C profiles. The deeper and better developed profile of the Sequoia soils is probably the result of their milder relief and consequent slower geologic erosion.

A representative profile of Sequoia silt loam is as follows:

A_1 0 to 1 inch, medium-gray or brownish-gray very friable silt loam high in organic matter.
A_2 1 to 8 inches, grayish-yellow friable silt loam with a weak fine granular structure.
B_1 8 to 12 inches, yellowish-brown friable silty clay loam with a moderate coarse granular structure.
B_2 12 to 26 inches, yellowish-red to reddish-yellow very firm (plastic to very plastic when wet; hard when dry) silty clay that has a moderate medium blocky structure; many small concretions and partially weathered shale fragments.
C 26 to 36 inches, reddish-yellow to brownish-yellow very plastic silty clay splotched and streaked with yellow and gray; yellow and olive-green shale fragments are common in this layer and become more numerous near the partially weathered shale bedrock.

Holston series

The Holston soils have developed from old stream alluvium originating chiefly from quartzite, sandstone, slate, and shale. They have undulating and hilly relief, good external drainage, and adequate but slightly restricted internal drainage. They appear to be very old soils and in some places they approach the Planosols in characteristics.

Like the other yellow members of the Red-Yellow Podzolic soils described, the Holston soils have developed from materials that are low in bases—a condition that in all probability promotes rapid soil maturity. Slightly restricted internal drainage of these soils may have been a contributing cause of the yellow color that contrasts to the reddish color of the well-drained Nolichucky soils, which developed from apparently similar materials. Holston soils are strongly to very strongly acid throughout the profile.

A representative profile of Holston loam in a virgin area is as follows:

A_1 0 to 1 inch, loose loam made dark gray by organic matter.
A_2 1 to 8 inches, gray very friable loam.
A_3 8 to 12 inches, yellowish-gray friable loam.
B_2 12 to 32 inches, yellow or slightly brownish-yellow firm to friable clay loam faintly splotched with gray in the lower part; weak fine to medium blocky structure.
C 32 to 48 inches +, yellow moderately compact sandy clay loam to sandy clay highly mottled with gray and brown.

Sequatchie series

The soils of the Sequatchie series are on low stream terraces or second bottoms along the larger creeks and rivers. They have developed from parent materials similar to those of the generally closely associated Staser series. They have nearly level to gently sloping relief. These soils were developed under a hardwood forest and under climatic conditions similar to those of the other zonal soils of the valley area. However, some of the materials from which they were derived were so recently deposited that only weak profile development is apparent. The differences between these soils and the Holston are probably largely due to differences in age.

A representative profile of Sequatchie fine sandy loam follows:

A_1 0 to 2 inches, dark grayish-brown loose fine sandy loam containing a relatively large amount of organic matter.
A_2 2 to 12 inches, grayish-brown or light-brown very friable fine sandy loam.
B_2 12 to 30 inches, yellowish-brown to brownish-yellow friable light clay loam; weak medium blocky structure.
C 30 to 42 inches +, brownish-yellow very friable sandy loam splotched with gray, yellow, and brown.

Pace series

The Pace soils were derived from old local alluvial-colluvial accumulations deposited at the foot of slopes occupied by soils derived from limestone. They are closely related to the Greendale soils as to position and character of parent material. The Pace soils, however, have well-defined A, B, and C horizons, whereas the Greendale have A–C profiles. In this county the Pace soils have developed from materials transported chiefly from Dunmore and Fullerton soils. They are undulating to rolling and medium to strongly acid in reaction. The soils are moderately well drained to well drained. Some of the moderately well drained profiles generally included with this series have a fairly well developed siltpan and would probably be more properly classified as Planosols.

A representative profile of Pace silt loam is as follows:

A_1 0 to 1 inch, medium-gray mellow very friable silt loam moderately high in organic matter.
A_2 1 to 10 inches, brownish-gray very friable silt loam.
B_1 10 to 16 inches, grayish-yellow to brownish-yellow friable heavy silt loam with a weak fine crumb structure.
B_2 16 to 30 inches, brownish-yellow friable silty clay loam with a weak fine blocky or coarse crumb structure.
C 30 to 48 inches +, pale-yellow to light yellowish-brown firm to compact silty clay loam splotched with gray.

Jefferson series

The soils of the Jefferson series are on slopes and benches at the base of mountains. Their parent materials are local alluvium and colluvium washed chiefly from the Ramsey, Muskingum, and Lehew soils on the adjoining uplands. The Jefferson soils have undulating to hilly relief and are well drained. In most places they have developed under mixed forests of hardwoods and pines. The climate was essentially that of the other zonal soils of the valley area. Some Jefferson soils receive frequent increments of soil material. These are young soils with little profile development and would be properly classified as Alluvial soils. The materials of Jefferson soils, however, are low in bases and easily eluviated; and in most places, soils with yellow profiles of the Red-Yellow Podzolic group have developed.

A representative profile of Jefferson stony fine sandy loam follows:

A_1 0 to 1 inch, medium-gray loose fine sandy loam stained with organic matter.
A_2 1 to 8 inches, grayish-yellow very friable stony fine sandy loam.
B_2 8 to 24 inches, grayish-yellow to brownish-yellow friable stony sandy clay loam.
C 24 to 48 inches +, brownish-yellow friable stony sandy clay loam mottled with gray, red, and brown.

GRAY-BROWN PODZOLIC SOILS

Gray-Brown Podzolic soils are a zonal group of soils having a comparatively thin organic covering and organic-mineral layers over a grayish-brown leached A horizon that rests upon an illuvial B horizon. The soils have developed under deciduous forest in a temperate moist climate. They have a surface covering of leaf litter, usually from deciduous trees; a dark thin mild (only slightly or moderately acid) humus, somewhat mixed with mineral soil; a grayish-brown crumb-structured loamy A_1 horizon over a light grayish-brown or grayish-yellow A_2 horizon; and a moderately heavy nut-structured yellowish-brown, brown, brownish-yellow, or reddish-brown B horizon, becoming lighter colored with depth. The total depth of the solum varies considerably but seldom exceeds 4 feet. Podzolization is the main process in the development of these soils (*13*).

State series

The soil of the State series is similar to the Hayter soils in many morphological characteristics and has developed under similar climate and vegetation. It differs, however, in being derived from a more general type of alluvium and in being on low terraces rather than on colluvial areas. The materials from which the State soil developed have washed chiefly from uplands underlain by granite and gneiss. In most places, however, they have a small admixture from quartzite, shale, sandstone, and conglomerate. The State soil is medium acid in reaction.

A representative profile is as follows:

A_1 0 to 3 inches, dark grayish-brown loose loam stained dark with organic matter.
A_2 3 to 12 inches, grayish-brown to brown very friable silt loam.
B_2 12 to 28 inches, yellowish-brown to brown friable clay loam with a weak medium blocky structure.
B_3 28 to 40 inches, brownish-yellow light clay loam.
C 40 to 60 inches, brownish-yellow to grayish-yellow very friable sandy loam; material is stratified and consists of variable coarse-textured materials.

Hayter series

Soils of the Hayter series have developed from old colluvial and local alluvial accumulations. These accumulations consist of materials that originated chiefly from slate and fine-grained quartzite but to some extent from limestone or other calcareous source. Most of the colluvial materials have been in place long enough for the development of the normal Gray-Brown Podzolic soil profile of the area. Hayter soils differ from the associated Jefferson soils in having a much browner color and apparently a much higher content of decomposed organic matter. They differ from the Allen soils in having a darker surface layer and a brown rather than a red subsoil. These soils are medium acid in reaction.

A representative profile is as follows:

A_1 0 to 3 inches, dark grayish-brown loose loam stained dark with organic matter.
A_2 3 to 12 inches, grayish-brown to brown friable silt loam with a weak fine crumb structure.
B_1 12 to 18 inches, yellowish-red friable light silty clay loam that has a weak fine blocky structure.
B_2 18 to 30 inches, light reddish-brown friable silty clay loam with a moderate medium blocky structure.
B_3 30 to 36 inches, yellowish-red to yellowish-brown friable clay loam.
C 36 to 60 inches, yellowish-brown to yellowish-red friable clay loam or sandy clay loam splotched with yellow and gray; numerous quartzite pebbles and shale fragments.

PLANOSOLS

Planosols are an intrazonal group of soils with eluviated surface horizons underlain by B horizons more strongly illuviated, cemented, or compacted than those of associated normal soils. They were developed upon a nearly level upland surface under grass or forest vegetation in a humid or subhumid climate (*13*).

In Sevier County the Monongahela, Tyler, and Roanoke series have been designated as Planosols. They have nearly level or slightly depressional relief and are poorly or imperfectly drained. The B horizons of the Planosols are more dense or compacted than the B horizons of most zonal soils but the degree of development varies.

The Planosols developed under climatic conditions similar to those under which the zonal soils developed, but they are more moist and less well aerated. There were probably some differences between the kinds of vegetation on the Planosols and Red-Yellow Podzolic soils, although deciduous forest was on both. From the standpoint of profile development, the Planosols appear to be older than the Red-Yellow Podzolic soils. The causes of development of older soils, however, are not known. The relief of the Planosols is such that geological erosion would be slow, but that factor alone is not the

349399—56——13

cause of their formation. The soil material itself is not older in years than that of associated zonal soils of similar relief. It is possible that relatively dense layers in the parent material and underlying rock strata caused slow internal drainage. This, combined with slow external drainage and unusual siltiness of the parent material, resulted in abnormal concentration or cementation of the material in or below the illuvial horizon.

Monongahela series

The Monongahela soil is closely associated with the Holston soils. Like those soils, it has developed from old stream alluvium washed from materials weathered mainly from sandstone and shale. The drainage conditions under which it developed were somewhat inferior, however, probably because of generally milder slope and less permeable underlying material. The Monongahela soil is imperfectly to moderately well drained; a compact layer has formed at a depth of about 2 feet.

A representative profile is as follows:

A_1 0 to 1 inch, medium-gray very friable silt loam moderately high in organic matter.
A_2 1 to 8 inches, yellowish-gray friable silt loam.
A_3 8 to 12 inches, grayish-yellow friable silt loam to heavy silt loam that has a weak crumb structure.
B_2 12 to 22 inches, pale-yellow friable silty clay loam that has a weak fine blocky structure.
Pan 22 to 36 inches, pale-yellow compact silty clay loam to silty clay, splotched and mottled with gray and yellowish brown.
C 36 to 48 inches +, moderately friable silty clay loam mottled with gray, yellow, and reddish brown.

Tyler series

The Tyler soil has parent materials similar to those of the Monongahela and Holston soils but is more poorly drained. It has developed on nearly level or slightly depressional stream terraces from old alluvium consisting chiefly of materials weathered from shale and sandstone. Development was under conditions of slow internal and external drainage. Differences between the Tyler and the Holston and Monongahela soils are due chiefly to differences in drainage. However, the Tyler soil probably developed from somewhat siltier materials that were underlain by slowly permeable material.

A representative profile of Tyler silt loam is as follows:

A_1 0 to 1 inch, medium-gray to dark-gray very friable silt loam.
A_2 1 to 10 inches, gray to yellowish-gray friable floury silt loam.
B_2 10 to 18 inches, pale-yellow friable heavy silt loam to silty clay loam, splotched with gray; weak fine to medium blocky structure.
Pan 18 to 40 inches, gray compact silty clay to silty clay loam, splotched with yellow; breaks into irregular fragments with very indistinct cleavage lines.
C 40 to 48 inches +, gray moderately friable silty clay loam.

Roanoke series

The soil of the Roanoke series is on level or slightly depressed areas of stream terraces. The old alluvium from which it has formed has washed largely from uplands underlain by granite and gneiss but includes a small admixture of a wide variety of materials. The Roanoke soil is poorly drained both internally and externally because

of level relief, the silty soil material, and the imperviousness of the underlying rocks. The soil is medium to strongly acid in reaction.

A representative profile is as follows:

A_1 0 to 1 inch, medium-gray loose silt loam splotched with light gray.
A_2 1 to 8 inches, light-gray friable silt loam with a weak medium crumb structure.
B_1 8 to 14 inches, yellowish-gray friable heavy silt loam splotched with light gray.
B_2 14 to 22 inches, firm (plastic when wet) silty clay loam, mottled gray and yellow; moderate medium blocky structure.
Claypan 22 to 36 inches, compact clay highly mottled with gray, bluish gray, yellow, rust brown, and black.
C 36 to 48 inches, slightly compact clay or clay loam highly mottled with gray and yellow; less compact and more permeable than the B_2 horizon.

LITHOSOLS

Lithosols are an azonal group of soils having no clearly expressed soil morphology and consisting of a freshly and imperfectly weathered mass of rock fragments. They are largely confined to steeply sloping land (*13*). These soils occupy positions where geologic erosion is relatively rapid and generally consist of materials that are easily eroded. As a result, material is removed from the surface or is extensively mixed, and soil-forming processes therefore have not acted on the soil material long enough to produce well-defined genetic soil characteristics. As mapped, these soils may include small areas of zonal soils.

Armuchee series

These soils have developed on hilly to steep relief from the weathered products of interbedded shale and limestone similar to those underlying the Sequoia soils. Normal erosion has almost kept pace with weathering processes, however, and the well-defined A, B, and C profile of the Sequoia soil has not developed. An incipient horizon differentiation occurs in virgin areas, but cultivation and erosion have tended to obliterate it in cropland. The higher percentage of limestone in the parent rock of these soils apparently accounts for their differences from the Litz soils.

A representative profile is as follows:

A_1 0 to 1 inch, dark-gray very friable silt loam high in organic matter.
A_2 1 to 6 inches, brownish-gray friable silt loam with a weak medium crumb structure.
C 6 to 20 inches, reddish-yellow to yellowish-red firm (plastic when wet) silty clay splotched with red, yellow, gray, and brown; fragments of shale are numerous in this layer.
D 20 inches +, interbedded shale and limestone; the limestone has dissolved out of the upper 1 to 2 feet in most places.

Dandridge series

The soils of the Dandridge series have formed from the residuum of calcareous shale. These soils are predominantly hilly to very steep. On such areas natural erosion apparently has been almost rapid enough to keep pace with soil development. Consequently, the soils are shallow, contain numerous shale fragments, and have very weakly developed profiles. These soils are neutral to slightly acid.

A representative profile is as follows:

A_1 0 to 1 inch, brownish-gray very friable silt loam stained dark with organic matter.

A_2 1 to 6 inches, yellowish-gray friable shaly silt loam.
C 6 to 24 inches, brownish-yellow to yellowish-gray firm (plastic when wet) shaly silty clay loam; contains a large amount of soft partially disintegrated shale fragments; in the lower part becomes lighter in color and is mottled with yellow and gray.
D 24 inches +, calcareous shale bedrock.

Lehew series

The Lehew soil consists of materials weathered from interbedded sandstone and shale. It is conspicuous because of the purple color of the parent rock as well as of the parent material. The soil material ranges from about 10 to 20 inches in depth over bedrock. The soil is generally strongly to very strongly acid.

A representative profile is as follows:

A_1 0 to 1 inch, medium- to dark-gray loose very friable loam.
A_2 1 to 8 inches, purplish-gray very friable loam.
C 8 to 20 inches, purplish-brown to purplish-red friable loam or light clay loam mixed with partially weathered red, purple, and green sandstone and shale fragments.

Litz series

The Litz soils were developed chiefly from soft acid shale interbedded with widely spaced layers of limestone or calcareous shale. The parent rocks differ from those of the Armuchee in containing much less limestone. The Litz soils are shallower and lighter colored than the Armuchee soils. They typically range from about 4 to 14 inches in depth to shale.

In practically all areas no B horizon or subsoil has developed. The A horizon is friable silt loam about 4 inches thick. The upper 1 or 2 inches is stained dark with organic matter. Below this the horizon is grayish-yellow to yellowish-brown friable silt loam. The C horizon, or parent material, has the same color as the lower part of the A horizon and consists of friable silty clay loam that overlies grayish-yellow soft partly decomposed shale at depths of 14 inches or less. In some places the soil is shallower than described and the A horizon lies directly on the soft decomposed shale; in others the silt loam A horizon may be considerably thicker. In some areas a thin B horizon of moderate medium blocky silty clay loam has developed.

Shale fragments are generally very numerous throughout the soil mass. In woods and old pastures, the topmost 1 or 2 inches of the soil is stained dark with organic matter. The soil is prevailingly strongly to very strongly acid. The underlying shales are acid, although at one time some of them may have contained calcium carbonate. The widely spaced layers of limestone have disappeared through weathering, and only shale remains at the surface. In a few places there is a weakly developed profile somewhat similar to that of the Sequoia soils.

Muskingum series

The Muskingum soils, in this county mapped only in a soil complex, consist of the weathered materials of acid light-colored sandstone or sandy shale. The parent rock of these soils is slightly lighter colored and coarser textured than that of the Ramsey soils. As a result of differences in parent materials, the Ramsey soils probably contain a somewhat higher amount of available potassium than the Muskingum. The Muskingum soils are shallow; depth to bedrock averages about 20 inches but varies from about 10 inches to 3 feet.

A representative profile of Muskingum loam is as follows:

A_1 0 to 1 inch, medium-gray loose very friable loam, moderately high in organic matter.
A_2 1 to 10 inches, yellowish-gray very friable loam; some small sandstone fragments throughout the layer.
C 10 to 20 inches, brownish-yellow friable loam or light clay loam; contains numerous small sandstone fragments; some gray splotching in the lower layers.

Ramsey series

The soils of the Ramsey series were developed from material weathered from quartzite, sandstone, and conglomerate or slate and fine-grained quartzite. This parent material differs from that of the Muskingum mainly in having some arkosic constituents. Ramsey soils are on hilly to very steep mountain slopes. They were developed chiefly under hardwood forests, although locally there is considerable pine in the present forest cover.

The rocks under the Ramsey soils weather slowly, and the parent material is therefore formed slowly. It is removed by geological erosion almost as rapidly as formed; consequently, the soils are shallow and do not have well-developed profiles. These soils are relatively infertile. They support a very poor forest vegetation and as a result are low in organic matter. The soils are strongly acid.

A representative profile is as follows:

A_1 0 to 1 inch, medium-gray loose fine sandy loam stained with a moderate amount of organic matter.
A_2 1 to 9 inches, pale-brown or light yellowish-brown very friable stony fine sandy loam.
A_3 9 to 14 inches, brownish-yellow friable stony fine sandy loam.
C 14 to 36 inches, pale-yellow friable stony fine sandy loam with thin layers of soft partially weathered rock fragments.
D 36 inches +, quartzite bedrock.

ALLUVIAL SOILS

Alluvial soils are 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 (*13*). In Sevier County these soils are on first bottom lands along streams, in depressions, and on foot slopes. They have nearly level, gently sloping, and depressional relief and good to very slow internal drainage. The main properties Alluvial soils have in common result from the lack of a profile with genetically related horizons. The properties of the soils are closely related to the alluvial deposit.

Alluvial soils derived from similar parent material may differ in drainage and have some different properties as a result. Such soils have been differentiated mainly on the basis of properties associated with good, imperfect, or poor drainage.

Buncombe series

The Buncombe soil is on first bottoms and consists of recent alluvium washed largely from uplands underlain by granite and gneiss. The alluvium differs from that from which the Congaree soil was formed chiefly in having a larger proportion of the coarser separates. These coarser materials are deposited in swift-flowing water chiefly on the natural levees. The Buncombe soil is excessively drained. It con-

sists of a loose light-brown or light yellowish-brown loamy fine sand throughout. The surface 3- or 4-inch layer is stained dark with organic matter in many places.

Staser, Hamblen, and Prader series

The Staser, Hamblen, and Prader soils were derived from young general alluvium consisting of sandstone, shale, slate, and quartzite, and, in some places, limestone materials. These soils have formed on nearly level flood plains under deciduous forest. Their differences are closely associated with differences in drainage. All are young and do not have developed profiles. In general they are higher in bases, phosphorus, nitrogen, and organic matter than the associated soils of the uplands.

The Staser soils are well drained and consist of grayish-brown to light-brown or brown very friable or loose fine sandy loam or silt loam to depths of 14 to 20 inches. Underlying this layer is a yellowish-brown or grayish-brown friable heavy loam, fine sandy loam, or heavy silt loam that is splotched or mottled below depths of 24 to 30 inches. These soils are slightly acid in most places.

The Hamblen soils are imperfectly drained and are brownish-gray to grayish-brown friable silt loam or very friable fine sandy loam to a depth of about 14 inches. Below this depth they are highly mottled and generally heavier in texture. This difference in texture may be partially due to soil-forming processes, but it is more likely due to deposition.

The Prader soil is poorly drained and predominantly gray or gray mottled throughout. The surface soil is a silt loam, but the material is somewhat heavier below a depth of about 10 inches.

Congaree series

This is a young soil of the first bottoms formed largely from alluvium washed from granite and gneiss. This material has not been in place long enough to develop genetically related horizons. Differences between this and the Staser soils are due mainly to differences in the character of the alluvium.

The Congaree soil is well drained and free of any mottlings to a depth of about 24 inches or more. The surface layer to a depth of about 14 inches is a grayish-brown or brown very friable loam. The material below this is a brownish-yellow friable loam to a depth of about 30 inches. In most places, it is underlain by light-colored stratified coarse- and fine-textured materials.

Lindside series

This is a young imperfectly drained soil that has not developed genetically related horizons. It consists of alluvium washed from uplands underlain by limestone or dolomitic limestone. It occurs on flood plains and is susceptible to flooding. The soil consists of grayish-brown or light-brown mellow very friable silt loam to a depth of 12 to 18 inches. Below this it is highly mottled silt loam to silty clay loam. This difference in texture may be partly due to soil-forming processes, but in most places it is probably caused by accidents of deposition.

Emory series

The Emory soil is on foot slopes and benches at the base of upland slopes, chiefly along intermittent streams. It is a young soil developed

from local alluvium and colluvium washed largely from the closely associated Decatur and Dewey soils. Relief is undulating to rolling; both runoff and internal drainage are moderate. The Emory soil was formed under hardwood forests and in a climate similar to that under which the associated zonal soils were developed. However, the parent materials were so recently deposited that soil-forming processes have not had time to develop genetic profiles.

A representative profile is as follows:

1 0 to 3 inches, dark grayish-brown very friable silt loam.
2 3 to 20 inches, brown friable silt loam with a weak fine crumb structure.
3 20 to 40 inches, reddish-brown to yellowish-brown moderately friable silt loam to silty clay loam.
4 40 to 60 inches +, yellowish-brown moderately plastic silty clay loam.

Greendale series

Greendale soils, mapped in this county as a complex with Pace soils, are on footslopes, along intermittent drains, and on alluvial-colluvial fans. They have formed from materials washed from the adjacent slopes. In this county the material is mostly from Dunmore and Fullerton soils. It is more siliceous, more strongly acid, and less fertile than the material from which the Emory soils were formed. The Greendale soils are included with the Alluvial soils because most of them are young and have indistinct or weakly developed profiles.

A representative profile is as follows:

1 0 to 2 inches, dark-gray mellow silt loam stained dark with organic matter.
2 2 to 12 inches, brownish-gray friable silt loam.
3 12 to 30 inches, yellowish-brown to brownish-yellow friable silt loam or light silty clay loam.
4 30 inches +, brownish-yellow friable silty clay loam or clay loam splotched with gray.

Barbourville and Cotaco series

The Barbourville and Cotaco soils are on foot slopes, along intermittent drains, and on alluvial-colluvial fans. They consist of material washed or rolled from the adjacent slopes. This parent material, which has washed mainly from uplands underlain by quartzite, sandstone, slate, and acid shale, is similar to that from which the Jefferson and Allen or even Hayter soils have developed. The differences between the Barbourville and Cotaco soils and the Jefferson, Allen, and Hayter soils is due mainly to differences in age. These soils are included with the Alluvial soils because they are young and have weakly developed or indistinct profiles.

The Barbourville soils are well drained and predominantly brown throughout. In most places, however, a fairly distinct color profile has developed. In such places the surface layer to a depth of about 10 inches is brown or grayish brown and the subsoil is light brown or yellowish brown. These soils are generally free of mottling to depths of 30 to 40 inches but may be mottled at about 20 inches in places. They range from silt loam to fine sandy loam in texture.

The Cotaco soils are imperfectly drained and are grayish brown or brownish gray to a depth of about 12 to 18 inches. The material below this is highly mottled with gray, yellow, and rust brown. The texture ranges from silt loam to loam but is a silt loam in most places. The material from which these soils formed is generally much siltier than that of the Barbourville soils and is predominantly from slate and shale.

Whitesburg series

The Whitesburg soil consists of recent colluvial or local alluvial material washed chiefly from Dandridge soils on uplands underlain by calcareous shale. They differ from the Cotaco soils, which are derived from acid shale, in being less acid (slightly acid to neutral), darker colored, and somewhat heavier textured. In most places, the surface layer to a depth of about 12 to 18 inches is grayish-brown friable silt loam. The subsoil is yellowish-brown friable heavy silt loam or silty clay loam, mottled with olive and gray. The heavier texture of the subsoil may be partly due to profile development, but in most places very little development is apparent.

Hollywood series

The Hollywood soil is mainly on foot slopes or on alluvial-colluvial fans. It is a fairly young or young soil consisting of materials washed from uplands underlain by highly calcareous fine-textured shale. It is imperfectly to poorly drained and differs from the Whitesburg soil in being much darker colored, and heavier textured, and more nearly alkaline. The Hollywood soil has formed on foot slopes subject to seepage. Most of the differences between this soil and the Whitesburg soil are due to this saturation with very hard water for a large part of the year. Finer textured materials also contributed to the differences. The Hollywood soils in other parts of the State are derived from materials washed from uplands underlain by argillaceous limestone. The parent material and the soils, however, do not differ appreciably from the unit mapped in this county.

A representative profile is as follows:

1 0 to 10 inches, very dark gray (almost black) to dark brownish-gray plastic silty clay loam.
2 10 to 22 inches, dark grayish-brown very plastic silty clay or clay splotched with brownish yellow and gray in lower part.
3 22 inches +, very plastic olive-gray or bluish-gray clay profusely mottled with shades of yellow and brown.

SOIL SURVEY METHODS AND DEFINITIONS

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

The color of each layer is noted. There is usually a relationship between the darkness of the topmost layer of soil and its content of organic matter; streaks and spots of gray, yellow, and brown in lower layers generally indicate poor drainage and poor aeration.

Texture—the content of sand, silt, and clay in each layer—is determined by the feel of the soil when rubbed between the fingers and is checked by mechanical analyses in the laboratory. Texture determines to a considerable extent the quantity of moisture the soil will hold available to plants, whether plant nutrients or fertilizers will be held by the soil in forms available to plants or will be leached out, and the difficulty or ease of cultivating the soil.

Soil structure, or granulation, and the number of pores or open spaces between soil particles determine the permeability or perviousness of the soil, and consequently, the ease with which plant roots penetrate the soil and water enters it.

Consistence, or the tendency of the soil to crumble or to stick together, determines the degree of difficulty that will be encountered in keeping the soil open and porous under cultivation. Consistence covers such soil characteristics as hardness, friability, plasticity, stickiness, compactness, toughness, and cementation.

Surface soil ordinarily refers to the surface layer, which is usually 5 to 10 inches thick. The layer just below the surface soil is the subsoil; the layer beneath the subsoil, the substratum.

The kind of rocks and the parent soil material that develops from these rocks affect the quantity and kind of plant nutrients found in the soil. Simple chemical tests are made to show the degree of acidity of the soil, and 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 the characteristics here listed, soil areas much alike in the kind, thickness, and arrangement of layers are mapped as one soil type. Some soil types are separated into two or more phases. For example, if a soil type has slopes ranging from 2 to 12 percent, the type may be mapped in two phases, an undulating phase (2- to 5-percent slopes), and a rolling phase (5- to 12-percent slopes). A soil that has been eroded in places may be mapped in two or more phases—an uneroded phase (denoted by the name of the soil type only), an eroded phase, and perhaps a severely eroded phase. A soil type is broken into phases primarily because of differences in the soil other than those of kind, thickness, and arrangement of layers. The slope of a soil, the frequency of outcropping bedrock found in it, the extent of its erosion or the artificial drainage used on the soil, for example, are characteristics that might cause a soil type to be divided into phases.

Two or more soil types may have similar profiles; that is, the soil layers may be nearly the same, except that the texture, especially of the surface layer, may 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 soil types, whether the number be only one or several, that are, except for texture—particularly the texture of the surface layer—about the same in kind, thickness, and arrangement of layers.

The name of a place near where a soil series was first found is chosen as the name of the series: thus Staser is the name of a deep porous well-drained soil series found on water-laid deposits in Sevier County. Two types of the Staser series are found—Staser silt loam and Staser fine sandy loam. Each of these soil types has a different surface soil texture, as their names indicate.

When very small areas of two or more kinds of soil are so intricately mixed they cannot be shown separately on a map of the scale used, they are mapped together, and the areas of the mixture are called a soil complex. Muskingum-Lehew loams, steep phases, is a complex of Muskingum loam, steep phase, and Lehew loam, steep phase.

Bare rocky mountainsides and very stony or badly gullied areas that have little true soil are known as miscellaneous land types and are not designated with series and type names but are given descriptive names, such as Rough mountainous land (Ramsey soil material), Rough gullied land (Dandridge soil materials), Stony colluvium (Jefferson soil material), and Rough gullied land (limestone material).

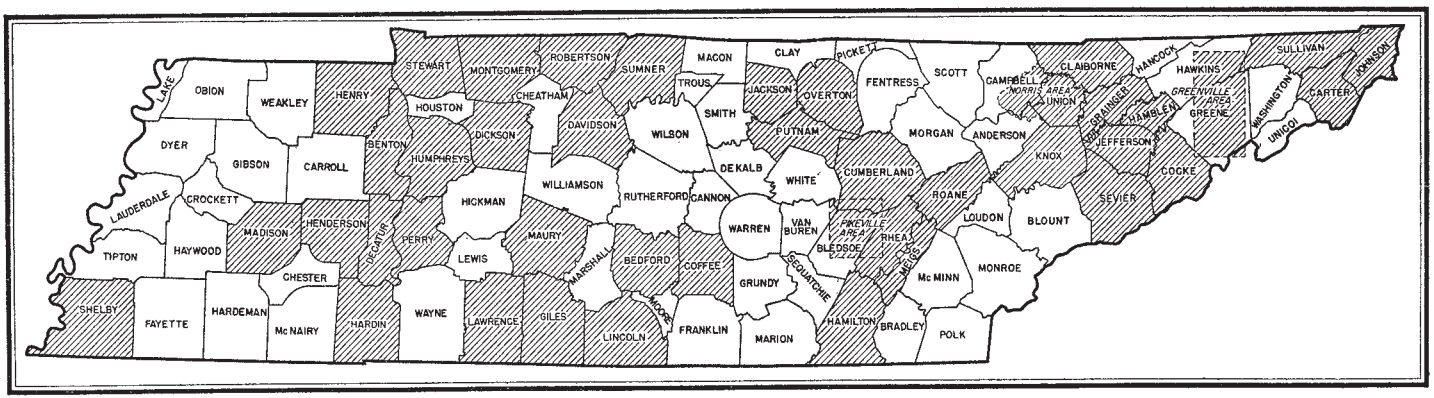
The soil type or, where the soil type is subdivided, the soil phase, is the mapping unit in soil surveys. It is the unit or the kind of soil that is most nearly uniform and has the narrowest range of characteristics. For this reason, land use and soil management practices can be more definitely specified for it than for broader groups of soils that contain more variation. One can say, for example, that soils of the Waynesboro series need lime for alfalfa. But for Waynesboro loam, undulating phase, it can be said that it has mild slopes and is suited to row crops grown in a rotation with a small grain and hay. On the other hand, Waynesboro clay loam, severely eroded hilly phase, has slopes that fall more than 12 feet in 100, is hard to work with heavy machinery, is easily eroded, and should be used principally for long-term hay or pasture. Both phases are included in the Waynesboro series.

LITERATURE CITED

(1) AUTEN, J. T.
1933. POROSITY AND WATER ABSORPTION OF FOREST SOILS. U. S. Dept. Agr. Jour. Agr. Research 46: 997–1014.
(2) DENUYL, D. and DAY, R. K.
1934. WOODLAND CARRYING CAPACITIES AND GRAZING INJURY STUDIES. Ind. Agr. Exp. Sta. Bul. 391, 12 pp., illus.
(3) FENNEMAN, N. M.
1938. PHYSIOGRAPHY OF EASTERN UNITED STATES. 714 pp., illus. New York and London.
(4) HALL, R. C.
1910. PRELIMINARY STUDY OF FOREST CONDITIONS IN TENNESSEE. Tenn. Geol. Survey Bul. 10A, 56 pp., illus.
(5) LUEBKE, B. H., ATKINS, S. W., ALLRED, C. E., and ROTH, W. J.
1939. TYPES OF FARMING IN TENNESSEE. Tenn. Agr. Exp. Sta. Bul. 169, 94 pp., illus.
(6) MOON, J. W., HIGBEE, H. W., ROBERTS, W., and others.
1941. SOIL SURVEY OF JEFFERSON COUNTY, TENNESSEE. U. S. Dept. of Agr. Soil Survey Rpt., Ser. 1935, No. 20, 104 pp., illus.
(7) POND, W. F.
1933. GEOLOGIC MAP OF TENNESSEE. Div. Geol. Tenn. Dept. Ed.
(8) RAMSEY, J. G. M.
1853. THE ANNALS OF TENNESSEE TO THE END OF THE EIGHTEENTH CENTURY. 832 pp., illus. Kingsport, Tenn. (Reprinted, 1926).
(9) ROTHROCK, M. U.
1946. THE FRENCH BROAD-HOLSTON COUNTRY. 573 pp., illus. Knoxville, Tenn.
(10) SMOKY MOUNTAINS HIKING CLUB.
1932. SMOKY MOUNTAIN HIKING CLUB HANDBOOK. 67 pp., illus. Knoxville, Tenn.
(11) TENNESSEE VALLEY AUTHORITY, DEPARTMENT OF FORESTRY RELATIONS.
1942. FORESTRY DATA FOR THE TENNESSEE VALLEY. Pt. III, Forestry Bul. No. 5, 25 pp.
(12) TREWARTHA, G. T.
1943. INTRODUCTION TO WEATHER AND CLIMATE. Ed. 2, 545 pp., illus. New York and London.

(13) UNITED STATES DEPARTMENT OF AGRICULTURE.
1938. SOILS AND MEN. U. S. Dept. Agr. Yearbook 1938, 1232 pp., illus.
(14) ———
1941. CLIMATE AND MAN. U. S. Dept. Agr. Yearbook 1941, 1248 pp., illus.
(15) ———
1944. INVESTIGATIONS IN EROSION CONTROL AND RECLAMATION OF ERODED LAND. U. S. Dept. Agr. Tech. Bul. 873, 66 pp., illus.
(16) ———
1945. INVESTIGATIONS IN EROSION CONTROL AND RECLAMATION OF ERODED LAND. U. S. Dept. Agr. Tech. Bul. 888, 95 pp., illus.
(17) UNITED STATES GEOLOGICAL SURVEY.
1895. GEOLOGIC ATLAS OF UNITED STATES, KNOXVILLE FOLIO, TENNESSEE. U. S. Geol. Survey folio 16, 6 pp., illus.
(18) WILLIAMS, S. C.
1924. HISTORY OF THE LOST STATE OF FRANKLIN. 378 pp. New York. (Revised, 1933.)
(19) WILLIAMSON, R. M.
1939. CLIMATE OF THE GREAT SMOKY MOUNTAINS NATIONAL PARK. Amer. Met. Soc. Bul. 20, 149 pp.

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price $3.75



Areas surveyed in Tennessee shown by shading.

Accessibility Statement

This document is not accessible by screen-reader software. The U.S. Department of Agriculture is committed to making its electronic and information technologies accessible to individuals with disabilities by meeting or exceeding the requirements of Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended in 1998. Section 508 is a federal law that requires agencies to provide individuals with disabilities equal access to electronic information and data comparable to those who do not have disabilities, unless an undue burden would be imposed on the agency. The Section 508 standards are the technical requirements and criteria that are used to measure conformance within this law. More information on Section 508 and the technical standards can be found at www.section508.gov.

If you require assistance or wish to report an issue related to the accessibility of any content on this website, please email Section508@oc.usda.gov. If applicable, please include the web address or URL and the specific problems you have encountered. You may also contact a representative from the USDA Section 508 Coordination Team.

Nondiscrimination Statement

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the

Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

(1) mail: U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

(3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.