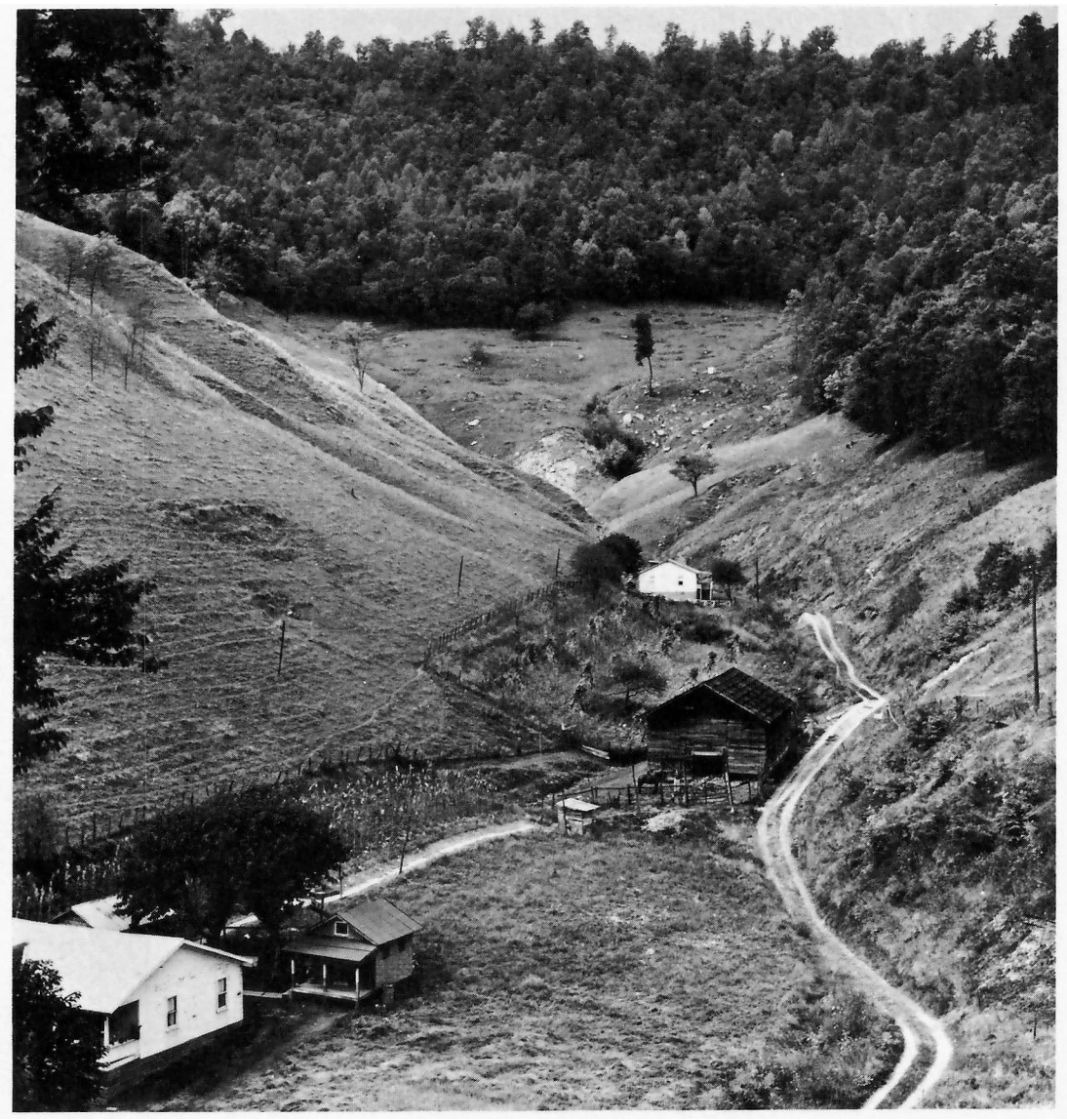
RECONNAISSANCE SOIL SURVEY

Fourteen Counties in Eastern Kentucky



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

Series 1962, No. 1

Issued February 1965

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY contains information about the soils in 14 counties in eastern Kentucky. It furnishes information helpful in planning and developing programs for agriculture, forestry, and other land uses.

In making this survey, soil scientists examined the soils and recorded characteristics that affect their suitability for farming, forestry, engineering, wildlife, and other uses. They plotted boundaries of eight soil associations on topographic maps, and from these maps cartographers made the county maps that accompany this report. A soil association consists of several kinds of soils that form a characteristic recurring pattern. The county maps show the locations of the soil associations, but not the individual soils in the associations or their patterns.

Each soil series, or group of similar soils, is described in the report, and interpretations are made for the use of the soils.

Locating the soil associations

A soil map of each of the 14 counties is in the jacket of this report. On these maps the boundaries of each soil association are outlined and are identified by a symbol. The map legend tells which soil association each symbol stands for. All areas marked with the same symbol are the same kind of soil association, wherever they occur on the map. The legend on each map is identical, though every map does not contain all eight of the soil associations.

Suppose, for example, you wish to know about an area marked by the symbol Db on one of the maps. The legend on the map shows that this symbol identifies the Dekalb-Muskingum-Berks association. This association, and all others mapped in the 14 counties, is described in the section "Soil Associations." More information about the soils in each association is given in the section "Descriptions of Soil Series and Land Types." Additional suggestions about how this report can be used are given in the section "Purpose and Methods of the Survey."

Finding information

Some readers will be more interested in one part of the report than in other parts, but many sections may be of interest to all.

Farmers and those who work with farmers can get information about the soils in the section "Descriptions of Soil Series and Land Types" and then turn to the section "Use and Management of Soils" and the subsections therein. This section on management and use also explains the capability classification of the soils.

Foresters and others interested in woodland can refer to the subsection "Use of Soils as Woodland." In that subsection the soils in the county are grouped according to their suitability for trees, and factors affecting the management of woodlands are explained.

Biologists and botanists will find helpful information in the subsection "Use of Soils for Wildlife."

Agronomist and horticulturists will find in the subsections "Use and Management of Soils for Agronomic Crops" and "Use and Management of Soils for Horticultural Crops" useful aids in determining which crops and other plants are suitable for planting in the survey area.

Engineers will want to refer to the subsection "Use of Soils for Engineering." Tables in that subsection show characteristics of the soils that affect engineering.

Newcomers to the area will be especially interested in the section "Soil Associations," where broad patterns of soils are described. They may also be interested in the section "General Nature of the Area," which gives additional information.

Anyone using this report can find more information about its use by reading the section "Purpose and Methods of the Survey," beginning on page 3.

* * * * *

This soil survey was made by the United States Department of Agriculture in cooperation with the Kentucky Agricultural Experiment Station to provide a basis for determining suitable uses for the soils in the area. The fieldwork was completed in 1962. Unless otherwise indicated, all statements in the report refer to conditions at the time the survey was in progress. The soil survey is a part of the technical assistance furnished by the Soil Conservation Service and the Kentucky Agricultural Experiment Station to the Eastern Kentucky Resource Development Program.

Cover picture: Typical farmstead in a steep mountainous area. In foreground, buildings and garden on nearly level Pope and Barbourville soils; in center background, pasture on sloping Muskingum soils; and in background, woodland on steep Muskingum soils.

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RECONNAISSANCE SOIL SURVEY OF FOURTEEN COUNTIES IN EASTERN KENTUCKY

BY HERMAN P. McDONALD, SOIL CONSERVATION SERVICE, AND ROBERT L. BLEVINS, KENTUCKY AGRICULTURAL EXPERIMENT STATION

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE KENTUCKY AGRICULTURAL EXPERIMENT STATION

THE FOURTEEN COUNTIES surveyed for this report are in the eastern part of Kentucky. They are Bell, Breathitt, Clay, Floyd, Harlan, Johnson, Knott, Lawrence, Leslie, Letcher, Magoffin, Martin, Perry, and Pike Counties (fig. 1). These counties have a total area of about 5,667 square miles, or 3,626,880 acres. The area is bounded on the east, southeast, and south by the adjoining States of West Virginia, Virginia, and Tennessee.

Coal mining is the largest enterprise in the area (*5*),[1] but the number of men employed in mines has declined in recent years because mechanization has increased. Agriculture and forestry are also important sources of income, though their importance has lessened in the past 10 years. This decline has been caused by a decrease in population, by a lack of good markets, and by a shortage of transportation. The area has no large industrial plants, but there are several small bakeries, milk processing plants, and bottling works.

[1] Italic numbers in parentheses refer to Literature Cited, p. 70.

General Nature of the Area[2]

This section discusses settlement and population, industry and agriculture, physiography and drainage, climate, and community facilities. Statistics in this section are from the U.S. Census of Agriculture.

Settlement and Population

Kentucky was a part of Virginia before it was separated from that State and called the Kentucky District. This district had three counties, which became the State of Kentucky in 1792. Later, these counties were divided into the 120 counties that today make up the State.

The original settlers came mainly from the colonies to the east and were mostly of English, Scotch, Irish, French, and German descent. Many people in the survey area are

[2] By H. H. BAILEY, associate professor of agronomy, Kentucky Agricultural Experiment Station.

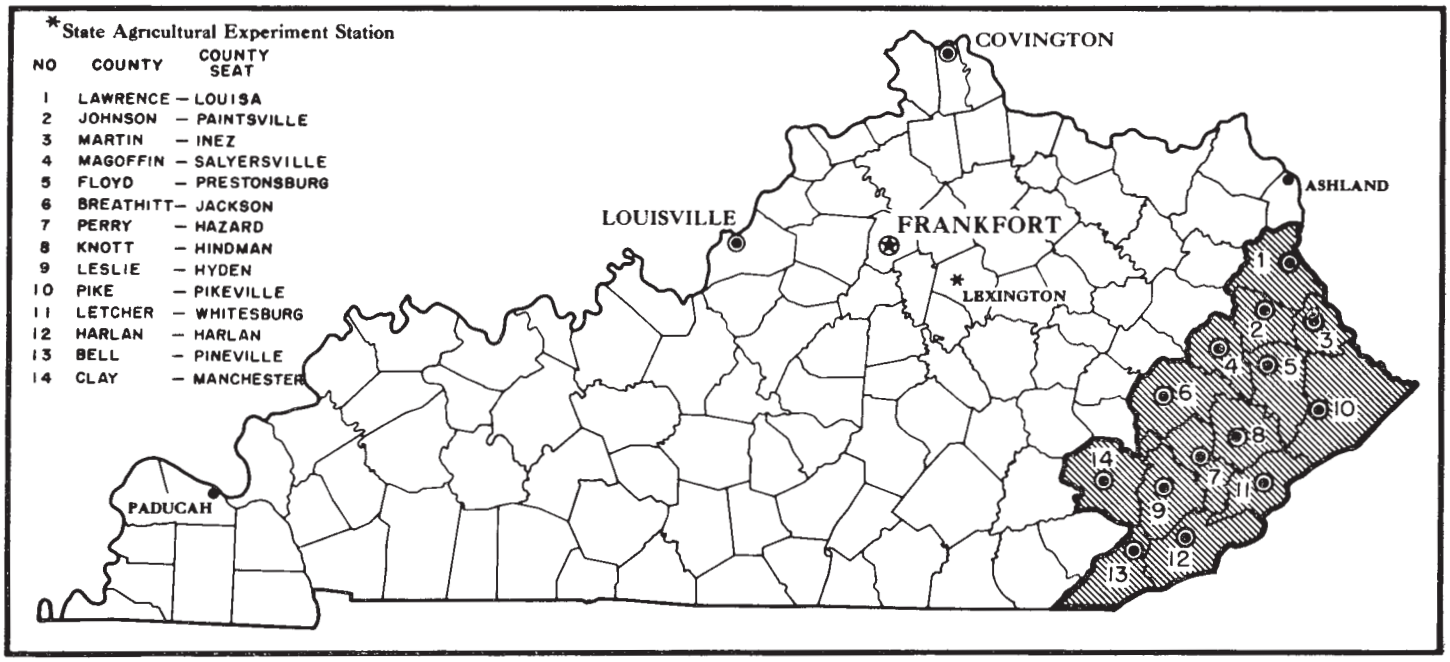

Figure 1.—Location of the 14 counties in eastern Kentucky.

descendants of these early settlers and have retained many of their customs. Family ties and loyalties are still exceedingly strong.

As shown in table 1, the population in the area has changed considerably in recent years. Between 1950 and 1960 the population decreased from 482,812 to 379,192, or almost 22 percent. During this 10-year period the number of farms decreased but the average size of farm increased.

Middlesboro, in Bell County, is the largest town in the area. In 1960 it had a population of 12,607. Other large towns and their population include Hazard, 5,958; Pikeville, 4,754; Paintsville, 4,025; and Prestonsburg, 3,133.

TABLE 1.—*Population of each of the 14 counties in 1950 and 1960 and percentage of decrease*

County	1950	1960	Decrease
			Percent
Bell	47, 602	35, 336	−25 8
Breathitt	19, 964	15, 490	−22 4
Clay	23, 116	20, 748	−10 2
Floyd	53, 500	41, 642	−22 2
Harlan	71, 751	51, 107	−28 8
Johnson	23, 846	19, 748	−17 2
Knott	20, 320	17, 362	−14 6
Lawrence	14, 418	12, 134	−15 8
Leslie	15, 537	10, 941	−29 6
Letcher	39, 522	30, 102	−23 8
Magoffin	13, 839	11, 156	−19. 4
Martin	11, 677	10, 201	−12 6
Perry	46, 566	34, 961	−24 9
Pike	81, 154	68, 264	−15 9
Total	482, 812	379, 192	−21. 5

Industry and Agriculture

Development of the area has been largely centered around mining soft coal, producing lumber and other forest products, farming, and, to less extent, light industry.

Coal mining (fig. 2) is the largest enterprise and is widespread throughout the area. During recent years mining of the conventional drift type has declined, but this decline has been partly offset by the introduction of strip mining and auger mining. Because of the trend toward greater mechanization, employment in the mining industry has also declined.

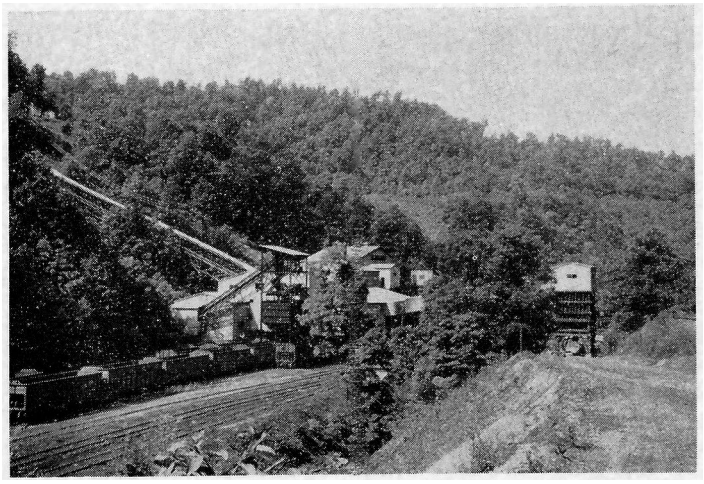

Figure 2.—**Coal tipple. Coal mining is the largest enterprise in the survey area.**

Practically all of the area was once wooded, but most of the virgin timber had been removed by the early 1920's. Approximately 80 percent of the acreage is now in second-growth trees, but most of the timber is of medium or low grade. Although several small mills are still operating, lumbering and related industries have declined in recent years.

Most of the people in the area farm, generally for home use. Table 2 lists the acreage in each of the 14 counties, according to the 1959 census of agriculture, and shows, for each county, the proportion in farms, the number of farms, and the average size of farm. In 1959 there was a total of 13,089 farms. Their average size ranged from 53.6 acres in Bell County to 131.5 acres in Lawrence County. Generally, less than 20 acres of each farm is cropland, and only about 1½ acres of this is on bottom land. The remaining cropland is on hilly land that can be plowed only by horse-drawn equipment.

TABLE 2.—*Total acreage, by counties, and proportionate extent, number, and size of farms in 1959*

County	Approximate land area	Proportion in farms	Number of farms	Average size of farm
	Acres	*Percent*		*Acres*
Bell	236, 800	6 9	306	53 6
Breathitt	316, 160	39 0	1, 290	95 7
Clay	303, 360	49 3	1, 465	102 1
Floyd	256, 640	32 4	1, 209	68 8
Harlan	300, 160	11 2	358	93 5
Johnson	168, 960	43 4	984	74 4
Knott	227, 840	25 7	846	69. 3
Lawrence	272, 000	51 5	1, 066	131. 5
Leslie	263, 680	13. 2	507	68. 6
Letcher	216, 960	19 6	610	69 7
Magoffin	193, 920	61 6	1, 305	91 6
Martin	147, 840	20 4	331	90. 9
Perry	219, 520	25 6	763	73 6
Pike	503, 040	29 9	2, 049	73 5
Total	3, 626, 880		13, 089	

The Conservation Needs Inventory completed by the Soil Conservation Service in 1959 shows the following land use for the area: 5.5 percent cropland, 3.2 percent pasture, 81.0 percent forest, 0.3 percent Federal land, 1.7 percent urban and other built-up areas, and 8.3 percent idle land.

Physiography and Drainage

These 14 counties are in the Mountain physiographic region and on the western border of the Appalachian Plateau. In most places the underlying rocks are of Pennsylvanian geologic age. Some limestone is exposed in faults in the southeastern part of the area. Long, sharp-crested ridges extend in a northeast-southwest direction and are separated by deep, narrow valleys. The southern part of this area is generally steeper and more rugged than the northern part, which has more rounded hilltops.

The 14 counties are drained by the Levisa Fork of the Big Sandy River and by the upper Cumberland, the Kentucky, and the Licking Rivers. The valleys along even the major streams are somewhat narrow, and the soils vary considerably in drainage.

Climate

Eastern Kentucky has a continental climate that varies widely in temperature and precipitation. It is in the path of low-pressure formations that bear moisture and move from the western gulf region northeastward over the Mississippi and Ohio Valleys to the Great Lakes and the northern Atlantic coast. Table 3 shows the long-term averages of temperature and precipitation in the Weather Bureau's Eastern Division of Kentucky, which includes the area covered in this soil survey (*9*).

In summer the temperature generally reaches, or slightly exceeds, 100°F., but rarely for more than a few days. Temperatures below zero occur with moderate frequency in December, January, and February, but long cold spells are always broken by intervals of moderate temperatures.

The average date of the last killing frost in spring is about April 24, and that of the first killing frost in fall is about October 15. The average length of growing season is 175 to 180 days (*9*).

The amount of snowfall varies considerably from year to year but annually averages about 20 inches. The ground seldom remains covered with snow for more than a few days.

TABLE 3.—*Long-term averages of temperature and precipitation in eastern Kentucky*

Month	Temperature	Precipitation
	°F	Inches
January	38 6	4 59
February	39 7	3 85
March	46 9	4 91
April	56 6	3 58
May	65 2	3 99
June	73 4	4 24
July	76 4	4 64
August	75 2	3 88
September	69 4	2 64
October	58 3	2 22
November	46 1	3 16
December	38 7	3 58
Year	57 1	45 28

Community Facilities

Cultural facilities in this area are limited because the counties are largely rural and there are no large towns.

School facilities are inadequate (*5*). The average county has about 40 one- and two-room schools and 13 consolidated schools. The consolidation of schools has proceeded slowly. An average of about 560 six-year-old children per county enter the first grade each year, but only about 198 remain to graduate. Health standards are low, and malnutrition is evident among some children of school age. In 1958 the area was served by 194 doctors, or about one for 2,000 people (*5*).

Throughout the area are many churches, but many of the rural ones serve rather small congregations.

Most people live within a reasonable distance of a drive-in motion picture theater, and there is a conventional motion picture theater in the larger towns. State parks and public fishing areas provide additional recreation. Hunting and fishing are popular in season.

Because of the sparse population and the rough topography, roads are not plentiful, but travel into and out of the area will be improved when the Kentucky Turnpike is completed. This highway is scheduled for completion in 1963. In addition, U.S. Highway Nos. 23, 119, and 460 are being improved and are improving travel into and out of the area. Many of the local roads are graveled, but many new hard-surfaced roads are being constructed.

Railroads are located to serve the major coal-producing sites within the area. Many small mines, however, haul their coal by truck to loading points of railroads or to nearby sites where it is used.

Electricity and telephones are available, except in the most isolated places. Water for rural homes is generally supplied by shallow wells or springs, and that for urban areas by municipal systems, which draw water from the rivers. Deeply drilled wells generally produce highly mineralized water. Some farm ponds have been constructed that impound runoff water for livestock, for fire protection, and occasionally for irrigation.

Purpose and Methods of the Survey

This reconnaissance survey covers 14 counties in eastern Kentucky, an area of about 3,627,000 acres along the western border of the Appalachian Plateau. This is a sparsely populated region characterized by long, sharp-crested ridges and narrow, deep valleys of intervening streams. Cutover hardwood forest of medium to low grade covers about 80 percent of the area. Cultivated and pastured land together account for only about 9 percent of the total acreage, and this is dominantly on small farms that produce crops for home use.

This survey was made to learn about the kinds of soils in the area, the patterns of their occurrence, and their potential for various uses. The map for this survey shows soil associations, or the areas covered by major patterns of soils on distinctive landscapes. Each soil association is a kind of landscape that can be defined in terms of the kinds of soils in it, the pattern of their occurrence, and their relative extent. For example, in this survey area Dekalb, Muskingum, and Berks are major soils occurring together in a distinctive pattern and proportion on rough, broken, stony, mountainous land that has been deeply cut by many small streams.

On this landscape, Dekalb soils make up about 70 percent of the acreage; Muskingum soils, 19 percent; and Berks soils, 7 percent. All of these soils are steep, stony, and shallow to moderately deep, but they are different in other respects, mainly because they formed in material weathered from different kinds of underlying rocks.

The soils dominant on this kind of landscape, or soil association, are covered with hardwood forest. They are steep, droughty, and low in natural fertility. Cultivated areas are mainly on the minor soils of this landscape—the Jefferson, Stendal, and Pope soils, which are on narrow flood plains along the streams. The pattern of soils on this landscape, therefore, is one that favors forestry,

wildlife, recreation, or some other use less intensive than farming.

The soil association just mentioned, and seven others, are shown on the maps that accompany this report and are described in the text. Each association has its own advantages and limitations for any specified kind of use.

For some kinds of broad preliminary study, it is sufficient to read only what is said about each soil association in the counties. But if some specific site needs to be selected for a definite purpose, such as building a pond or planting a special crop, it is then necessary to know more about the soil at that site.

The soil associations shown on the maps that accompany this report are made up of patterns of soils named by soil series. A soil series is a group of soils that have about the same kind of profile, or sequence of layers. Except for different texture in the surface layer, all the soils of one series have major horizons, or layers, that are similar in thickness, arrangement, and other important characteristics.

A map showing patterns of soil series, or even a map showing single soil series, does not provide a classification detailed enough for many practical purposes. For this reason, a single soil series may be divided into one or more soil types according to texture of the surface layer. In the Dekalb series, for example, there may be two or more soil types, as Dekalb fine sandy loam and Dekalb stony loam.

Soil types are not precise enough for planning the management of a single farm or field, building a road, or locating a pond for livestock. Some areas of Dekalb loam, for example, are so steep that cultivation is precluded. Others are on slopes mild enough to allow growing of some crops under careful management. Thus, where potential use justifies the effort, a soil type may be divided into phases on basis of slope, stoniness, depth to bedrock, or similar properties. These properties affect use but do not determine behavior of the soil as part of the natural, untouched landscape.

TABLE 4.—*Acreage and proportionate extent, by counties, of soils*

[Dashed lines indicate soil does not occur in county.

Soil or land type	Capability class or subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Allegheny fine sandy loam, 6 to 12 percent slopes.	IIIe												
Allegheny loam, 2 to 6 percent slopes	IIe											40	(1)
Allegheny loam, 6 to 12 percent slopes	IIIe											100	0. 1
Alegheny loam, 6 to 12 percent slopes, eroded.	IIIe												
Allegheny loam, 12 to 20 percent slopes, eroded.	IVe											160	. 1
Allegheny silt loam, 0 to 2 percent slopes	I			60	(1)			20	(1)			60	(1)
Allegheny silt loam, 2 to 6 percent slopes	IIe	100	0. 1	30	(1)	150	0. 1	60	(1)			140	. 1
Allegheny silt loam, 6 to 12 percent slopes.	III					70	(1)					100	
Alluvial escarpment	VIIs			120	(1)			80	(1)			60	(1)
Atkins fine sandy loam	IIIw	60	(1)					60	(1)	40	(1)		
Atkins silt loam	IIIw	80	(1)	80	(1)			160	0 1	80	(1)	120	. 1
Barbourville gravelly loam, 2 to 6 percent slopes.	IIe	140	. 1	670	0 2	1, 040	4	640	. 3	180	0. 1	280	. 2
Barbourville gravelly loam, 6 to 12 percent slopes.	IIIe	80	(1)	630	. 2	1, 120	. 4	360	. 2	160	. 1	220	. 2
Bruno loamy fine sand, 0 to 2 percent slopes.	IIIs			90	(1)			40	(1)			170	. 1
Bruno loamy fine sand, 6 to 12 percent slopes.	IVs							120	. 1			100	. 1
Built-up areas	None	50	(1)	380	. 1	130	. 1			310	. 1	60	(1)
Cotaco gravelly loam, 2 to 6 percent slopes.	IIw			90	(1)			160	. 1			120	. 1
Cotaco gravelly loam, 6 to 12 percent slopes.	IIIe			70	(1)	180	. 1	80	(1)			80	. 1
Cotaco loam, 2 to 6 percent slopes	IIw	60	(1)	20	(1)					60	(1)		
Dekalb fine sandy loam, 6 to 12 percent slopes.	IIIe					120	(1)			60	(1)		
Dekalb fine sandy loam, 12 to 20 percent slopes.	VIe					240	. 1						
Dekalb fine sandy loam, 20 to 30 percent slopes.	VIIe												
Dekalb stony loam, 12 to 20 percent slopes.	VIs			720	. 2	220	. 1	670	. 3			320	. 2
Dekalb stony loam, 12 to 20 percent slopes, severely eroded.	VIIs			180	. 1	60	(1)	230	. 1			160	. 1
Dekalb stony loam, 20 to 30 percent slopes.	VIIs	1, 710	. 8	1, 360	. 5	420	. 2	1, 680	. 7	2, 120	. 8	360	. 3

See footnote at end of table.

The soil map for this survey shows areas covered by patterns of soil series, not single series or soil types and phases. For this reason, the map has limited direct application where detailed planning is required to build a road, dig a pond, or grow some special crop. The map will show which areas are generally favorable for such purposes, but not the exact site preferable.

The value of a survey, however, is not determined only by the detail in which it is mapped. Soil scientists studied the area in much greater detail than they mapped it. They have provided in this report a detailed description of each soil series (pp. 31 to 40), and have estimated the extent of each soil type and phase that would have been delineated if it had been agreed that mapping the area in such detail were warranted (tables 4 to 11).

With the help of agronomists, foresters, wildlife managers, and others, the soil scientists have derived groupings of soils for production of wood crops, agronomic crops, horticultural crops, and wildlife, as well as groupings for soil engineering. They have interpreted these groupings in terms of practical use. Their interpretations can be supplemented by studying the descriptions of the soil associations, the descriptions of the soil series, and tables 4 to 11 showing estimated extent of each soil type and phase.

Soil Associations

The eight soil associations mapped in the 14 counties of eastern Kentucky are described in this section. Their location and extent are shown on the soil maps of the 14 counties that accompany this report.

The soil series named in the various soil associations are described in the section "Descriptions of Soil Series and Land Types." Estimated acreages of the different soil types and phases in each association are shown, by counties, in tables 4 to 11. The acreages in these tables were estimated by expanding from small areas that were surveyed in detail. The figures, therefore, are in estimates rather than precise measurements.

and land types in the (Db) *Dekalb-Muskingum-Berks soil association*

Acreages are based on detailed soil surveys of sample areas]

Knott		Lawrence		Leslie		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
		40	(1)													40	(1)
				50	(1)					20	(1)					110	(1)
				30	(1)					60	0. 1					190	(1)
				110	0. 1											110	(1)
																160	(1)
20	(1)			50	(1)			60	(1)	20	(1)	40	(1)	80	(1)	410	(1)
20	(1)	80	(1)	30	(1)			140	0. 1	40	(1)	20	(1)	130	(1)	940	(1)
										20	(1)					190	(1)
50	(1)			90	(1)					30	(1)	70	(1)	210	(1)	710	(1)
20	(1)	100	0. 1	10	(1)	150	0. 1					10	(1)	80	(1)	530	(1)
50	(1)	140	. 1	50	(1)	80	(1)	140	. 1	110	. 1	40	(1)	120	(1)	1, 250	(1)
340	0. 2	540	. 3	400	. 2	520	. 3	180	. 1	420	. 3	310	0. 2	820	0. 2	6, 480	0. 2
100	. 1	80	(1)	140	. 1	140	. 1	240	. 1	250	. 2	90	. 1	1, 050	. 2	4, 660	. 2
60	(1)	20	(1)	70	(1)			240	. 1	50	(1)	60	(1)	120	(1)	920	(1)
										60	. 1			230	. 1	510	(1)
		160	. 1			40	(1)			80	. 1	660	. 3	150	(1)	2, 020	. 1
60	(1)	40	(1)	70	(1)	40	(1)	60	(1)	70	. 1	80	. 1	320	. 1	1, 110	. 1
20	(1)	40	(1)	50	(1)	60	(1)	220	. 1					120	(1)	920	(1)
20	(1)	160	. 1					40	(1)							360	(1)
		120	. 1													300	(1)
		120	. 1													360	(1)
		580	. 3													580	(1)
920	. 4	100	. 1	640	. 3	820	. 4	560	. 3	430	. 3	480	. 3	1, 140	. 2	7, 020	. 2
640	. 3			150	. 1	160	. 1			150	. 1	120	. 1	260	. 1	2, 110	. 1
220	. 1	40	(1)	1, 140	. 5	2, 400	1 2	820	. 5	1, 120	. 8	930	. 5	2, 360	. 5	16, 680	. 5

TABLE 4.—*Acreage and proportionate extent, by counties, of soils*

[Dashed lines indicate soil does not occur in county.

Soil or land type	Capability class or subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Dekalb stony loam, 20 to 30 percent slopes, severely eroded.	VIIs	310	0 2	380	0. 1	100	(1)	470	0 2	570	0. 2	300	0 2
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes	VIIs	52, 400	25. 6	15, 880	5 5	43, 000	16 8	17, 300	7 7	24, 980	9 3	26, 380	18. 5
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes, severely eroded.	VIIs	9, 950	4 9	5, 620	1 9	9, 640	3 8	5, 730	2. 5	4, 900	1 8	4, 190	2 9
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes.	VIIs	108,240	52. 9	197,160	67 9	169,300	66. 0	148,900	65. 9	185,600	69. 4	78, 640	55. 2
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes, severely eroded.	VIIs	17, 480	8 5	52, 020	17 9	21, 800	8 5	36, 390	16 1	34, 740	13 0	14, 940	10 5
Enders silt loam, 6 to 12 percent slopes	IIIe	------	------	------	------	------	------	------	------	20	(1)	------	------
Enders silt loam, 12 to 20 percent slopes	IVe	70	(1)	------	------	------	------	------	------	30	(1)	------	------
Gilpin-Upshur silty clay loams, 6 to 12 percent slopes.	IIIe	------	------	------	------	------	------	------	------	------	------	------	------
Gilpin-Upshur silty clay loams, 12 to 20 percent slopes.	VIe	------	------	------	------	------	------	------	------	------	------	------	------
Gilpin-Upshur silty clay loams, 20 to 30 percent slopes.	VIe	------	------	------	------	------	------	------	------	------	------	------	------
Gilpin-Upshur clays, 20 to 30 percent slopes, severely eroded.	VIIe	------	------	------	------	------	------	------	------	------	------	------	------
Gilpin-Upshur silty clay loams, 30 to 50 percent slopes	VIIe	------	------	------	------	------	------	------	------	------	------	------	------
Gilpin-Upshur clays, 30 to 50 percent slopes, severely eroded.	VIIe	------	------	------	------	------	------	------	------	------	------	------	------
Gullied land	VIIe	------	------	90	(1)	------	------	120	. 1	------	------	140	. 1
Hayter gravelly loam, 2 to 6 percent slopes.	IIe	------	------	70	(1)	------	------	------	------	------	------	------	------
Hayter gravelly loam, 6 to 12 percent slopes	IIIe	------	------	230	. 1	60	(1)	------	------	------	------	------	------
Hayter gravelly loam, 12 to 20 percent slopes.	IVe	------	------	------	------	120	. 1	------	------	------	------	------	------
Holston gravelly loam, 2 to 6 percent slopes.	IIe	------	------	60	(1)	------	------	------	------	------	------	100	1
Holston gravelly loam, 6 to 12 percent slopes.	IVe	------	------	140	(1)	------	------	------	------	------	------	80	. 1
Holston gravelly loam, 12 to 20 percent slopes.	IVe	------	------	90	(1)	120	. 1	------	------	------	------	60	(1)
Holston fine sandy loam, 2 to 6 percent slopes.	IIe	------	------	------	------	------	------	------	------	------	------	------	------
Holston fine sandy loam, 6 to 12 percent slopes	IIIe	------	------	------	------	------	------	40	(1)	------	------	------	------
Holston fine sandy loam, 12 to 20 percent slopes, eroded.	IVe	------	------	------	------	------	------	60	(1)	------	------	------	------
Holston silt loam, 2 to 6 percent slopes	IIe	------	------	------	------	------	------	40	(1)	------	------	------	------
Holston silt loam, 6 to 12 percent slopes	IIIe	------	------	------	------	------	------	120	. 1	20	(1)	------	------
Huntington fine sandy loam	I	------	------	------	------	------	------	------	------	------	------	------	------
Huntington silt loam	I	------	------	------	------	------	------	------	------	------	------	------	------
Jefferson gravelly loam, 2 to 6 percent slopes.	IIe	------	------	150	. 1	160	. 1	360	. 2	240	1	280	. 2
Jefferson gravelly loam, 6 to 12 percent slopes.	IIIe	920	. 4	880	. 3	440	. 2	920	4	960	4	900	6
Jefferson gravelly loam, 6 to 12 percent slopes, eroded.	IIIe	260	. 1	420	. 1	80	(1)	240	. 1	100	(1)	400	. 3
Jefferson gravelly loam, 12 to 20 percent slopes.	IVe	1, 340	. 7	1, 240	. 4	1, 020	. 4	1, 160	5	820	3	1, 360	1 0
Jefferson gravelly loam, 12 to 20 percent slopes, eroded.	IVe	40	(1)	220	. 1	------	------	480	. 2	220	. 1	540	4
Jefferson gravelly loam, 12 to 20 percent slopes, severely eroded.	VIe	------	------	------	------	120	. 1	220	1	------	------	280	. 2
Jefferson gravelly loam, 20 to 30 percent slopes.	VIe	------	------	960	. 3	1, 120	. 4	740	. 3	------	------	2, 160	1 5
Jefferson gravelly loam, 20 to 30 percent slopes, severely eroded.	VIe	------	------	------	------	160	. 1	280	. 1	------	------	420	3
Jefferson stony loam, 6 to 12 percent slopes	VIs	------	------	190	. 1	------	------	140	. 1	------	------	------	------
Jefferson stony loam, 12 to 20 percent slopes.	VIs	1, 360	. 7	520	. 2	100	(1)	360	. 2	920	4	300	. 2
Jefferson stony loam, 12 to 20 percent slopes, severely eroded	VIs	180	. 1	100	(1)	------	------	120	. 1	100	(1)	120	. 1

See footnote at end of table.

and land types in the (Db) *Dekalb-Muskingum-Berks soil association*—Continued

Acreages are based on detailed soil surveys of sample areas]

Knott		Lawrence		Leslie		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
180	0. 1	-------	-----	480	0 2	280	0 2	280	0 2	310	0 2	260	0. 1	740	0. 2	4, 660	0. 2
11, 900	5 6	40, 230	20 5	13, 120	5 4	11, 730	6 1	32, 380	18. 8	10, 290	7. 8	10, 860	5 4	38, 270	8. 2	348, 720	10. 9
4, 100	1. 9	7, 860	4 0	4, 660	1 9	3, 150	1. 6	5, 020	2. 9	2, 980	2. 3	3, 780	1. 9	12, 720	2. 7	84, 300	2. 6
145,880	68. 6	124,430	63. 3	166,820	68. 3	136,150	70 3	99, 930	58 0	88, 090	66. 9	136,550	68. 3	309,950	66 4	2,095,640	65. 4
38, 160	18 0	2, 580	1 3	43, 940	18 0	27, 320	14. 1	18, 200	10. 6	20, 380	15. 5	35, 640	17. 8	77, 780	16. 7	441, 370	13. 8
-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	20	(1)
-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	100	(1)
-------	-----	40	(1)	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	40	(1)
-------	-----	860	. 4	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	860	(1)
-------	-----	800	. 4	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	800	(1)
-------	-----	800	. 4	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	800	(1)
-------	-----	640	. 3	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	640	(1)
-------	-----	300	. 2	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	300	(1)
60	(1)	-------	-----	80	(1)	-------	-----	-------	-----	110	. 1	60	(1)	270	1	930	(1)
-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	70	(1)
-------	-----	120	. 1	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	410	(1)
-------	-----	30	(1)	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	150	(1)
-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	110	(1)	270	(1)
-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	250	. 1	470	(1)
-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	210	. 1	480	(1)
40	(1)	-------	-----	-------	-----	-------	-----	-------	-----	30	(1)	40	(1)	-------	-----	110	(1)
100	. 1	-------	-----	-------	-----	-------	-----	-------	-----	80	. 1	90	1	-------	-----	310	(1)
50	(1)	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	50	(1)	-------	-----	160	(1)
20	(1)	40	(1)	30	(1)	-------	-----	-------	-----	-------	-----	20	(1)	-------	-----	150	(1)
40	(1)	-------	-----	50	(1)	-------	-----	-------	-----	-------	-----	40	(1)	-------	-----	270	(1)
-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	190	. 1	190	(1)
-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	30	(1)	30	(1)
150	1	240	. 1	270	. 1	270	1	300	2	250	2	140	1	490	. 1	3, 200	. 1
640	3	1, 320	7	840	4	950	5	740	. 4	510	. 4	590	. 3	1, 020	. 2	11, 630	. 4
300	. 2	40	(1)	400	. 2	180	1	280	. 2	90	. 1	280	. 2	410	. 1	3, 480	. 1
900	4	460	. 2	1, 080	. 5	570	3	1, 180	. 7	740	. 6	820	4	2, 230	5	14, 920	. 5
-------	-----	240	. 1	-------	-----	-------	-----	-------	-----	-------	-----	150	. 1	90	(1)	1, 980	1
160	. 1	60	(1)	170	. 1	80	(1)	320	2	260	. 2	60	(1)	460	1	2, 190	. 1
690	. 3	500	3	890	. 4	60	(1)	1, 340	. 8	-------	-----	760	4	1, 930	4	11, 150	4
70	(1)	-------	-----	150	1	-------	-----	210	1	-------	-----	80	. 1	540	. 1	1, 910	. 1
-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------	-----	140	. 1	-------	-----	470	(1)
140	1	-------	-----	360	2	910	5	220	. 1	270	. 2	220	1	380	. 1	6, 060	. 2
80	(1)	-------	-----	90	(1)	270	1	-------	-----	90	. 1	70	(1)	100	(1)	1, 320	. 1

TABLE 4.—*Acreage and proportionate extent, by counties, of soils*

[Dashed lines indicate soil does not occur in county.

Soil or land type	Capability class or subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Jefferson stony loam, 20 to 30 percent slopes.	VIs	2,020	1.0	770	0.3	120	0.1	310	0.1	2,140	0.8	240	0.2
Jefferson stony loam, 20 to 30 percent slopes, severely eroded.	VIIs	140	.1	130	(1)	------	------	110	.1	200	.1	80	.1
Mine spoil	None	320	.2	------	------	------	------	------	------	760	.3	------	------
Monongahela fine sandy loam, 2 to 6 percent slopes.	IIe	------	------	20	(1)	------	------	60	(1)	------	------	------	------
Monongahela fine sandy loam, 6 to 12 percent slopes.	IIIe	------	------	100	(1)	------	------	60	(1)	------	------	------	------
Monongahela loam, 2 to 6 percent slopes.	IIe	------	------	------	------	------	------	------	------	------	------	160	.1
Monongahela silt loam, 0 to 2 percent slopes.	IIw	------	------	------	------	------	------	80	(1)	------	------	------	------
Monongahela silt loam, 2 to 6 percent slopes.	IIe	------	------	60	(1)	------	------	60	(1)	------	------	------	------
Monongahela silt loam, 6 to 12 percent slopes.	IIIe	------	------	30	(1)	------	------	60	(1)	------	------	------	------
Muse silt loam, 6 to 12 percent slopes	IIIe	------	------	------	------	140	.1	------	------	------	------	------	------
Muskingum-Gilpin silt loams, 6 to 12 percent slopes.	IIIe	160	.1	360	.1	340	.1	440	.2	180	.1	300	.2
Muskingum-Gilpin silt loams, 6 to 12 percent slopes, severely eroded.	IVe	100	.1	120	(1)	180	.1	120	.1	40	(1)	120	.1
Muskingum-Gilpin silt loams, 12 to 20 percent slopes.	IVe	280	.1	500	.2	460	.2	880	.4	840	.3	700	.5
Muskingum-Gilpin silt loams, 12 to 20 percent slopes, severely eroded.	VIe	100	.1	120	(1)	40	(1)	360	.2	180	.1	240	.2
Muskingum-Gilpin silt loams, 20 to 30 percent slopes.	VIe	1,120	.6	880	.3	660	.2	1,040	.5	940	.4	1,960	1.4
Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded.	VIIe	------	------	140	(1)	------	------	------	------	------	------	------	------
Philo fine sandy loam	I	------	------	------	------	------	------	------	------	------	------	------	------
Philo silt loam	I	------	------	50	(1)	------	------	60	(1)	------	------	60	(1)
Pope gravelly fine sandy loam	IIs	1,220	.6	1,530	.5	740	.3	660	.3	1,100	.4	820	.6
Pope fine sandy loam, 0 to 2 percent slopes.	I	200	.1	160	.1	------	------	90	(1)	200	.1	220	.2
Pope fine sandy loam, 6 to 12 percent slopes.	IIe	40	(1)	40	(1)	------	------	60	(1)	60	(1)	60	(1)
Pope silt loam, 0 to 2 percent slopes	I	50	(1)	60	(1)	80	(1)	60	(1)	140	.1	140	.1
Pope silt loam, 6 to 12 percent slopes	IIe	------	------	30	(1)	------	------	20	(1)	------	------	40	(1)
Purdy silt loam	IVw	------	------	------	------	------	------	------	------	------	------	------	------
Rarden silt loam, 6 to 12 percent slopes, eroded.	IVe	------	------	------	------	------	------	110	.1	------	------	160	.1
Rarden silt loam, 12 to 20 percent slopes, eroded.	VIe	------	------	------	------	------	------	180	.1	------	------	200	.1
Riverwash	VIIs	------	------	150	.1	600	.2	120	.1	------	------	------	------
Rock land	VIIs	1,890	.9	2,400	.8	------	------	730	.3	2,140	.8	640	.4
Sequatchie fine sandy loam, 0 to 2 percent slopes.	I	40	(1)	100	(1)	------	------	80	(1)	------	------	80	.1
Sequatchie fine sandy loam, 2 to 6 percent slopes	IIe	80	(1)	70	(1)	110	.1	100	.1	60	(1)	120	.1
Sequatchie fine sandy loam, 6 to 12 percent slopes.	IIIe	------	------	60	(1)	40	(1)	110	.1	------	------	160	.1
Stendal gravelly fine sandy loam	IIw	1,560	.8	1,140	.4	500	.2	530	.2	460	.2	640	.4
Stendal fine sandy loam	IIw	220	.1	90	(1)	120	.1	180	.1	260	.1	260	.2
Stendal silt loam	IIw	120	.1	60	(1)	100	(1)	230	.1	320	.1	280	.2
Strip mine	None	60	(1)	250	.9	90	(1)	------	------	40	(1)	------	------
Tyler silt loam	IIIw	40	(1)	------	------	------	------	40	(1)	------	------	60	(1)
Wellston silt loam, 2 to 6 percent slopes	IIe	40	(1)	------	------	100	(1)	------	------	------	------	------	------
Wellston silt loam, 6 to 12 percent slopes.	IIIe	70	(1)	100	(1)	280	.1	100	(1)	60	(1)	200	.1
Wellston silt loam, 12 to 20 percent slopes.	IVe	80	(1)	------	------	160	.1	------	------	------	------	80	.1
Wellston silt loam, 12 to 20 percent slopes, severely eroded.	IVe	------	------	40	(1)	140	.1	80	(1)	------	------	60	(1)
Whitwell loam	IIw	80	(1)	70	(1)	300	.1	100	.1	40	(1)	160	.1
Zaleski silt loam, 2 to 6 percent slopes	IIe	------	------	------	------	------	------	60	(1)	------	------	120	.1
Total		204,860	100.0	290,550	100.0	256,390	100.0	225,830	100.0	267,390	100.0	142,600	100.0

[1] Less than 0.1 percent.

and land types in the (Db) *Dekalb-Muskingum-Berks soil association*—Continued

Acreages are based on detailed soil surveys of sample areas]

Knott		Lawrence		Leslie		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
150	0. 1	20	(1)	400	0. 2	1, 300	0 7	360	0. 2	320	0. 2	250	0. 1	940	0. 2	9, 340	0. 3
------	------	------	------	110	(1)	150	. 1	100	. 1	110	. 1	90	. 1	260	. 1	1, 480	. 1
60	(1)	------	------	80	(1)	560	3	------	------	------	------	110	. 1	110	(1)	2, 000	. 1
------	------	------	------	120	. 1	------	------	60	(1)	------	------	------	------	40	(1)	300	(1)
80	(1)	60	(1)	90	(1)	------	------	------	------	------	------	70	(1)	------	------	460	(1)
------	------	------	------	------	------	------	------	------	------	90	. 1	------	------	------	------	250	(1)
------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	(1)	110	(1)
90	. 1	------	------	40	(1)	------	------	120	. 1	------	------	40	(1)	60	(1)	470	(1)
50	(1)	------	------	20	(1)	------	------	------	------	------	------	20	(1)	110	(1)	290	(1)
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	140	(1)
280	. 1	400	0. 2	320	1	520	. 3	300	. 2	250	. 2	280	. 2	640	. 1	4, 770	. 2
50	(1)	120	. 1	90	(1)	140	. 1	100	. 1	100	. 1	50	(1)	140	(1)	1, 470	. 1
490	. 2	2, 200	1. 1	550	. 2	640	. 3	520	. 3	560	. 4	430	. 2	1, 260	. 3	10, 310	. 3
80	(1)	200	. 1	170	. 1	120	. 1	140	. 1	180	. 1	140	. 1	320	. 1	2, 390	. 1
420	. 2	5, 200	2. 7	600	2	840	. 4	2, 140	1. 2	790	. 6	420	. 2	1, 580	. 3	18, 590	. 6
160	. 1	280	. 1	------	------	------	------	------	------	------	------	160	. 1	------	------	740	(1)
20	(1)	60	(1)	10	(1)	------	------	------	------	------	------	10	(1)	------	------	100	(1)
30	(1)	------	------	20	(1)	------	------	------	------	30	(1)	20	(1)	------	------	270	(1)
1, 170	. 6	1, 200	. 5	1, 230	. 5	600	. 3	740	. 4	480	. 4	1, 080	. 6	1, 340	. 3	13, 910	. 4
40	(1)	280	. 2	50	(1)	------	------	------	------	50	(1)	40	(1)	330	. 1	1, 660	. 1
50	(1)	------	------	40	(1)	------	------	------	------	40	(1)	30	(1)	230	. 1	650	(1)
40	(1)	100	.1	50	(1)	190	.1	220	.1	40	(1)	40	(1)	160	(1)	1,370	.1
20	(1)	------	------	20	(1)	------	------	------	------	------	------	20	(1)	50	(1)	200	(1)
------	------	------	------	------	------	------	------	------	------	30	(1)	------	------	30	(1)	60	(1)
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	270	(1)
------	------	80	(1)	------	------	------	------	------	------	------	------	------	------	------	------	460	(1)
80	(1)	------	------	140	.1	40	(1)	380	.2	30	(1)	110	.1	------	------	1,650	.1
1,820	.9	310	.2	2,180	.9	1,320	.7	520	.3	320	.3	1,620	.8	1,250	.3	17,140	.5
70	(1)	------	------	90	(1)	80	(1)	60	(1)	30	(1)	70	(1)	180	(1)	880	(1)
50	(1)	------	------	60	(1)	60	(1)	80	(1)	60	.1	50	(1)	230	.1	1,130	(1)
40	(1)	------	------	50	(1)	------	------	------	------	50	(1)	40	(1)	190	(1)	740	(1)
840	.4	560	.3	950	.4	500	.3	2,060	1.2	260	.2	760	.4	850	.2	11,610	.4
60	(1)	1,120	.6	140	.1	100	.1	700	.4	90	.1	40	(1)	410	.1	3,790	.1
40	(1)	240	.1	50	(1)	220	.1	160	.1	150	.1	60	(1)	240	.1	2,270	.1
------	------	20	(1)	------	------	------	------	------	------	------	------	20	(1)	------	------	480	(1)
------	------	------	------	------	------	------	------	------	------	20	(1)	------	------	130	(1)	290	(1)
------	------	40	(1)	------	------	------	------	------	------	------	------	------	------	------	------	180	(1)
40	(1)	60	(1)	70	(1)	------	------	140	.1	70	.1	60	(1)	160	(1)	1,410	(1)
------	------	------	------	30	(1)	40	(1)	------	------	------	------	------	------	110	(1)	500	(1)
40	(1)	20	(1)	30	(1)	------	------	140	.1	40	(1)	60	(1)	------	------	650	(1)
50	(1)	------	------	60	(1)	60	(1)	320	.2	50	(1)	50	(1)	230	(1)	1,570	.1
------	------	------	------	------	------	------	------	------	------	------	------	------	------	60	(1)	240	(1)
212,61	100.0	196,520	100.0	244,270	100.0	193,810	100.0	172,460	100.0	131,650	100.0	199,850	100.0	467,030	100.0	3,205,820	100.0

TABLE 5.—*Acreage and proportionate extent, by counties, of soils and a land type in the* (Dg) *Dekalb-Muskingum-Gilpin-Jefferson soil association*

[Dashed lines indicate soil does not occur in county. Acreages are based on detailed soil surveys of sample areas]

Soil or land type	Capability class or subclass	Johnson		Lawrence		Total	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Allegheny fine sandy loam, 6 to 12 percent slopes	IIIe			50	0.4	50	0.3
Allegheny silt loam, 2 to 6 percent slopes	IIe	30	0.7	50	.4	80	.5
Allegheny silt loam, 6 to 12 percent slopes	IIIe			40	.3	40	.2
Atkins silt loam	IIIw			80	.7	80	.5
Barbourville gravelly loam, 2 to 6 percent slopes	IIe			50	.4	50	.3
Barbourville gravelly loam, 6 to 12 percent slopes	IIIe	30	.7			30	.2
Cotaco gravelly loam, 2 to 6 percent slopes	IIw	20	.5	40	.3	60	.4
Cotaco gravelly loam, 6 to 12 percent slopes	IIIe	20	.5			20	.1
Dekalb fine sandy loam, 6 to 12 percent slopes	IVe			100	.9	100	.6
Dekalb fine sandy loam, 12 to 20 percent slopes	VIe			110	.9	110	.7
Dekalb stony loam, 12 to 20 percent slopes	VIs	130	3.2	80	.7	210	1.3
Dekalb stony loam, 12 to 20 percent slopes, severely eroded	VIIs			50	.4	50	.3
Dekalb stony loam, 20 to 30 percent slopes	VIIs	220	5.4	480	4.1	700	4.4
Dekalb stony loam, 20 to 30 percent slopes, severely eroded	VIIs			150	1.3	150	1.0
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes	VIIs	1,340	32.7	4,780	41 0	6,120	38.8
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes, severely eroded	VIIs	300	7.3	860	7.4	1,160	7.4
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes	VIIs	150	3.6	140	1.2	290	1.8
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes, severely eroded	VIIs	40	1. 0			40	.3
Gullied land	VIIe	10	.2			10	.1
Hayter gravelly loam, 6 to 12 percent slopes	IIIe			60	.5	60	.4
Holston fine sandy loam, 6 to 12 percent slopes	IIIe			80	.7	80	.5
Holston fine sandy loam, 12 to 20 percent slopes, eroded	IVe			60	.5	60	.4
Holston silt loam, 2 to 6 percent slopes	IIe			30	.3	30	.2
Jefferson gravelly loam, 2 to 6 percent slopes	IIe	20	5			20	.1
Jefferson gravelly loam, 6 to 12 percent slopes	IIIe	40	1. 0	130	1 1	170	1. 1
Jefferson gravelly loam, 6 to 12 percent slopes, eroded	IIIe			40	.3	40	.2
Jefferson gravelly loam, 12 to 20 percent slopes	IVe	80	2 0	150	1 3	230	1. 5
Jefferson gravelly loam, 12 to 20 percent slopes, eroded	IVe	40	1. 0	70	.6	110	.7
Jefferson gravelly loam, 12 to 20 percent slopes, severely eroded	VIe	20	5	50	.4	70	.4
Jefferson gravelly loam, 20 to 30 percent slopes	VIe	130	3 2	100	.9	230	1 5
Jefferson gravelly loam, 20 to 30 percent slopes, severely eroded	VIe	30	7			30	.2
Monongahela fine sandy loam, 2 to 6 percent slopes	IIe			30	3	30	.2
Monongahela fine sandy loam, 6 to 12 percent slopes	IIIe			90	8	90	6
Monongahela silt loam, 2 to 6 percent slopes	IIe			40	.3	40	.2
Monongahela silt loam, 6 to 12 percent slopes	IIIe			100	9	100	6
Muskingum-Gilpin silt loams, 6 to 12 percent slopes	IIIe	120	2. 9	220	1. 9	340	2 2
Muskingum-Gilpin silt loams, 6 to 12 percent slopes, severely eroded	IVe			100	9	100	.6
Muskingum-Gilpin silt loams, 12 to 20 percent slopes	IVe	200	4 9	410	3 5	610	3 9
Muskingum-Gilpin silt loams, 12 to 20 percent slopes, severely eroded	VIe	50	1 2	70	6	120	.8
Muskingum-Gilpin silt loams, 20 to 30 percent slopes	VIe	580	14 1	1, 480	12 7	2, 060	13 1
Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded	VIIe	80	2 0	240	2 1	320	2 0
Pope gravelly fine sandy loam	IIs	40	1 0	60	.5	100	6
Pope fine sandy loam, 0 to 2 percent slopes	I	40	1 0	110	9	150	1. 0
Pope fine sandy loam, 6 to 12 percent slopes	IIe			50	4	50	.3
Pope silt loam, 0 to 2 percent slopes	I	20	.5	100	.9	120	.8
Rarden silt loam, 6 to 12 percent slopes, eroded	IVe			70	6	70	4
Rarden silt loam, 12 to 20 percent slopes, eroded	VIe	30	7	80	7	110	.7
Sequatchie fine sandy loam, 2 to 6 percent slopes	IIe	20	.5			20	.1
Sequatchie fine sandy loam, 6 to 12 percent slopes	IIIe	20	5	90	.8	110	.7
Stendal gravelly fine sandy loam	IIw	20	5	70	.6	90	.6
Stendal fine sandy loam	IIw	30	7	50	4	80	5
Stendal silt loam	IIw	30	7	70	.6	100	.6
Tilsit silt loam, 2 to 6 percent slopes	IIe			60	5	60	4
Tyler silt loam	IIIw	20	.5	30	3	50	.3
Wellston silt loam, 2 to 6 percent slopes	IIe			20	2	20	.1
Wellston silt loam, 6 to 12 percent slopes	IIIe	60	1 4	140	1 2	200	1. 3
Wellston silt loam, 12 to 20 percent slopes	IVe	50	1 2			50	.3
Wellston silt loam, 12 to 20 percent slopes, eroded	IVe	20	5	50	4	70	.4
Zaleski silt loam, 2 to 6 percent slopes	IIe	20	5			20	.1
Total		4, 100	100 0	11, 660	100 0	15, 760	100 0

TABLE 6.—*Acreage and proportionate extent of soils in the* (Gd) *Gilpin-Upshur-Dekalb soil association*

[This association occurs only in Lawrence County. Acreages are based on detailed soil surveys of sample areas]

Soil	Capability class or subclass	Lawrence		Soil	Capability class or subclass	Lawrence	
		Acres	*Percent*			*Acres*	*Percent*
Allegheny silt loam, 2 to 6 percent slopes	IIe	80	0 2	Hayter gravelly loam, 6 to 12 percent slopes	IIIe	60	0.2
Barbourville gravelly loam, 2 to 6 percent slopes	IIe	60	.2	Hayter gravelly loam, 12 to 20 percent slopes	IVe	240	.8
Barbourville gravelly loam, 6 to 12 percent slopes	IIIe	40	1	Jefferson gravelly loam, 2 to 6 percent slopes	IIe	40	.1
Cotaco gravelly loam, 2 to 6 percent slopes	IIw	120	4	Jefferson gravelly loam, 6 to 12 percent slopes	IIIe	60	.2
Cotaco gravelly loam, 6 to 12 percent slopes	IIIe	40	1	Jefferson gravelly loam, 12 to 20 percent slopes	IVe	40	.1
Cotaco loam, 2 to 6 percent slopes	IIw	80	.2	Jefferson gravelly loam, 20 to 30 percent slopes	VIe	40	.1
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes	VIIs	1, 220	3. 8	Jefferson stony loam, 20 to 30 percent slopes	VIs	60	.2
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes, severely eroded	VIIs	320	1 0	Muskingum-Gilpin silt loams, 6 to 12 percent slopes	IIIe	220	.7
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes	VIIs	1, 000	3 1	Muskingum-Gilpin silt loams, 20 to 30 percent slopes	VIe	580	1.8
Dekalb stony loam, 12 to 20 percent slopes	VIs	140	.4	Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded	VIIe	200	.6
Dekalb stony loam, 12 to 20 percent slopes, severely eroded	VIIs	100	3	Philo silt loam	I	60	.2
Dekalb stony loam, 20 to 30 percent slopes	VIIs	600	1 9	Pope fine sandy loam, 0 to 2 percent slopes	I	80	.2
Dekalb stony loam, 20 to 30 percent slopes, severely eroded	VIIs	200	.6	Pope silt loam, 0 to 2 percent slopes	I	240	.8
Enders silt loam, 12 to 20 percent slopes	IVe	30	1	Rarden silt loam, 6 to 12 percent slopes, eroded	IVe	50	.2
Gilpin-Upshur complex, 6 to 12 percent slopes	IIIe	970	3 0	Rarden silt loam, 12 to 20 percent slopes, eroded	VIe	50	.2
Gilpin-Upshur complex, 6 to 12 percent slopes, severely eroded	IVe	110	3	Stendal silt loam	IIw	120	.4
Gilpin-Upshur complex, 12 to 20 percent slopes	VIe	1,150	3.6	Tilsit silt loam, 2 to 6 percent slopes	IIe	60	.2
Gilpin-Upshur complex, 12 to 20 percent slopes, severely eroded	VIe	180	.6	Upshur silty clay, 6 to 12 percent slopes, eroded	IVe	80	.2
Gilpin-Upshur complex, 20 to 30 percent slopes	VIe	4,000	12 4	Upshur silty clay, 12 to 20 percent slopes, eroded	VIe	160	.5
Gilpin-Upshur complex, 20 to 30 percent slopes, severely eroded	VIIe	1,000	3.1	Upshur silty clay, 20 to 30 percent slopes, eroded	VIe	420	1.3
Gilpin-Upshur complex, 30 to 50 percent slopes	VIIe	12,950	40.2	Wellston silt loam, 6 to 12 percent slopes	IIIe	110	.3
Gilpin-Upshur complex, 30 to 50 percent slopes, severely eroded	VIIe	4,790	14.9	Wellston silt loam, 12 to 20 percent slopes, eroded	IVe	40	.1
Hayter gravelly loam, 2 to 6 percent slopes	IIe	40	.1	Total		32,230	100 0

TABLE 7.—*Acreage and proportionate extent of soils in the* (Gw) *Gilpin-Upshur-Wellston-Muskingum soil association*

[This association occurs only in Lawrence County. Acreages are based on detailed soil surveys of sample areas]

Soil	Capability subclass	Lawrence		Soil	Capability subclass	Lawrence	
		Acres	*Percent*			*Acres*	*Percent*
Dekalb fine sandy loam, 6 to 12 percent slopes	IVe	30	1. 1	Muskingum-Gilpin silt loams, 12 to 20 percent slopes	IVe	380	13. 6
Dekalb fine sandy loam, 12 to 20 percent slopes	VIe	120	4 3	Muskingum-Gilpin silt loams, 12 to 20 percent slopes, severely eroded	VIe	100	3 6
Dekalb stony loam, 6 to 12 percent slopes	VIs	50	1. 8	Muskingum-Gilpin silt loams, 20 to 30 percent slopes	VIe	60	2 1
Enders silt loam, 6 to 12 percent slopes	IIIe	50	1 8	Rarden silt loam, 6 to 12 percent slopes	IVe	40	1. 4
Enders silt loam, 12 to 20 percent slopes	IVe	150	5 4	Rarden silt loam, 12 to 20 percent slopes, eroded	VIe	20	7
Gilpin-Upshur complex, 6 to 12 percent slopes	IIIe	450	16. 1	Tilsit silt loam, 2 to 6 percent slopes	IIe	90	3 2
Gilpin-Upshur complex, 12 to 20 percent slopes	VIe	400	14 3	Upshur silty clay, 6 to 12 percent slopes, eroded	IVe	130	4 6
Gilpin-Upshur complex, 12 to 20 percent slopes, severely eroded	VIe	30	1 1	Upshur silty clay, 12 to 20 percent slopes, eroded	VIe	140	5 0
Gilpin-Upshur complex, 20 to 30 percent slopes	VIe	40	1 4	Wellston silt loam, 2 to 6 percent slopes	IIe	20	. 7
Muskingum-Gilpin silt loams, 6 to 12 percent slopes	IIIe	80	2 8	Wellston silt loam, 6 to 12 percent slopes	IIIe	260	9 3
				Wellston silt loam, 12 to 20 percent slopes	IVe	160	5. 8
				Total		2, 800	100 0

TABLE 8.—*Acreage and proportionate extent, by counties, of soils and land*

[Dashed lines indicate soil does not occur in county.

Soil or land type	Capability class or subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Allegheny fine sandy loam, 6 to 12 percent slopes.	IIIe												
Allegheny loam, 2 to 6 percent slopes	IIe			60	0 8	120	0 7						
Allegheny loam, 6 to 12 percent slopes	IIIe			110	1. 5	220	1. 3						
Allegheny loam, 6 to 12 percent slopes, eroded.	IIIe			160	2. 2	320	1. 9						
Allegheny loam, 12 to 20 percent slopes, eroded.	IVe			240	3 4								
Allegheny silt loam, 0 to 2 percent slopes	I												
Allegheny silt loam, 2 to 6 percent slopes	IIe	90	1 1	100	1. 4	160	1 0	20	0 5	50	0 6	120	3. 4
Allegheny silt loam, 6 to 12 percent slopes	IIIe			50	7	120	. 7	60	1. 5			40	1. 1
Allegheny silt loam, 6 to 12 percent slopes, eroded.	IIIe	70	. 9										
Alluvial escarpment	VIIs			30	4								
Atkins fine sandy loam	IIIw												
Atkins silt loam	IIIw			70	1. 0	200	1 2			20	. 2		
Barbourville gravelly loam, 2 to 6 percent slopes	IIe	50	. 6	90	1. 3	400	2. 4	110	2. 8	120	1. 5	140	4. 0
Barbourville gravelly loam, 6 to 12 percent slopes.	IIIe	30	. 4	130	1. 8	540	3 2	130	3. 3	70	. 9	130	3 7
Bruno loamy fine sand, 0 to 2 percent slopes.	IIIs												
Built-up areas	None	820	10. 4	320	4. 5	800	4. 8	400	10 2	1, 910	23. 5		
Cotaco gravelly loam, 2 to 6 percent slopes.	IIw			60	. 8	160	1. 0					40	1. 1
Cotaco gravelly loam, 6 to 12 percent slopes.	IIIe			90	1. 3	260	1 6	30	. 8				
Cotaco loam, 2 to 6 percent slopes	IIw	20	. 3	30	. 4	80	. 5			50	. 6		
Dekalb fine sandy loam, 6 to 12 percent slopes.	IVe					40	2						
Dekalb fine sandy loam, 12 to 20 percent slopes.	VIe					140	. 9						
Dekalb fine sandy loam, 20 to 30 percent slopes.	VIIe												
Dekalb stony loam, 12 to 20 percent slopes.	VIs			120	1 7	260	1. 6	80	2. 0			90	2. 6
Dekalb stony loam, 12 to 20 percent slopes, severely eroded.	VIIs			40	. 6	80	. 5	20	. 5				
Dekalb stony loam, 20 to 30 percent slopes.	VIIs	850	10 8	230	3 2	640	3 9	180	4. 6	320	3 9	160	4. 6
Dekalb stony loam, 20 to 30 percent slopes, severely eroded.	VIIs	340	4. 3	210	2. 9	380	2. 3	150	3 8	150	1. 8	120	3. 4
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes.	VIIs	10	. 1	130	1 8	80	5	60	1. 5			50	1. 4
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes, severely eroded	VIIs			100	1. 4			20	5			30	. 9
Gullied land	VIIe			50	. 7								
Hayter gravelly loam, 2 to 6 percent slopes.	IIe												
Hayter gravelly loam, 6 to 12 percent slopes.	IIIe			110	1. 5	220	1. 3						
Hayter gravelly loam, 12 to 20 percent slopes.	IVe					220	1. 3						
Holston loam, 2 to 6 percent slopes	IIe			250	3. 5	760	4. 6					30	. 9
Holston loam, 6 to 12 percent slopes	IIIe			200	2 8	640	3. 8					180	5. 1
Holston loam, 12 to 20 percent slopes, eroded.	IVe			430	6. 0	720	4. 3					100	2. 9
Holston fine sandy loam, 2 to 6 percent slopes.	IIe							20	. 5	150	1. 9		
Holston fine sandy loam, 6 to 12 percent slopes.	IIIe	170	2. 2					120	3. 1	220	2. 7		
Holston fine sandy loam, 12 to 20 percent slopes, eroded.	IVe							90	2 3				
Holton silt loam, 2 to 6 percent slopes	IIe							50	1 3	90	1. 1		
Holton silt loam, 6 to 12 percent slopes	IIIe	170	2. 2					70	1. 8	70	. 9		

See footnote at end of table.

types in the (Jm) *Jefferson-Muskingum-Holston-Dekalb soil association*

Acreages are based on detailed soil surveys of sample areas]

Knott		Lawrence		Leslie		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
		60	1. 4													60	0. 1
				30	0. 8	10	0. 2									220	. 3
				60	1. 7											390	. 5
				140	3 9											620	. 9
		140	3. 4	120	3. 4											500	. 7
				30	. 8			30	0. 5							60	. 1
30	2 9	30	. 7	50	1. 4	20	. 5	60	1. 0			40	1. 0			770	1. 1
		20	. 5													290	. 4
		100	2. 4													170	. 2
				40	1. 1							30	8			100	. 1
				20	6							30	. 7			50	. 1
30	2. 9			50	1. 4	20	. 5	50	. 8			20	. 5			460	. 6
20	2 0	100	2. 4	60	1. 7	60	1. 4	90	1. 5			30	. 7			1, 270	1. 8
10	1. 0	60	1. 4	30	. 8	40	. 9	110	1. 9	30	8. 3	40	1 0	70	4. 3	1, 420	2. 0
								90	1. 5							90	. 1
60	5 9			130	3 6	630	15. 0	150	2. 5	20	5. 6	1, 240	31. 2	220	13. 6	6, 700	9. 3
				30	. 8	30	. 7	90	1. 5			30	. 7	30	1 9	470	. 7
20	2. 0	30	. 7	20	. 6	20	. 5	100	1. 7							570	. 8
		70	1. 7					60	1 0							310	. 4
																40	. 1
		110	2. 7													250	. 3
		180	4 3													180	. 2
				30	. 8	50	1. 2	150	2. 5			20	. 5	40	2 5	840	1. 2
																140	. 2
30	2. 9	70	1. 7	40	1. 1	210	5. 0	210	3. 6	20	5. 6	30	. 8	70	4 3	3, 060	4. 2
		40	1. 0	120	3 4	110	2. 6	30	. 5	20	5 6	70	1. 8			1, 740	2. 4
20	2. 0	60	1. 4	70	2. 0	30	. 7	50	. 8			60	1. 5	40	2. 5	660	. 9
				50	1. 4							40	1. 0			240	. 3
				20	. 6							20	. 5			90	. 1
		80	1.9													80	.1
		210	5.1													540	.7
		150	3.6													370	.5
								120	2.0					30	1.9	1,190	1.6
								240	4.1					150	9.3	1,410	2.0
		90	2.2	160	4.5							110	2.8	90	5.6	1,700	2.4
20	2.0	50	1.2			130	3.1	70	1.2			30	.8			470	.7
40	3.9	220	5.3			210	5.0	190	3.2	20	5.5	150	3.8			1,340	1.9
60	5.9	280	6.8			90	2.1	190	3.2	20	5.5	140	3.5			870	1.2
30	2.9	80	1.9	120	3.4	80	1.9					80	2.0			530	.7
40	3.9					60	1.4									410	.6

TABLE 8.—*Acreage and proportionate extent, by counties, of soils and land*

Soil or land type	Capability class or subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Holton silt loam, 6 to 12 percent slopes, eroded.	IIIe	40	0. 5					60	1 5				
Huntington fine sandy loam	I									30	0. 4		
Huntington silt loam	I	50	. 6										
Jefferson gravelly loam, 2 to 6 percent slopes.	IIe			60	0 8	120	0. 7	80	2. 0	110	1 4	70	2. 0
Jefferson gravelly loam, 6 to 12 percent slopes.	IIIe	420	5. 3	220	3 1	520	3 1	120	3. 1	540	6 6	150	4. 3
Jefferson gravelly loam, 6 to 12 percent slopes, eroded.	IIIe	110	1. 4	180	2. 5	160	1 0	80	2 0	100	1 2	80	2. 3
Jefferson gravelly loam, 12 to 20 percent slopes	IVe	1, 060	13. 4	360	5. 0	1, 120	6 7	210	5. 4	610	7 5	240	6. 8
Jefferson gravelly loam, 12 to 20 percent slopes, eroded	IVe	160	2 0	100	1 4	90	. 5	120	3 1	230	2 8	130	3 7
Jefferson gravelly loam, 12 to 20 percent slopes, severely eroded.	VIe			70	1. 0	140	9	40	1 0			40	1. 1
Jefferson gravelly loam, 20 to 30 percent slopes	VIe			340	4 8	1, 020	6. 1	160	4 1			190	5 4
Jefferson gravelly loam, 20 to 30 percent slopes, severely eroded	VIe					180	1 1	50	1 3			70	2. 0
Jefferson stony loam, 6 to 12 percent slopes.	VIs												
Jefferson stony loam, 12 to 20 percent slopes	VIs	1, 180	15 0	280	3. 9	170	1. 0	70	1 8	1, 070	13 2	60	1. 7
Jefferson stony loam, 12 to 20 percent slopes, severely eroded.	VIs	120	1. 5	50	. 7			30	. 8	60	. 7	20	. 6
Jefferson stony loam, 20 to 30 percent slopes.	VIs	830	10. 5	200	2. 8	190	1. 1	130	3. 3	850	10. 5	110	3. 1
Jefferson stony loam, 20 to 30 percent slopes, severely eroded.	VIIs	140	1 8	40	. 6			50	1. 3	80	1. 0	70	2 0
Monongahela loam, 2 to 6 percent slopes.	IIe											70	2 0
Monongahela fine sandy loam, 2 to 6 percent slopes	IIe	40	. 5	80	1. 1			50	1 3				
Monongahela fine sandy loam, 6 to 12 percent slopes.	IIIe												
Monongahela fine sandy loam, 6 to 12 percent slopes, eroded.	IIIe			60	. 8			30	. 8				
Monongahela silt loam, 2 to 6 percent slopes	IIe	30	. 4	60	. 8	200	1 2	70	1 8				
Monongahela silt loam, 6 to 12 percent slopes.	IIIe			90	1. 3	160	1. 0	40	1 0				
Muse silt loam, 6 to 12 percent slopes	IIIe					400	2 4						
Muse silt loam, 12 to 20 percent slopes, eroded.	IVe					140	. 9						
Muskingum-Gilpin silt loams, 6 to 12 percent slopes.	IIIe	170	2 2	30	. 4	220	1 3	30	. 8	100	1 2	40	1. 1
Muskingum-Gilpin silt loams, 6 to 12 percent slopes, severely eroded	IVe												
Muskingum-Gilpin silt loams, 12 to 20 percent slopes.	IVe	220	2. 8	250	3. 5	960	5. 8	190	4 9	240	3 0	170	4 8
Muskingum-Gilpin silt loams, 12 to 20 percent slopes, severely eroded.	VIe	70	. 9	80	1. 1	260	1 6	60	1 5	50	6	90	2 6
Muskingum-Gilpin silt loams, 20 to 30 percent slopes.	VIe	250	3. 2	320	4. 5	1, 140	6 8	310	8 0	120	1. 5	280	8 0
Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded.	VIIe			120	1. 7							70	2 0
Newark silt loam	IIw	80	1 0							30	. 4		
Philo fine sandy loam	I												
Philo silt loam	I			50	. 7	40	2						
Pope gravelly fine sandy loam	IIs	90	1 1	120	1 7	480	2 9	70	1 8	220	2. 7	120	3. 4
Pope fine sandy loam, 0 to 2 percent slopes.	I					140	. 8	20	. 5				
Pope fine sandy loam, 6 to 12 percent slopes	IIe							40	1. 0				
Pope silt loam, 0 to 2 percent slopes	I												
Pope silt loam, 6 to 12 percent slopes	IIe			50	. 7								
Sequatchie fine sandy loam, 0 to 2 percent slopes.	I												
Sequatchie fine sandy loam, 2 to 6 percent slopes.	IIe	70	9	130	1 8	160	1. 0			80	1. 0		

See footnote at end of table.

types in the (Jm) *Jefferson-Muskingum-Holston-Dekalb soil association*—Continued

Knott		Lawrence		Leshe		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
		110	2.7	120	3.4							120	3.0			450	0.6
																30	(1)
																50	.1
40	3.9			120	3.4	100	2.4	100	1.7			90	2.3	40	2.5	930	1.3
90	8.8	150	3.6	210	5.9	410	9.8	360	6.1	20	5.5	150	3.8	60	3.7	3,420	4.7
		70	1.7	130	3.6	100	2.4	110	1.9			90	2.3			1,210	1.7
50	4.9	290	7.0	180	5.0	230	5.5	520	8.8	30	8.3	100	2.5	100	6.2	5,100	7.1
		70	1.7									80	2.0	60	3.7	1,040	1.4
20	2.0			40	1.1	30	.7	90	1.5			10	.2	20	1.2	500	.7
40	3.9	150	3.6	140	4.0	170	4 0	360	6.1			110	2.8	140	8.6	2,820	3.9
				30	.8			70	1 2			20	.5	30	1.8	450	.6
												40	1.0			40	.1
30	2.9			110	3.1	270	6.4	70	1.2	20	5.5	80	2.0	30	1.8	3,440	4.8
10	1.0			20	.6	40	1.0					20	.5			370	.5
30	2.9	60	1.4	110	3.1	130	3.1	80	1.4	60	16.7	70	1.8	50	3.1	2,900	4.0
				20	.6	40	1.0					20	.5	20	1.2	480	.7
																70	.1
30	2.9	60	1.4	70	2 0			90	1.5							420	.6
		120	2.9					150	2.5							270	.4
				20	.6											110	.2
20	2 0	70	1 7	30	.8			40	.7			60	1.5	30	1 8	610	.8
30	2.9	30	7	80	2 2			80	1 4			90	2 3			600	.8
																400	.6
																140	.2
		110	2 7	20	.6	80	1 9	150	2 5							950	1 3
						40	1 0									40	.1
20	2 0	270	6 5	30	8	90	2 1	470	8 0	20	5 6	60	1.5	90	5 6	3,080	4.3
		70	1 7	40	1 1									20	1 2	740	1.0
30	2 9	90	2 2	70	2 0	120	2 8	300	5 1	60	16 7	60	1 5	130	8.0	3,280	4.5
		70	1 7									30	8			290	.4
																110	.2
												20	5			20	(1)
																90	.1
20	2 0	50	1 2	120	3 4	140	3 3	180	3 1	20	5 6	110	2 8			1,740	2 4
						50	1 2	80	1 4							290	.4
																40	1
						40	1 0									40	1
																50	1
				40	1 1			20	3							60	1
30	2 9			60	1 7			60	1 0			50	1 2			640	.9

TABLE 8.—*Acreage and proportionate extent, by counties, of soils and land*

Soil or land type	Capability class or subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Sequatchie fine sandy loam, 6 to 12 percent slopes.	IIIe	------	------	120	1. 7	100	0. 6	70	1. 8	------	------	70	2. 0
Stendal gravelly fine sandy loam	IIw	90	1. 1	60	. 8	420	2 5	60	1. 5	140	1. 7	70	2. 0
Stendal fine sandy loam	IIw	20	. 3	------	------	------	------	40	1. 0	------	------	------	------
Stendal silt loam	IIw	------	------	70	1. 0	260	1. 6	------	------	150	1. 8	40	1. 1
Strip mine	None	------	------	------	------	40	. 2	------	------	------	------	------	------
Tyler silt loam	IIIw	------	------	100	1. 4	140	. 8	------	------	60	. 7	10	. 3
Wellston silt loam, 6 to 12 percent slopes.	IIIe	------	------	------	------	------	------	------	------	------	------	------	------
Wellston silt loam, 12 to 20 percent slopes.	IVe	20	. 3	------	------	------	------	------	------	------	------	------	------
Wellston silt loam, 12 to 20 percent slopes, eroded.	IVe	------	------	------	------	------	------	------	------	------	------	------	------
Whitwell loam	IIw	------	------	60	. 8	120	. 7	------	------	40	. 5	------	------
Zaleski silt loam, 2 to 6 percent slopes	IIe	------	------	------	------	------	------	20	. 5	------	------	20	. 6
Total		7, 880	100. 0	7, 160	100. 0	16, 650	100. 0	3, 910	100. 0	8, 130	100. 0	3, 510	100. 0

[1] Less than 0.1 percent.

(Db) **Dekalb-Muskingum-Berks association: Dominantly moderately deep, steep to very steep, very stony soils in mountainous areas**

This soil association makes up parts of all 14 counties and is rough, broken, mountainous, and deeply dissected by many small streams. Ridgetops in the association are very narrow and generally very stony, and side slopes are very steep, are very stony, and are marked by rock outcrops in a few places. The valley floors consist of narrow flood plains that are bordered by strongly sloping colluvial soils. Figure 3 shows the relationship of the major soils in this association to parent material and topography.

The Dekalb, Muskingum, and Berks soils make up about 96 percent of the association and occupy the ridgetops and very steep side slopes. All of these soils are generally very stony.

The Dekalb soils, which account for about 70 percent of this association, are shallow to moderately deep over sandstone and siltstone. They have a fine sandy loam or loam surface layer and a subsoil that contains many stone fragments.

The Muskingum soils make up approximately 19 percent of the association. They are shallow to moderately deep over interbedded siltstone and shale and have a silt loam surface layer and subsoil.

The Berks soils account for about 7 percent of the association. They are shallow to moderately deep over interbedded siltstone and shale. Their surface layer is silt loam, and their subsoil contains many stones and fragments of shale.

The Jefferson, Stendal, and Pope soils make up about 3 percent of the association and occur on the lower foot slopes and on flood plains. The Jefferson soils are deep, are well drained, and generally have a gravelly loam or stony loam surface layer and a clay loam or loam subsoil. The somewhat poorly drained Stendal and the well-drained Pope soils are on flood plains and consist of deep silt loam to fine sandy loam.

Also in this soil association, but accounting for less than 1 percent of it, are Wellston, Enders, Rarden, and Upshur soils, mostly on ridgetops; Barbourville, Hayter, Cotaco, Zaleski, Holston, Allegheny, Monongahela, Tyler, Purdy, Sequatchie, and Whitwell soils on the lower foot slopes and benches; and Philo, Atkins, Bruno, Huntington, and Newark soils on the narrow flood plains.

The following kinds of miscellaneous land make up a small acreage of this association: (1) Built-up areas consisting of villages, towns, mining camps, and railroad and highway rights-of-way on the valley floors and their adjacent foot slopes; (2) Rock land consisting of many small areas of sandstone outcrops, of bouldery and very stony land, and of limestone outcrops along Pine Mountain; (3) stony and sandy alluvial land along some of the streams; and (4) a few small areas in which the surface layers of rock have been removed from the underlying coal. Mine spoil and waste are prominent in parts of the association that have been mined extensively for coal. Drift and auger coal mines are common. Auger mine trails, shown on county soil maps by a special symbol, average between 40 and 80 feet in width and follow the contour of the mountains.

This soil association is largely in hardwood forest, but small, scattered areas have been cleared and are used for row crops, meadow or pasture, or are idle. Although the dominant Dekalb, Muskingum, and Berks soils are droughty and low in natural fertility, they are well suited to trees if woodland management is good. The Jefferson soils on foot slopes and the Pope and Stendal soils on flood plains are moderately low to moderately high in natural fertility. These soils generally respond well to additions of lime and fertilizer and to other good management. The less extensive soils range from moderately low to moderately high in natural fertility. On the steep slopes erosion is a severe hazard.

types in the (Jm) *Jefferson-Muskingum-Holston-Dekalb soil association*—Continued

Knott		Lawrence		Leslie		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
20	2 0	30	0 7	60	1 7	------	------	------	------	------	------	100	2 5	------	------	570	0 8
30	2 9	20	5	60	1 7	140	3 3	280	4. 7	------	------	40	1. 0	30	1. 8	1, 440	2. 0
------	------	------	------	------	------	40	1 0	60	1. 0	------	------	------	------	------	------	160	. 2
20	2 0	------	------	40	1. 1	70	1 7	------	------	------	------	30	. 8	------	------	680	. 9
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	40	. 1
10	1 0	30	0 7	50	1. 4	30	. 7	------	------	------	------	30	. 8	------	------	460	. 6
20	2 0	------	------	20	. 6	------	------	------	------	------	------	20	. 5	------	------	60	. 1
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	20	(1)
------	------	------	------	30	. 8	------	------	------	------	------	------	20	. 5	------	------	50	. 1
20	2 0	------	------	70	2 0	40	1 0	110	1. 9	------	------	40	1 0	------	------	500	. 7
------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	1 9	70	. 1
1, 020	100 0	4, 150	100 0	3, 560	100. 0	4, 200	100 0	5, 910	100. 0	360	100 0	3, 970	100 0	1, 620	100. 0	72, 030	100 0

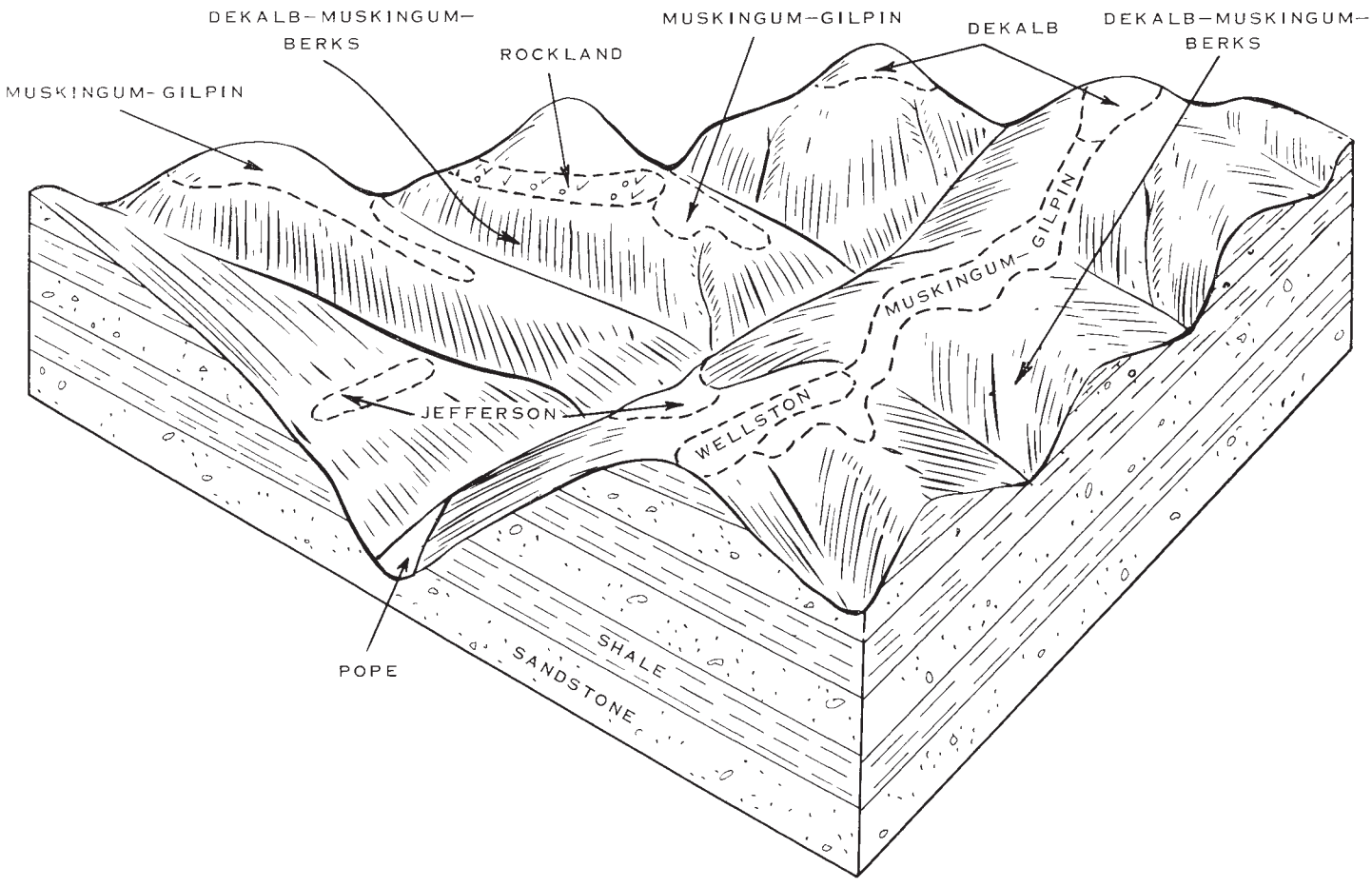

***Figure 3.*—Relative position of major soils, and their relation to parent material and topography, in the (Db) Dekalb-Muskingum-Berks association on narrow ridgetops and steep to very steep side slopes and in the (Md) Muskingum-Dekalb-Gilpin-Wellston association on broad mountaintops.**

TABLE 9.—*Acreage and proportionate extent, by counties, of soils and a*

[Dashed lines indicate soil does not occur in county.

Soil or land type	Capability subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Dekalb fine sandy loam, 6 to 12 percent slopes.	IVe	------	------	------	------	280	2.9	------	------	60	1.7	------	------
Dekalb fine sandy loam, 12 to 20 percent slopes.	VIe	------	------	------	------	250	2.6	------	------	------	------	------	------
Dekalb stony loam, 12 to 20 percent slopes.	VIs	------	------	600	29.7	200	2.1	70	10.3	------	------	110	9.6
Dekalb stony loam, 12 to 20 percent slopes, severely eroded	VIIs	------	------	60	3.0	------	------	------	------	------	------	------	------
Dekalb stony loam, 20 to 30 percent slopes.	VIIs	1,380	27.7	200	9.9	280	3.0	130	19.1	650	18.6	150	13.2
Dekalb stony loam, 20 to 30 percent slopes, severely eroded.	VIIs	290	5.9	90	4.4	80	.9	30	4.4	90	2.6	40	3.5
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes.	VIIs	10	.2	------	------	70	.7	30	4.4	20	.6	50	4.4
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes, severely eroded.	VIIs	------	------	------	------	------	------	------	------	------	------	------	------
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes.	VIIs	------	------	------	------	------	------	------	------	------	------	------	------
Enders silt loam, 6 to 12 percent slopes	IIIe	110	2.2	------	------	------	------	------	------	30	.8	------	------
Enders silt loam, 12 to 20 percent slopes.	IVe	40	.8	------	------	------	------	------	------	140	4.0	------	------
Muskingum-Gilpin silt loams, 6 to 12 percent slopes	IIIe	250	5.0	200	9.9	1,340	14.1	50	7.3	60	1.7	90	7.9
Muskingum-Gilpin silt loams, 6 to 12 percent slopes, severely eroded.	IVe	------	------	40	2.0	------	------	------	------	------	------	------	------
Muskingum-Gilpin silt loams, 12 to 20 percent slopes.	IVe	1,140	22.9	420	20.7	2,720	28.7	80	11.8	1,050	30.0	160	14.0
Muskingum-Gilpin silt loams, 12 to 20 percent slopes, severely eroded	VIe	230	4.6	80	4.0	300	3.2	------	------	------	------	20	1.8
Muskingum-Gilpin silt loams, 20 to 30 percent slopes.	VIe	980	19.7	130	6.4	2,140	22.6	110	16.2	1,190	34.0	180	15.8
Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded.	VIIe	------	------	------	------	------	------	------	------	------	------	------	------
Rarden silt loam, 6 to 12 percent slopes, eroded.	IVe	------	------	------	------	------	------	------	------	------	------	20	1.7
Rarden silt loam, 12 to 20 percent slopes, eroded	VIe	------	------	------	------	------	------	30	4.4	------	------	60	5.3
Rock land	VIIs	------	------	80	4 0	------	------	50	7.4	------	------	40	3.5
Tilsit silt loam, 2 to 6 percent slopes	IIe	------	------	------	------	140	1.5	------	------	------	------	------	------
Wellston silt loam, 2 to 6 percent slopes	IIe	90	1.8	------	------	260	2.7	------	------	40	1.1	------	------
Wellston silt loam, 6 to 12 percent slopes.	IIIe	350	7.0	80	4.0	920	9.7	60	8.8	170	4.9	140	12.3
Wellston silt loam, 12 to 20 percent slopes.	IVe	110	2.2	------	------	340	3.6	------	------	------	------	40	3.5
Wellston silt loam, 12 to 20 percent slopes, eroded.	IVe	------	------	40	2.0	160	1.7	40	5.9	------	------	40	3.5
Total		4,980	100.0	2,020	100.0	9,480	100.0	680	100.0	3,500	100.0	1,140	100.0

[1] Less than 0 1 percent.

land type in the (Md) *Muskingum-Dekalb-Gilpin-Wellston soil association*

Acreages are based on detailed soil surveys of sample areas]

Knott		Lawrence		Leslie		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
		170	5.9													510	1.3
		200	7.0													450	1.2
180	11.7	250	8.7	790	19.0	150	7.5	380	16.4	260	18.0	220	14.4	120	10.4	3,330	8.6
110	7.1	70	2.4	250	6.0	40	2.0			50	3.5	80	5.2			660	1.7
310	20.1	130	4.5	870	20.9	140	7.0	490	21.1	410	28.5	380	24.8	300	25.9	5,820	15.0
50	3.3	50	1.8	150	3.6	100	5.0	40	1.7	90	6.2	40	2.6	60	5.2	1,200	3.1
110	7.2	40	1.4	230	5.5	60	3.0			60	4.2	70	4.6	50	4 3	800	2.1
30	2.0			70	1.7							40	2.6			140	.4
20	1.3															20	(1)
		100	3.5													240	.6
		40	1.4													220	.6
100	6.5	190	6.6	340	8.2	190	9.5	230	9.9	120	8.3	90	5.9	100	8.6	3,350	8.6
40	2.6	40	1.4	80	1.9	20	1.0					40	2.6			260	.7
160	10.4	450	15.7	290	7.0	490	24.5	510	22.0	240	16 6	140	9.2	160	13.8	8,010	20.6
30	1.9	100	3.5	90	2.2	40	2.0			60	4.2	30	2.0	40	3.4	1,020	2.6
270	17.5	220	7.7	610	14.7	610	30.5	450	19.4			230	15.0	200	17.2	7,320	18.9
		80	2.8													80	.2
		140	4.9													160	.4
		90	3.1													180	.5
60	3.9	40	1.4	110	2.6					40	2.8	60	3.9	30	2.6	510	1.3
		150	5.2													290	.7
		40	1.4													430	1.7
30	1.9	140	4 9	150	3.6	120	6.0	100	4.3	60	4.2	40	2.6	60	5.2	2,420	6.2
		90	3.1	70	1.7	40	2.0							40	3.4	730	1.9
40	2.6	50	1.7	60	1.4			120	5.2	50	3.5	70	4.6			670	1.7
1,540	100.0	2,870	100.0	4,160	100.0	2,000	100.0	2,320	100 0	1,440	100.0	1,530	100.0	1,160	100.0	38,820	100.0

TABLE 10.—*Acreage and proportionate extent, by counties, of soils*

[Dashed lines indicate soil does not occur in county.

Soil or land type	Capability class or subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Allegheny loam, 2 to 6 percent slopes.	IIe	------	------	50	0. 4	------	------	------	------	------	------	60	0. 4
Allegheny loam, 6 to 12 percent slopes.	IIIe	------	------	20	. 2	------	------	------	------	------	------	20	. 1
Allegheny loam, 12 to 20 percent slopes, eroded.	IVe	------	------	------	------	------	------	------	------	------	------	------	------
Allegheny silt loam, 0 to 2 percent slopes.	I	660	5. 3	230	2 0	280	1. 5	560	3. 1	460	3. 9	470	3. 4
Allegheny silt loam, 2 to 6 percent slopes.	IIe	800	6. 4	160	1. 4	340	1. 8	420	2. 3	260	2. 2	320	2 3
Allegheny silt loam, 6 to 12 percent slopes, eroded.	IIIe	------	------	30	. 3	------	------	120	. 7	------	------	100	. 7
Alluvial escarpment	VIIs	------	------	610	5. 3	280	1 5	1, 670	9 2	------	------	510	3 7
Atkins fine sandy loam	IIIw	140	1. 1	180	1. 6	------	------	130	. 7	190	1 6	------	------
Atkins silt loam	IIIw	360	2. 9	540	4 7	260	1. 4	510	2 8	240	2. 0	520	3. 8
Barbourville gravelly loam, 2 to 6 percent slopes.	IIe	120	1. 0	480	4 2	320	1. 7	250	1 4	340	2. 8	250	1. 8
Barbourville gravelly loam, 6 to 12 percent slopes, eroded.	IIIe	40	. 3	220	1. 9	260	1 4	140	. 8	40	. 3	140	1. 0
Bruno loamy fine sand, 2 to 6 percent slopes.	IIIs	------	------	310	2. 7	680	3. 6	680	3 7	------	------	610	4 4
Bruno loamy fine sand, 6 to 12 percent slopes.	IVs	------	------	120	1. 1	400	2 1	320	1 8	------	------	170	1. 2
Built-up areas	None	1, 590	12. 8	390	3. 4	200	1. 1	2, 230	12 2	3, 530	29. 5	830	6 1
Cotaco gravelly loam, 2 to 6 percent slopes.	IIw	------	------	60	. 5	80	. 4	90	. 5	------	------	100	. 7
Cotaco gravelly loam, 6 to 12 percent slopes.	IIIe	------	------	40	. 4	------	------	60	. 3	------	------	30	. 2
Cotaco loam, 2 to 6 percent slopes	IIw	40	. 3	30	. 3	140	. 7	------	------	------	------	------	------
Hayter gravelly loam, 2 to 6 percent slopes.	IIe	------	------	------	------	------	------	------	------	------	------	------	------
Hayter gravelly loam, 6 to 12 percent slopes.	IIIe	------	------	------	------	------	------	------	------	------	------	------	------
Holston loam, 0 to 2 percent slopes.	I	------	------	------	------	------	------	------	------	------	------	80	. 6
Holston loam, 2 to 6 percent slopes.	IIe	------	------	80	. 7	300	1. 6	------	------	------	------	180	1. 3
Holston loam, 6 to 12 percent slopes.	IIIe	------	------	------	------	40	. 2	------	------	------	------	80	. 6
Holston loam, 12 to 20 percent slopes, eroded.	IVe	------	------	------	------	------	------	------	------	------	------	40	. 3
Holston fine sandy loam, 2 to 6 percent slopes.	IIe	------	------	------	------	------	------	80	. 4	130	1. 1	------	------
Holston fine sandy loam, 6 to 12 percent slopes.	IIIe	100	. 8	------	------	------	------	80	. 4	100	. 8	------	------
Holston fine sandy loam, 12 to 20 percent slopes, eroded	IVe	------	------	------	------	------	------	------	------	------	------	------	------
Holston silt loam, 2 to 6 percent slopes.	IIe	------	------	------	------	------	------	100	. 5	260	2 2	------	------
Holston silt loam, 6 to 12 percent slopes.	IIIe	80	. 6	------	------	------	------	30	. 2	90	. 7	------	------
Holston silt loam, 6 to 12 percent slopes, eroded.	IIIe	40	. 3	------	------	------	------	------	------	------	------	------	------
Huntington fine sandy loam	I	------	------	------	------	------	------	------	------	240	2. 0	------	------
Huntington silt loam	I	580	4. 6	------	------	------	------	------	------	------	------	------	------
Jefferson gravelly loam, 2 to 6 percent slopes.	IIe	------	------	120	1. 0	100	. 5	180	1 0	80	. 7	120	. 9

See footnote at end of table.

and land types in the (Ps) *Pope-Stendal-Allegheny soil association*

Acreages are based on detailed soil surveys of sample areas]

Knott		Lawrence		Leslie		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
------	------	-------	------	20	0. 4	110	1. 0	-------	------	90	1. 5	------	------	-------	------	330	0. 2
------	------	-------	------	------	------	-------	------	-------	------	100	1. 7	------	------	-------	------	140	. 1
------	------	120	0. 7	------	------	-------	------	-------	------	------	------	------	------	-------	------	120	. 1
210	3. 6	950	5. 2	150	3. 2	410	3. 9	210	1. 7	220	3. 8	180	2. 9	900	3. 6	5, 890	3. 4
70	1. 2	1, 580	8. 7	80	1. 7	150	1. 4	270	2. 2	140	2. 4	80	1 3	830	3. 3	5, 500	3. 2
------	------	220	1. 2	------	------	-------	------	-------	------	90	1. 5	------	------	200	. 8	760	. 4
90	1. 6	2, 100	11 5	500	10. 6	210	2. 0	-------	------	390	6. 7	520	8. 3	2, 240	9. 0	9, 120	5. 2
100	1. 7	200	1. 1	80	1. 7	160	1. 5	-------	------	------	------	90	1. 4	250	1. 0	1, 520	. 9
280	4. 8	600	3. 3	200	4. 2	310	2. 9	590	4. 8	170	2. 9	250	4. 0	660	2. 7	5, 490	3. 2
90	1. 6	220	1. 2	70	1. 5	360	3. 4	40	. 3	110	1. 9	120	1. 9	320	1. 3	3, 090	1. 8
40	. 7	140	. 8	30	. 6	40	. 4	50	. 4	60	1. 0	30	. 5	280	1 1	1, 510	. 9
350	6 0	1, 140	6. 2	290	6. 1	180	1. 7	1, 170	9. 6	270	4. 6	320	5. 1	1, 060	4. 3	7, 060	4 0
70	1. 2	250	1. 4	------	------	-------	------	-------	------	70	1. 2	------	------	550	2. 2	1, 950	1. 1
140	2 4	220	1. 2	130	2. 8	1, 520	14. 3	400	3. 3	180	3. 1	1, 190	19. 0	2, 400	9. 6	14, 950	8. 5
40	. 7	-------	------	------	------	-------	------	60	. 5	80	1. 4	30	. 5	90	. 4	630	. 4
30	. 5	-------	------	------	------	-------	------	60	. 5	------	------	------	------	100	. 4	320	. 2
20	. 3	60	. 3	------	------	-------	------	70	. 6	------	------	------	------	-------	------	360	. 2
------	------	240	1 3	------	------	-------	------	-------	------	------	------	------	------	-------	------	240	. 1
------	------	350	1. 9	------	------	-------	------	-------	------	------	------	------	------	-------	------	350	. 2
------	------	-------	------	------	------	180	1. 7	-------	------	------	------	------	------	-------	------	260	. 1
------	------	-------	------	------	------	-------	------	110	. 9	------	------	------	------	260	1. 0	930	. 5
------	------	-------	------	------	------	-------	------	30	. 2	------	------	------	------	130	. 5	280	. 2
------	------	-------	------	------	------	-------	------	-------	------	------	------	------	------	-------	------	40	(1)
------	------	30	. 2	------	------	120	1. 1	130	1. 1	110	1. 9	------	------	-------	------	600	. 3
40	. 7	20	. 1	------	------	60	. 6	50	. 4	110	1 9	40	6	-------	------	600	. 3
------	------	-------	------	------	------	-------	------	-------	------	30	. 5	------	------	-------	------	30	(1)
60	1. 0	40	. 2	30	. 6	130	1. 2	-------	------	------	------	30	. 5	-------	------	650	. 4
40	. 7	-------	------	------	------	90	. 8	-------	------	------	------	------	------	-------	------	330	. 2
50	. 9	20	. 1	50	1. 1	-------	------	-------	------	------	------	30	. 5	-------	------	190	. 1
------	------	-------	------	------	------	210	2. 0	-------	------	------	------	------	------	280	1. 1	730	. 4
------	------	-------	------	------	------	-------	------	-------	------	------	------	------	------	100	. 4	680	. 4
70	1. 2	160	. 9	20	. 4	80	. 7	70	. 6	70	1. 2	20	. 3	220	. 9	1, 310	. 7

TABLE 10.—*Acreage and proportionate extent, by counties, of soils*

Soil or land type	Capability class or subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Jefferson gravelly loam, 6 to 12 percent slopes	IIIe	120	1 0	210	1. 8	160	0 9	180	1 0	80	0 7	90	0 7
Jefferson gravelly loam, 6 to 12 percent slopes, eroded.	IIIe	60	. 5	30	3	60	3	60	3	40	3	40	. 3
Jefferson gravelly loam, 12 to 20 percent slopes.	IVe	40	3	50	. 4	40	2	30	. 2	20	2	20	. 1
Jefferson gravelly loam, 12 to 20 percent slopes, eroded.	IVe									10	. 1		
Jefferson stony loam, 12 to 20 percent slopes.	VIs									30	. 2		
Monongahela loam, 0 to 2 percent slopes.	IIw	70	6									70	. 5
Monongahela loam, 2 to 6 percent slopes	IIe											110	. 8
Monogahela fine sandy loam, 2 to 6 percent slopes.	IIe	50	. 4	60	5			40	2	80	7		
Monongahela fine sandy loam, 6 to 12 percent slopes	IIIe												
Monongahela silt loam, 0 to 2 percent slopes.	IIw							60	3				
Monongahela silt loam, 2 to 6 percent slopes.	IIe	150	1 2	90	. 8	160	. 8	60	3	100	. 8		
Monongahela silt loam, 6 to 12 percent slopes.	IIIe			20	. 2	60	. 3						
Newark silt loam	IIw	380	3 0							130	1. 1		
Philo fine sandy loam	I	180	1 4	160	1 4	540	2 9			110	9		
Philo silt loam	I	260	2 1	190	1 7	620	3. 3	120	7	160	1 3	110	. 8
Pope gravelly fine sandy loam	IIs	480	3 8	1, 290	11 2	880	4 7	770	4 2	390	3. 3	570	4. 1
Pope fine sandy loam, 0 to 2 percent slopes.	I	1, 360	10 9	1, 350	11 8	3, 240	17. 3	1, 870	10 3	1, 380	11 5	1, 780	13 0
Pope fine sandy loam, 6 to 12 percent slopes	IIe	540	4 3	300	2 6	280	1 5	620	3 4	230	1 9	700	5 1
Pope silt loam, 0 to 2 percent slopes.	I	1, 140	9. 1	1, 360	11. 8	3, 140	16 8	1, 720	9. 4	690	5 8	1, 310	9 5
Pope silt loam, 6 to 12 percent slopes.	IIe			260	2 3	340	1 8	480	2 6			400	3. 0
Purdy silt loam	IVw							110	. 6			80	. 6
Riverwash	VIIs			50	. 4	200	1 1						
Sequatchie fine sandy loam, 0 to 2 percent slopes.	I	380	3 0	180	1 6	240	1 3	420	2 3	420	3 5	340	2. 5
Sequatchie fine sandy loam, 2 to 6 percent slopes.	IIe	460	3 7	100	9	300	1 6	520	2 9	80	. 7	410	3 0
Sequatchie fine sandy loam, 6 to 12 percent slopes.	IIIe			100	9	60	. 3	120	7			110	. 8
Stendal gravelly fine sandy loam	IIw	360	2 9	120	1 0	540	2 9	560	3 1	360	3 0	450	3. 3
Stendal fine sandy loam	IIw	540	4 3	470	4 1	1, 340	7 2	920	5 1	490	4 1	860	6. 3
Stendal silt loam	IIw	880	7 0	990	8. 6	2, 300	12 3	1, 130	6 2	620	5 2	1, 100	8 0
Tyler silt loam	IIIw	390	3 1	140	1 2	80	4	220	1 2	350	3 0	220	1. 6
Whitwell loam	IIw	120	1 0	290	2 5	480	2 6	470	2 6	230	1 9	270	2. 0
Zaleski silt loam, 2 to 6 percent slopes	IIe							80	. 4			70	5
Total		12, 510	100. 0	11, 480	100 0	18. 740	100. 0	18, 210	100 0	11, 960	100 0	13, 740	100. 0

[1] Less than 0 1 percent.

and land types in the (Ps) *Pope-Allegheny soil association*—Continued

Knott		Lawrence		Leslie		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
130	2 2	220	1 2	90	1 9	60	0 6	200	1 6	80	1 4	100	1 6	220	0. 9	1, 940	1 1
80	1 4	------	------	70	1 5	30	3	------	------	20	. 3	70	1 1	130	. 5	690	4
60	1 0	30	2	40	8	20	2	50	4	20	. 3	------	------	40	. 2	460	3
------	------	------	------	------	------	------	------	------	------	------	------	10	2	------	------	20	(1)
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	30	(1)
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	140	. 1
------	------	------	------	------	------	------	------	------	------	110	1 9	------	------	------	------	220	1
30	5	------	------	------	------	------	------	100	8	------	------	------	------	50	. 2	410	. 2
------	------	------	------	------	------	------	------	70	6	------	------	------	------	------	------	70	(1)
------	------	------	------	------	------	80	7	------	------	------	------	------	------	80	. 3	220	. 1
30	. 5	70	4	30	6	100	. 9	60	5	------	------	30	5	80	. 3	960	. 5
40	. 7	------	------	30	6	------	------	------	------	------	------	------	------	------	------	150	. 1
------	------	------	------	------	------	90	9	------	------	------	------	------	------	110	. 4	710	. 4
80	1 4	190	1 0	50	1 1	130	1 2	300	2 5	------	------	60	1 0	------	------	1, 800	1. 0
100	1. 7	70	4	90	2 0	190	1 8	230	1 9	80	1 4	100	1. 6	210	8	2, 530	1 5
400	6 9	220	1 2	240	5 1	260	2 5	400	3 3	140	2. 4	270	4. 3	1, 050	4 2	7, 360	4 2
740	12 7	1, 490	8 2	600	12 7	1, 440	13 6	1, 950	16 0	680	11 6	660	10 5	2, 250	9 0	20, 790	11. 9
150	2. 6	400	2. 2	130	2 7	240	2 3	190	1 5	210	3. 6	170	2. 7	760	3 1	4, 920	2. 8
690	11 9	2, 770	15 2	570	12 1	810	7 7	1, 110	9. 1	630	10 7	620	9. 9	1, 980	8. 0	18, 540	10. 6
130	2 2	170	. 9	110	2 3	110	1 0	------	------	------	------	120	1 9	600	2. 4	2, 720	1 6
------	------	------	------	------	------	------	------	------	------	60	1. 0	------	------	120	. 5	370	. 2
70	1 2	------	------	60	1. 3	40	4	110	9	80	1. 4	40	. 6	200	. 8	850	. 5
110	1 9	180	1 0	100	2 1	380	3 6	260	2 1	160	2. 7	100	1. 6	530	2. 1	3, 800	2 2
80	1 4	610	3 3	60	1 3	80	. 7	330	2 7	170	2 9	80	1 3	770	3. 1	4, 050	2. 3
90	1 6	------	------	70	1 5	------	------	------	------	80	1 4	110	1 7	160	7	900	5
60	1 0	------	------	60	1. 3	310	2 9	550	4 5	90	1 5	60	. 9	850	3 4	4, 370	2 5
290	5 0	470	2 6	90	2 0	800	7 6	1, 570	12 8	320	5 5	90	1 4	1, 150	4 6	9, 400	5. 4
420	7 2	1, 560	8 5	350	7 4	610	5 8	760	6 2	390	6. 7	390	6 2	1, 530	6 2	13, 030	7 4
90	1 6	270	1 5	100	2 1	290	2 7	150	1 2	80	1 4	130	2 1	300	1 2	2, 810	1. 6
150	2 6	750	4 1	130	2 7	------	------	530	4 3	160	2 7	130	2 1	770	3 1	4, 480	2 5
------	------	110	6	------	------	210	2 0	------	------	------	------	------	------	90	. 4	560	. 3
5,810	100 0	18, 240	100 0	4, 720	100 0	10, 600	100 0	12, 230	100 0	5, 850	100 0	6, 270	100 0	24, 900	100 0	175, 260	100 0

TABLE 11.—*Acreage and proportionate extent, by counties, of*

[Dashed lines indicate soil does not occur in county.

Soil or land type	Capability subclass	Bell		Breathitt		Clay		Floyd		Harlan		Johnson	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Dekalb fine sandy loam, 12 to 20 percent slopes	VIe	------	------	------	------	60	2 8	------	------	------	------	------	------
Dekalb stony loam, 12 to 20 percent slopes	VIs	------	------	90	1 9	40	1. 9	40	0. 5	------	------	20	0. 5
Dekalb stony loam, 12 to 20 percent slopes, severely eroded.	VIIs	------	------	------	------	------	------	------	------	------	------	------	------
Dekalb stony loam, 20 to 30 percent slopes	VIIs	140	2 2	60	1. 2	70	3 3	110	1 4	140	1. 5	70	1. 8
Dekalb stony loam, 20 to 30 percent slopes, severely eroded.	VIIs	80	1 2	------	------	20	1 0	40	. 5	20	. 2	30	. 8
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes.	VIIs	100	1 5	260	5 3	30	1 4	250	3 1	460	5. 0	100	2. 6
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes, severely eroded.	VIIs	------	------	60	1. 2	------	------	50	. 6	100	1. 1	------	------
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes.	VIIs	210	3 2	430	8 8	20	1. 0	370	4. 6	440	4. 8	300	7. 7
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes, severely eroded	VIIs	------	------	90	1. 8	------	------	130	1. 6	100	1. 1	50	1. 3
Muskingum-Gilpin silt loams, 6 to 12 percent slopes	IIIe	------	------	40	. 8	------	------	------	------	------	------	20	. 5
Muskingum-Gilpin silt loams, 6 to 12 percent slopes, severely eroded.	IVe	------	------	------	------	------	------	------	------	------	------	------	------
Muskingum-Gilpin silt loams, 12 to 20 percent slopes.	IVe	100	1. 5	------	------	30	1 4	20	. 3	40	. 4	30	. 8
Muskingum-Gilpin silt loams, 12 to 20 percent slopes, severely eroded	VIe	------	------	------	------	20	1. 0	------	------	------	------	------	------
Muskingum-Gilpin silt loams, 20 to 30 percent slopes	VIe	100	1. 5	------	------	------	------	30	. 4	60	. 7	------	------
Rock land	VIIs	5, 840	88 9	3, 870	79. 0	1, 810	86 2	6, 970	87 0	7, 820	85. 2	3, 260	84. 0
Total		6, 570	100 0	4, 900	100 0	2, 100	100 0	8, 010	100. 0	9, 180	100 0	3, 880	100. 0

[1] Less than 0.1 percent.

Forestry, wildlife, and recreation are good uses for soils in this association. Many small, fairly smooth areas of Dekalb, Muskingum, Berks, and Jefferson soils occur throughout the association and are fair to good for pasture and meadow. The Pope, Stendal, and other soils on the narrow flood plains produce good to high yields of many kinds of crops.

About 94 percent of this soil association consists of soils in capability subclass VIIs, and 1 percent, of soils in subclass VIe. The remaining 5 percent of the association consists of soils in capability subclasses IIe, IIw, IIs, IIIe, IIIw, IVe, IVw, IVs, and VIIe, and of small areas of miscellaneous land.

(Dg) Dekalb-Muskingum-Gilpin-Jefferson association: Dominantly steep, moderately deep, silty soils in hilly areas

This soil association occurs only in Johnson and Lawrence Counties. It is hilly and is dissected by many small streams. Valleys and ridgetops are narrow, and side slopes are steep. The valley floors are flood plains that are bordered by strongly sloping colluvial soils. Figure 4 shows the relationship of the major soils in this association to the parent material and topography.

The Dekalb soils, which make up about 46 percent of the soil association, are on ridgetops and moderately steep to steep side slopes. These soils are excessively drained, are moderately deep to shallow, and are underlain by sandstone and siltstone. Their surface soil is fine sandy loam or loam; their subsoil contains many stone fragments.

The Muskingum soils are somewhat excessively drained. They account for about 26 percent of the association, and they occur with the Gilpin soils on ridgetops and on moderately steep to steep side slopes. The Muskingum soils have a silt loam surface layer and subsoil and are moderately deep to shallow over siltstone and shale. Some areas are stony, and a few rocks crop out in places.

The Gilpin soils, which are well drained and somewhat excessively drained, amount to about 7 percent of the soil association. They occur with the Muskingum soils on the ridgetops and moderately steep to steep side slopes. Generally, Gilpin soils are moderately deep over siltstone and shale. They have a surface layer of silt loam and a subsoil of heavy silt loam or light silty clay loam.

Jefferson soils make up approximately 6 percent of the association and occur on the lower foot slopes. They are deep, are well drained, and generally have a gravelly loam surface layer and a clay loam or loam subsoil.

The Pope soils account for about 3 percent of the association and occur on bottoms along the streams. These soils are deep, are well drained, and generally have a silt loam to fine sandy loam surface layer and subsoil.

soils and a land type in the (Rd) *Rock land-Dekalb soil association*

Acreages are based on detailed soil surveys of sample areas]

Knott		Lawrence		Leslie		Letcher		Magoffin		Martin		Perry		Pike		Total	
Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
																60	0. 1
210	3 1	40	1 1	220	3. 1	90	1 4			60	0 7	240	3 0	60	0. 7	1, 110	1. 3
						40	. 6									40	(1)
160	2. 3	70	2. 0	170	2 4	80	1 3	60	6 0	140	1 6	180	2 3	120	1. 5	1, 570	1. 9
						50	8			50	. 6			60	. 7	350	. 4
260	3 8	140	4. 0	380	5 4	130	2. 1			230	2 7	420	5 3	240	2. 9	3, 000	3 6
120	1 7			120	1. 7			40	4 0	80	. 9	140	1. 8			710	. 8
190	2. 8	330	9. 3	260	3. 7	330	5. 2			780	9 1	300	3 8	640	7 7	4, 600	5. 5
150	2. 2			200	2 9					150	1 8	220	2. 8	120	1. 4	1, 210	1. 4
20	. 3											20	. 3			100	. 1
10	. 1											20	. 3			30	(1)
20	. 3	20	. 6	40	. 6			40	4. 0	30	. 4	20	. 2	20	. 2	410	. 5
20	. 3			10	. 1							20	2			70	. 1
40	. 6			40	. 6			30	3. 0	90	1 1	40	. 5			430	. 5
5, 660	82 5	2, 950	83 1	5, 570	79. 5	5, 590	88 6	830	83 0	6, 930	81. 1	6, 280	79 5	7, 070	84 9	70, 450	83. 7
6, 860	100 0	3, 550	100. 0	7, 010	100 0	6, 310	100. 0	1, 000	100. 0	8, 540	100 0	7, 900	100 0	8, 330	100. 0	84, 140	100. 0

The following soils make up the remaining 12 percent of the association: Wellston, Rarden, and Tilsit soils on the gently sloping to strongly sloping ridgetops; Allegheny, Holston, Monongahela, Tyler, Hayter, Barbourville, Sequatchie, Whitwell, Zaleski, and Cotaco soils on the lower benches and foot slopes; and the Stendal and Atkins soils on the stream bottoms.

The soils in this association are mainly in mixed stands of hardwoods, but some areas have been cleared and are used for pasture or are left idle. The Dekalb, Muskingum, Berks, and Gilpin soils are droughtly and low in natural fertility. Jefferson soils on the foot slopes are moderately low to moderately high in natural fertility and respond to fertilization and liming. The other soils in this association range from moderately low to moderately high in natural fertility. The erosion hazard is moderately severe on the steeper slopes.

Although a considerable acreage of the soil association is fair to good for pasture, meadow, and certain horticultural crops, the best general use is probably forestry. Good to high yields of corn, tobacco, and vegetables could be produced on the Pope, Jefferson, and other soils on the flood plains and on the lower foot slopes and alluvial fans.

Approximately 54 percent of the soils in this soil association are in capability subclass VIIs, 17 percent in subclass VIe, 9 percent in subclass IVe, and 8 percent in subclass IIIe. The remaining 12 percent consists of soils in class I and in subclasses IIe, IIw, IIs, IIIw, VIs, and VIIe.

(Gd) **Gilpin-Upshur-Dekalb association: Dominantly steep, moderately deep, silty soils and silty clays in hilly areas**

This soil association is a rough, broken, hilly area in Lawrence County. It has been dissected by small streams that have cut narrow, steep-sided valleys and have left narrow ridgetops above the valleys. Some of the ridgetops are stony, and sandstone crops out on the side slopes in a few places. The narrow valley floors are flood plains bordered by sloping to strongly sloping soils in colluvium. Figure 5 shows the relationship of the major soils in this association to parent material and topography.

Gilpin and Upshur soils account for about 83 percent of the total acreage in the association. These soils are in intricate patterns in more than three-fourths of their acreage and cannot be shown separately, even on a detailed soil map.

About one-seventh of the acreage in Gilpin and Upshur soils is uniformly Gilpin soil, and a very small part is uniformly Upshur soil.

Dekalb soils occupy 9 percent of the association, Muskingum soils 2 percent, and Hayter and Pope soils each about 1 percent. Totaling 4 percent are small areas of

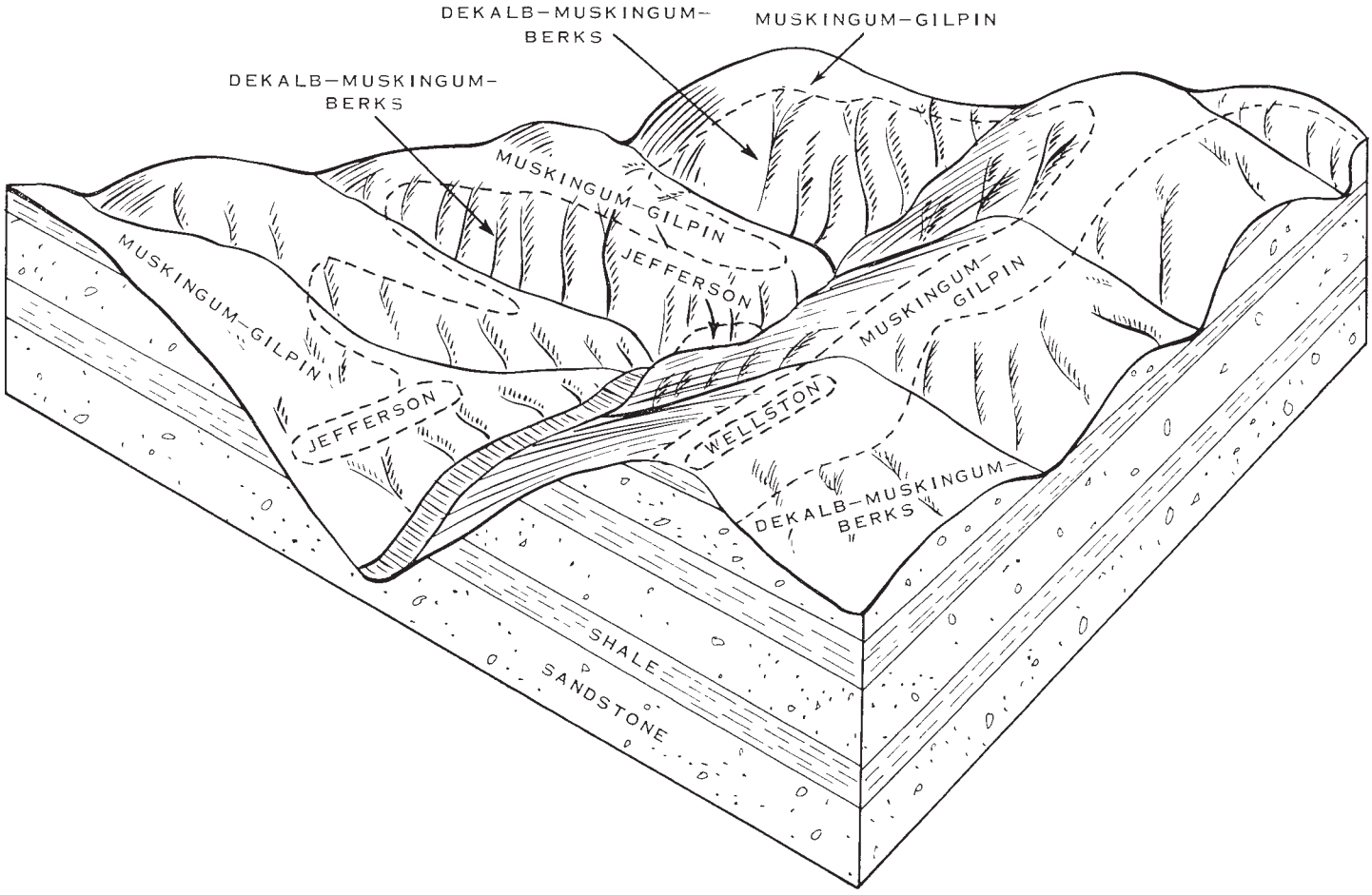

Figure 4.—**Relative position of the major soils in the** (Dg) **Dekalb-Muskingum-Gilpin-Jefferson association and their relation to the parent material and topography.**

Allegheny, Barbourville, Berks, Cotaco, Philo, Rarden, Stendal, Tilsit, and Wellston soils.

Gilpin soils are well drained or somewhat excessively drained, range from moderately deep to shallow, and make up approximately 50 percent of the soil association. They have a silt loam surface layer and a heavy silt loam to light silty clay loam subsoil underlain by a mixture of siltstone and brittle shale.

Upshur soils are well drained or somewhat excessively drained and are dominantly deep over weakly calcareous, soft, red shale. They make up about 33 percent of the association. The surface layer of these soils is silty clay in most places, but in uneroded areas it is silty clay loam. The subsoil is clay.

Dekalb soils are shallow to moderately deep over sandstone and siltstone. They have a fine sandy loam or loam surface layer and a subsoil that contains many stone fragments.

About one-fifth of the intermingled acreage of the Gilpin and Upshur soils is severely eroded, and nearly all of it has been cleared and is idle or is used for pasture. In natural fertility Muskingum, Dekalb, Gilpin, and Rarden soils are low; Pope, Philo, and Stendal soils are moderately high; and Hayter, Upshur, and the other soils of the association are moderate. Soils of this association generally respond to good management, but the erosion hazard is severe on the steeper slopes. Although the soils are generally best used as woodland, fair yields of pasture can be produced on most of the soils on uplands. Good to high yields of many crops and of meadow can be produced on Pope and Stendal soils on the narrow flood plains.

Approximately 59 percent of the association is in soils of capability subclass VIIe, 20 percent in subclass VIe, 10 percent in subclass VIIs, and 5 percent in subclass IIIe. The remaining 6 percent consists of soils in capability subclasses IIe, IIw, IVe, and VIs.

(Gw) Gilpin-Upshur-Wellston-Muskingum association: Dominantly moderately deep to deep, silty and clayey soils on sloping to strongly sloping ridgetops in hilly areas

This soil association is sloping to strongly sloping and is on broad ridgetops in hilly areas. (See figure 5.) It is generally above the (Dg) Dekalb-Muskingum-Gilpin-Jefferson association and the (Gd) Gilpin-Upshur-Dekalb association. It occurs as tracts of 40 acres or less that are widespread in the northern part of Lawrence County.

Gilpin and Upshur soils make up about 50 percent of the total acreage in the association. These soils are in intricate patterns in nearly half of their acreage and cannot be shown separately even on a detailed soil map. In these patterns the Gilpin soils are somewhat more extensive than

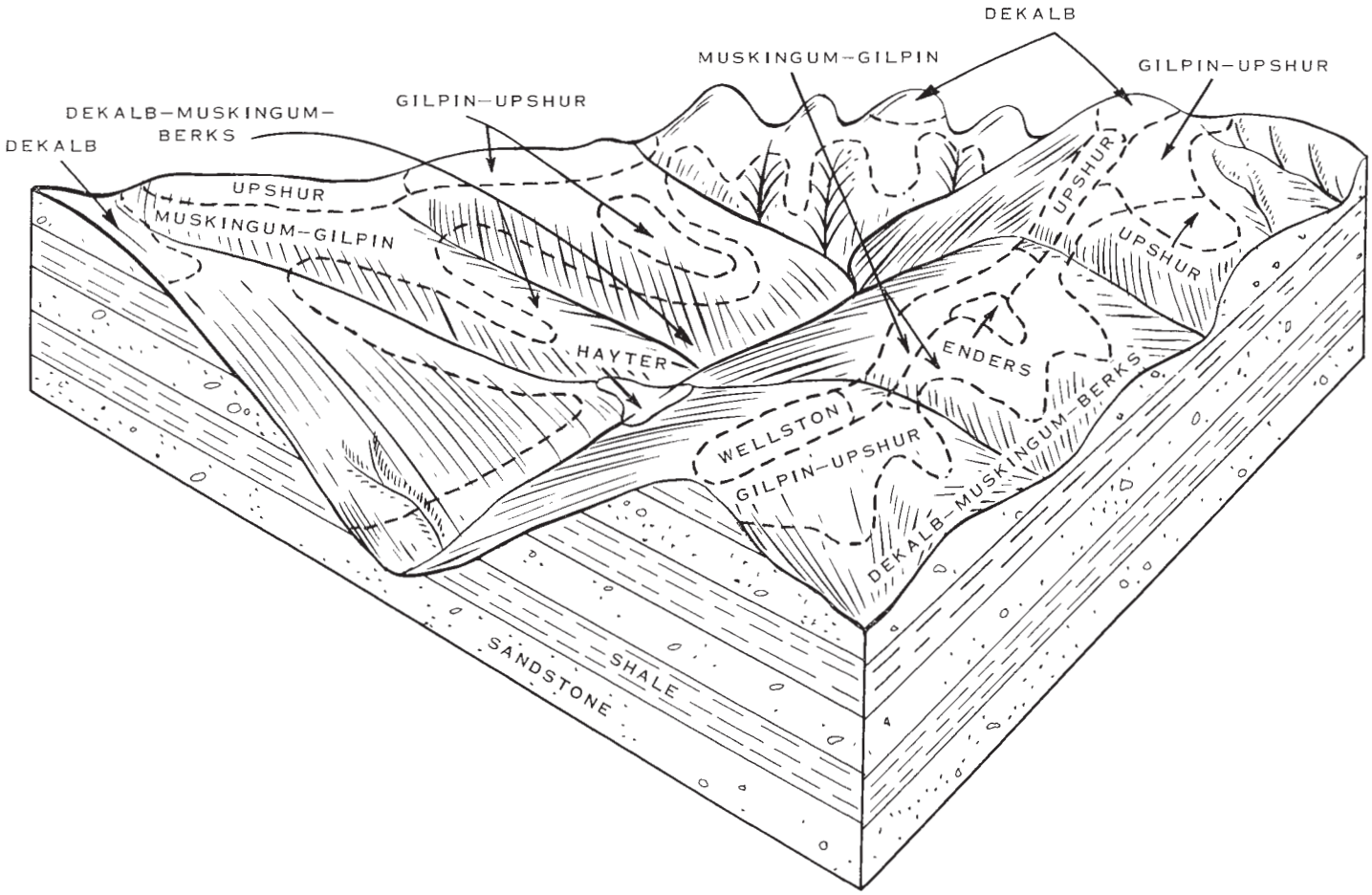

***Figure 5.*—Relative position of major soils, and their relation to parent material and topography, in the** (Gd) **Gilpin-Upshur-Dekalb association on steep slopes and in the** (Gw) **Gilpin-Upshur-Wellston-Muskingum association on broad ridgetops.**

the Upshur. In the rest of their acreage, about one-third is uniformly Gilpin soils, and about one-sixth is uniformly Upshur soils.

Wellston soils occupy 16 percent of this soil association, Muskingum soils 16 percent, Enders soils 7 percent, Dekalb soils 6 percent, Tilsit soils 3 percent, and Rarden soils 2 percent.

Gilpin soils are well drained or somewhat excessively drained and make up approximately 27 percent of the association. They occupy ridgetops and are generally moderately deep over siltstone and shale. They have a silt loam surface layer and a heavy silt loam or light silty clay loam subsoil.

Upshur soils are well drained or somewhat excessively drained and are dominantly deep over weakly calcareous, soft, red shale. Their surface layer is mostly silty clay loam, and their subsoil is clay. They occupy about 23 percent of the association.

Wellston soils are well drained and are moderately deep over sandstone and shale. They have a silt loam surface layer and a silty clay loam subsoil.

The Muskingum soils are somewhat excessively drained and range from moderately deep to shallow. They have a silt loam surface layer and subsoil and are underlain by siltstone mixed with brittle shale.

About half the acreage of intricately mixed Gilpin and Upshur soils has been cleared and is used for crops and pasture. Most of the rest of the association is in hardwood forest. In natural fertility the Dekalb, Muskingum, and Rarden soils are low and the Gilpin, Upshur, Wellston, Enders, and Tilsit soils are moderate. All the soils in this association respond to good management. Those on the steeper slopes, however, are susceptible to moderately severe erosion and are best suited to pasture, meadow, and forest. They are poorly suited to most cultivated crops but produce fair yields of hay and pasture.

About 32 percent of this soil association is in soils of capability subclass VIe, 32 percent in subclass IVe, and 30 percent in subclass IIIe. The remaining 6 percent consists of soils in capability subclasses IIe and VIs.

(Jm) Jefferson-Muskingum-Holston-Dekalb association: Dominantly deep to moderately deep, loamy and silty soils on lower side slopes and benches in mountainous areas

This is a sloping to moderately steep soil association between steep uplands and broad stream bottoms. It is mainly in small areas along the major streams and around the head of those streams. The soils were derived mainly from sandstone and shale. Figure 6 shows the relationship of the major soils in this association to parent material and topography.

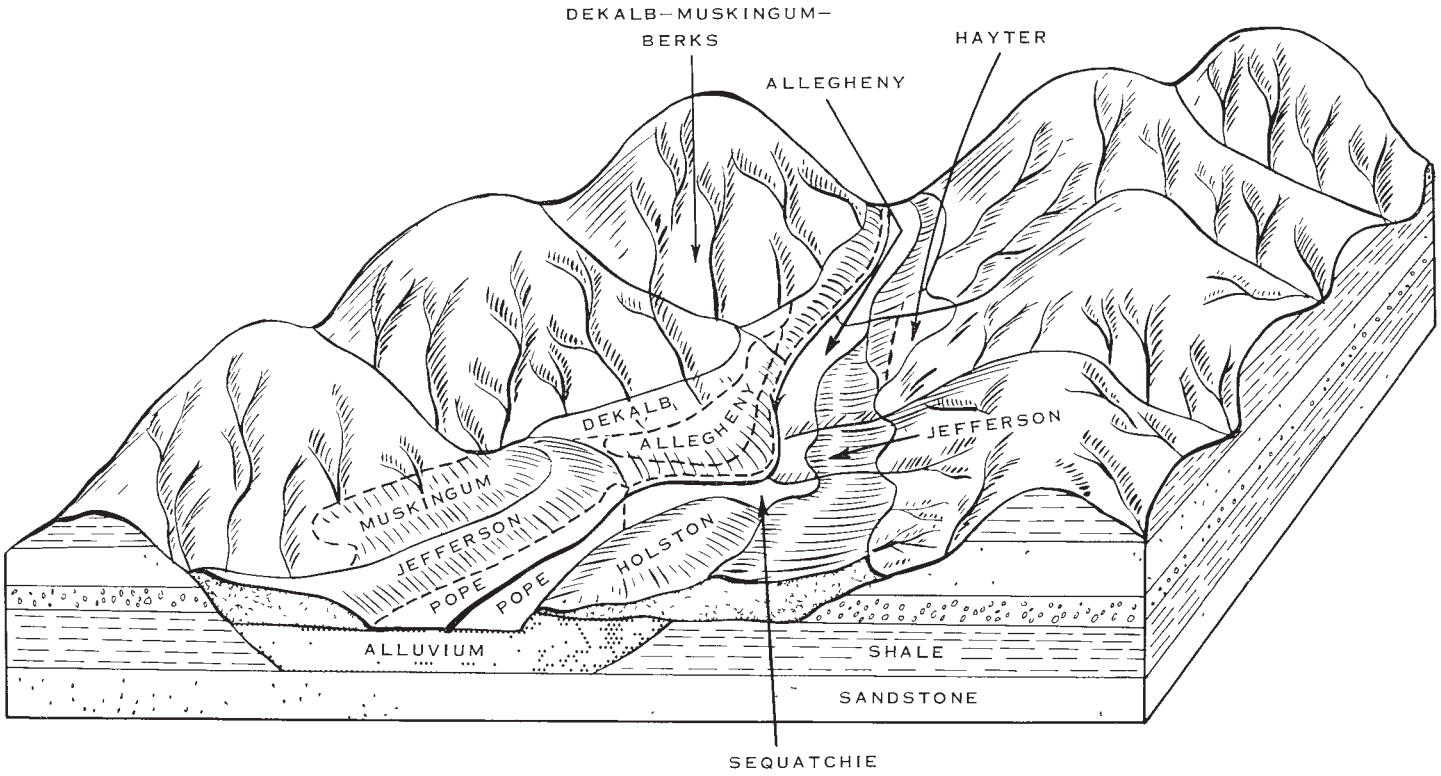

***Figure 6.*—Relative position of major soils, and their relation to parent material and topography, in the (Jm) Jefferson-Muskingum-Holston-Dekalb association.**

Jefferson soils make up about 32 percent of the association and occur on foot slopes below steeper Muskingum and Dekalb soils. Jefferson soils are generally deep and have a gravelly loam surface layer over a clay loam or loam subsoil. About 30 percent of their acreage in this association is stony.

Muskingum soils account for approximately 12 percent of the association and occur on the lower slopes of uplands. These soils are generally moderately deep and have a silt loam or loam surface layer and a silt loam subsoil. In this association about 40 percent of their acreage is stony.

Holston soils make up 11 percent of the association and occur on benches along the major streams. These soils are deep and generally have a surface layer of fine sandy loam, loam, or silt loam and a subsoil of fine sandy clay loam or silty clay loam.

Dekalb soils amount to 9 percent of the association and occur on the lower slopes of uplands. In this association Dekalb soils are moderately deep. They have a fine sandy loam or loam surface layer and subsoil. Approximately 50 percent of their acreage is stony.

Also in this soil association are Barbourville soils on alluvial fans and Allegheny soils on stream terraces. These soils make up 8 percent of the association.

Approximately 19 percent of the association is made up of Wellston soils on some of the lower ridgetops; Sequatchie, Monongahela, Whitwell, Tyler, Hayter, Cotaco, Muse, and Zaleski soils on the lower benches and foot slopes; and Pope, Philo, Stendal, Atkins, Huntington, Newark, and Bruno soils on the narrow flood plains.

The following kinds of miscellaneous land make up 9 percent of this association: (1) Built-up areas consisting of villages, towns, mining camps, and railroad and highway rights-of-way on lower foot slopes and flood plains; and (2) Strip mines consisting of areas in which the overburden of soil and rock has been removed from the underlying coal.

Most soils of this association have been cleared and are farmed. The gently sloping soils are used for row crops, and the strongly sloping soils are used for meadow and pasture. The deep, well-drained soils on foot slopes, benches, and flood plains respond well to fertilization and other good management.

The Dekalb and Muskingum soils are droughty and have low natural fertility. The erosion hazard is moderately severe on the steep slopes. Natural fertility ranges from moderately low to moderately high in the Jefferson soils on foot slopes and in the Holston soils on the lower benches, as well as in other soils on foot slopes, lower benches, and flood plains. This soil association is generally best suited to pasture and horticultural crops. Under good management, fair to good yields can be obtained on the Dekalb, Muskingum, Jefferson, and Holston soils.

Approximately 21 percent of the association is in soils of capability subclass IIIe, 18 percent in subclass IVe, 11 percent in subclass VIe, 10 percent in subclass VIs, 10 percent in subclass IIe, 9 percent in subclass VIIs, and 5 percent in subclass IIw. The remaining 16 percent of the association is made up of soils in subclasses IIs, IIIw, IIIs, and VIIe, and of miscellaneous land.

(Md) **Muskingum-Dekalb-Gilpin-Wellston association: Dominantly moderately deep soils on sloping to moderately steep mountainous ridgetops**

This soil association is sloping to moderately steep and occupies the broad ridgetops. (See figure 3.) It is in fairly small, scattered areas in the mountainous parts of all 14 counties.

Muskingum and Dekalb soils are somewhat excessively drained and generally occupy strong slopes. The Muskingum soils amount to about 37 percent of the association. They are moderately deep to shallow over mixed siltstone and shale and have a silt loam surface layer and subsoil. Some areas are stony.

The Dekalb soils occupy about 32 percent of the association and are stony in many places. These soils are moderately deep to shallow over sandstone and siltstone and have a fine sandy loam or loam surface layer and subsoil.

Gilpin soils are well drained or somewhat excessively drained and make up approximately 15 percent of the association. Generally these soils are moderately deep over siltstone and shale. They have a silt loam surface layer and a heavy silt loam or light silty clay loam subsoil.

Wellston soils, which amount to about 11 percent of the association, are gently sloping to strongly sloping. They are moderately deep and have a silt loam surface layer and a silty clay loam subsoil.

Rock land, which consists of many rock outcrops, stones, and boulders, interspersed with soil material, makes up about 1 percent of the association. The rest of the association is Rarden, Enders, and Tilsit soils on gentle to strong slopes.

The soils of this association are mostly in mixed stands of hardwoods, but a small acreage has been cleared and is used for pasture, or is idle. Muskingum, Dekalb, Gilpin, and Rarden soils are droughty and low in natural fertility; Wellston, Enders, and Tilsit soils are moderately fertile. Generally, the soils of this association respond to good management, but the erosion hazard is moderately severe on the steeper slopes. Because the association is on ridgetops, it is best suited to forestry and wildlife, though some areas accessible to roads are suited to pasture, meadow, and row crops.

Approximately 27 percent of this association is in soils of capability subclass IVe, 24 percent in subclass VIIs, 23 percent in subclass VIe, 15 percent in subclass IIIe, and 9 percent in subclass VIs. About 2 percent consists of soils in capability subclasses IIe and VIIe.

(Ps) **Pope-Stendal-Allegheny association: Deep, loamy soils on flood plains, benches, and lower foot slopes**

This soil association occurs along the large streams and consists of nearly level flood plains and gently sloping to sloping benches and foot slopes. The flood plains make up fairly broad valley floors. The soils in this association formed mostly from sandstone and shale materials that were brought in from the steep and very steep soils of the surrounding (Db) Dekalb-Muskingum-Berks association. Most of the (Ps) Pope-Stendal-Allegheny association is on level or nearly level bottom land along streams, but some is on low stream terraces and alluvial fans. The banks along the major streams are generally sandy and strongly sloping. Figure 7 shows the relationship of the major soils in this association to parent material and topography.

Pope soils account for about 34 percent of this soil association and occupy bottoms along the streams. These soils are deep and well-drained silt loams to fine sandy loams.

Stendal soils make up approximately 15 percent of the association and occur with the Pope soils in level or slightly depressed areas. Stendal soils are deep, are somewhat poorly drained, and range from silt loam to fine sandy loam.

Allegheny soils amount to 7 percent of the association and occur mostly on low stream terraces. These soils are deep and well drained. They generally have a silt loam or fine sandy loam surface layer and a fine sandy clay loam or light silty clay loam subsoil.

Miscellaneous land types make up 8 percent of the soil association. These are Built-up areas consisting of towns, villages, mining camps, coal tipples, and railroad and highway rights-of-way; Alluvial escarpments; and gravelly and sandy Riverwash.

Bruno soils account for about 6 percent of the association, Sequatchie soils 5 percent, and Atkins soils 4 percent. The remaining 21 percent of the association is made up of Jefferson, Hayter, Zaleski, Cotaco, Barbourville, Whitwell, Holston, Monongahela, Tyler, and Purdy soils on the lower foot slopes and benches; of Philo soils on the flood plains; and of Huntingon and Newark soils along some of the streams of Letcher, Pike, Harlan, and Bell counties.

Most of the soils in this association have been cleared and are used for row crops, meadow, and pasture. The Pope soils on the bottoms and Sequatchie soils on the low stream terraces are moderately high in natural fertility and respond to fertilization and other good management. The somewhat poorly drained Stendal soils are moderate in natural fertility. They are limited mostly by excess water but respond well to tile drainage. The soils in the association that are on the foot slopes, benches, and flood plains range from moderately low to moderately high in natural fertility. In the lower positions the soils are subject to frequent or to occasional overflow, depending on the size of the stream channel and the watershed. The soils in this association, however, are the most productive and most intensively cultivated in the survey area. The Pope, Stendal, and Allegheny soils produce good to high yields of meadow, pasture, corn, and specialized crops.

Approximately 31 percent of this association is in soils of capability class I, 19 percent in subclass IIw, 15 percent in subclass IIe, 6 percent in subclass IIIw, 6 percent in subclass VIIs, 5 percent in subclass IIIe, and 8 percent in miscellaneous land. The remaining 10 percent is made up of soils in capability subclasses IIs, IIIs, IVe, IVw, IVs, and VIs.

(Rd) **Rock land-Dekalb association: Extremely rocky land and very stony, shallow soils in mountainous areas**

This very rough, mountainous soil association occupies very steep side slopes and very narrow ridgetops. Most of it consists of rock outcrops and boulders interspersed with very stony, shallow soils that formed chiefly from sandstone and shale. Figure 8 shows the relationship of

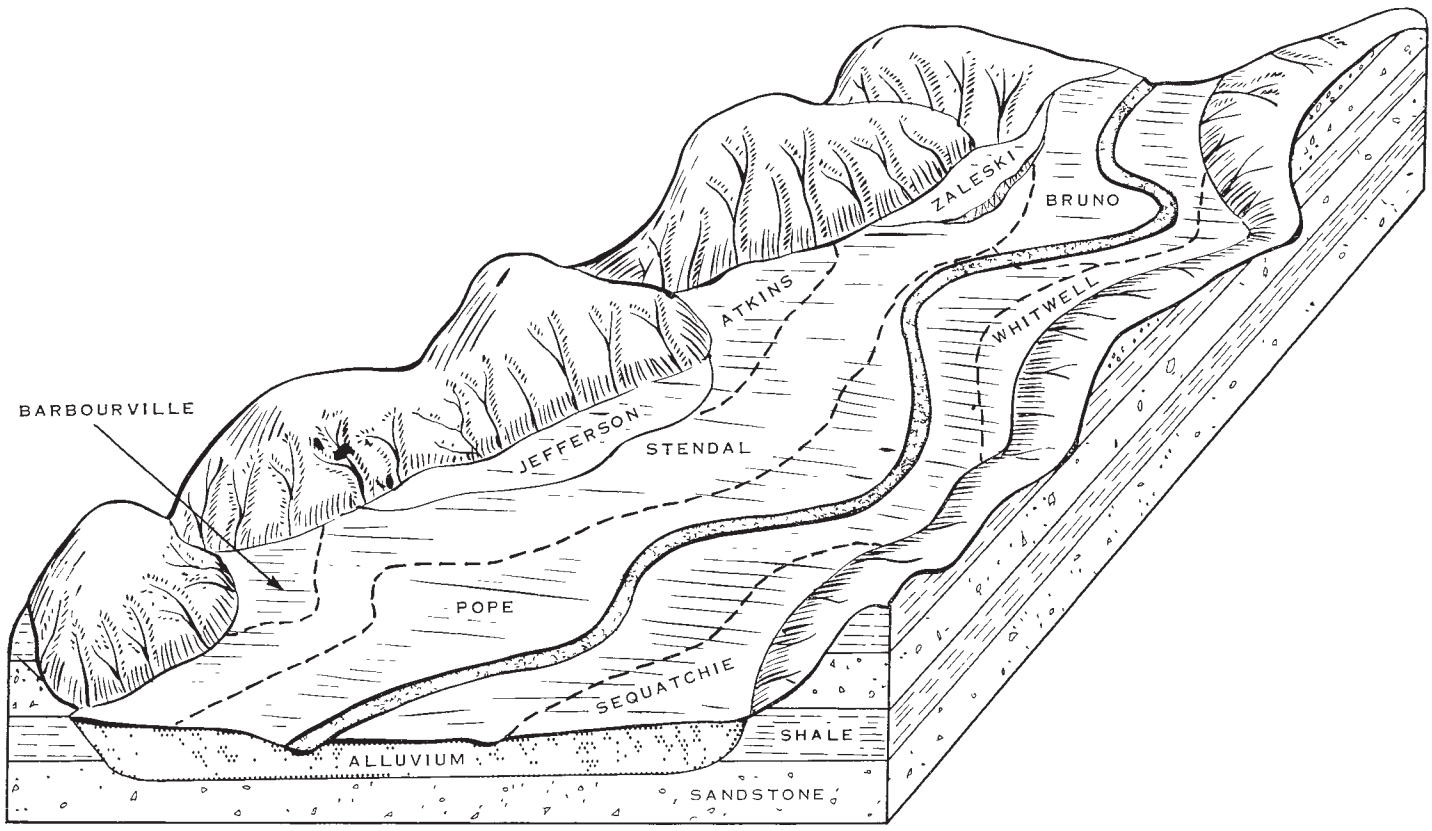

Figure 7.—Relative position of major soils, and their relation to parent material and topography, in the (Ps) Pope-Stendal-Allegheny association.

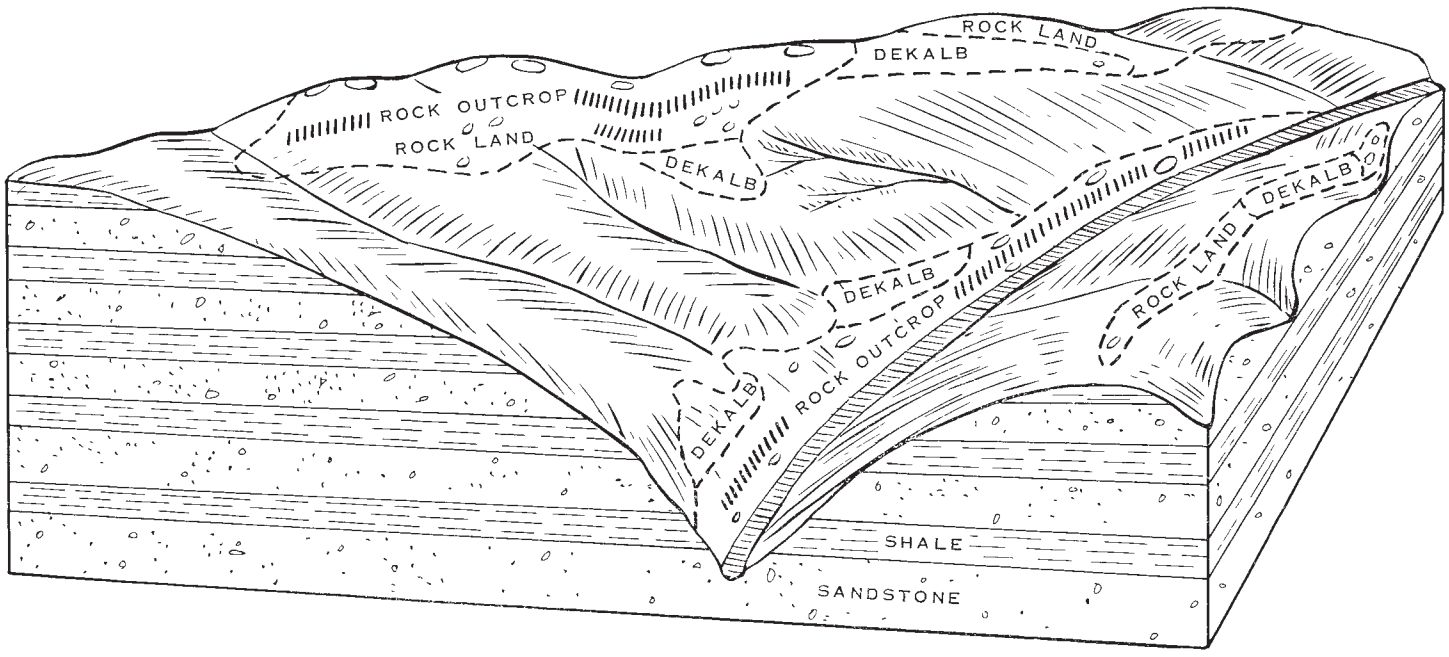

Figure 8.—Relative position of Rock land and the Dekalb soils, and their relation to parent material and topography, in the (Rd) Rock land-Dekalb association.

the major soils in this association to parent material and topography.

Rock land amounts to about 84 percent of this association; it is made up chiefly of massive ledges and boulders of sandstone and scattered areas of very stony fine sandy loam and very stony silt loam. Both limestone and sandstone crop out in small areas along the Pine Mountain fault in Bell, Harlan, Letcher, and Pike Counties.

Dekalb soils amount to about 16 percent of the association and occur mainly along the ridgetops. These soils are shallow to moderately deep over sandstone and siltstone. They have a very stony fine sandy loam to very stony loam surface soil and a fine sandy loam subsoil. In some places, however, the Dekalb soils are not stony. Because the scattered rock outcrops are large and numerous, use and management of the association is difficult. The outcrops are large boulders and ledges that cover more than 90 percent of the surface.

Most of the acreage in this soil association is in low-quality timber, but a few small, scattered areas have been cleared and are idle or have reverted to brush. A few parks and recreational sites have been developed, and many others could be. Uses for wildlife habitats and forestry are possible. Timber of fair to good quality could be produced in some coves and on some of the cool slopes. Silica is mined in a large deposit on the Pine Mountain range in Pike County, and further expansion of silica mining is probable.

Approximately 97 percent of this soil association is in soils of capability subclass VIIs, and 2 percent is in subclass VIs. The remaining 1 percent is in soils of capability subclasses IIIe, IVe, and VIe.

Descriptions of Soil Series and Land Types

Described in this section, in alphabetic order, are the soil series and miscellaneous land types determined to be of significant extent in the 14 counties of eastern Kentucky. The characteristics of these soil series and land types were learned by detailed sampling and observation at appropriate sites in the 14 counties.

The soil series are groups of soils, each group about alike in sequence of layers and in kind of parent material. Each kind of soil reflects the interaction of climate, vegetation, parent material, and relief through periods of time. This interaction takes place in the formation of any true soil. The miscellaneous land types, in contrast, are gullied areas, spoil around mine tipples, spoil left by strip mining, riverwash, rock outcrop, and similar areas either so recently worked or so little changed that they cannot be classified as soil.

The soil map that accompanies this report does not show soil series and miscellaneous land types. Nevertheless, the topographic position and relative extent of these are mentioned in the description of each soil association. (See pages 5 to 31.) Thus, for investigation or planning that requires more detailed information, many interpolations can be made by studying the following descriptions of the soil series and land types along with the map of soil associations and the descriptions of those associations. In the section "Use and Management of Soils," interpretations have been made for the probable major users in these 14 counties—those interested in improving production of forest, wildlife, horticultural crops, or field crops, and those who wish to find sites suitable for roads, ponds, drainageways, or other engineering structures.

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Allegheny Series

In the Allegheny series are deep, well-drained, nearly level to strongly sloping soils on stream terraces. These soils formed in material derived from acid sandstone and shale. Uneroded areas normally have a surface layer of dark-brown fine sandy loam, loam, or silt loam. The subsoil is strong-brown fine sandy clay loam or silty clay loam.

Allegheny soils occur in close association with the Holston, Monongahela, Tyler, and Purdy soils. They are leached less than the Holston soils and have a darker and browner surface soil and subsoil. They are better drained than the Monongahela, Tyler, and Purdy soils and, unlike those soils, do not have a fragipan.

Allegheny soils occupy a small total acreage scattered in small areas along major streams in the (Db) Dekalb-Muskingum-Berks, (Dg) Dekalb-Muskingum-Gilpin-Jefferson, (Jm) Jefferson-Muskingum-Holston-Dekalb, and (Ps) Pope-Stendal-Allegheny soil associations. For the most part, they have been cleared of their native mixed hardwoods and are now used for row crops and meadow. Good yields of row crops can be obtained on the milder slopes, but the steeper slopes are better suited to meadow.

Profile description of Allegheny loam, 2 to 6 percent slopes:

0 to 8 inches, dark-brown, very friable loam.
8 to 15 inches, yellowish-brown, friable loam to fine sandy clay loam.
15 to 36 inches +, strong-brown, friable fine sandy clay loam with subangular blocky structure.

Allegheny soils have a deep root zone, moderate permeability, very high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderate in fertility and are strongly acid. They respond well to liming and fertilization and are easy to keep in good tilth.

Alluvial Escarpment

This land type is recent alluvium on moderately steep to steep riverbanks. It is generally stratified and varies widely in texture. Although this land is frequently flooded and is likely to change, most areas have some value for agriculture. Approximately 9,930 acres of Alluvial escarpment occurs in this part of Kentucky.

Atkins Series

In the Atkins series are poorly drained, nearly level alluvial soils that formed on stream bottoms in material derived from acid sandstone and shale. These soils have a grayish-brown fine sandy loam or silt loam surface layer and a grayish-brown to light grayish-brown fine sandy loam or silt loam subsoil.

The Atkins soils occur with the Stendal, Philo, Pope, and Bruno soils but are less well drained than those soils and are mottled throughout the profile.

Atkins soils occur throughout the survey area, though their total acreage is small. Most of the acreage is in the

(Ps) Pope-Stendal-Allegheny soil association, but small areas are in the (Db) Dekalb-Muskingum-Berks, the (Dg) Dekalb-Muskingum-Gilpin-Jefferson, and the (Jm) Jefferson-Muskingum-Holston-Dekalb soil associations. For the most part, these soils have been cleared of their native mixed hardwoods and are now used for pasture and cultivated crops. Effectively drained areas can be used for row crops, but undrained areas are best suited to pasture.

Profile description of Atkins fine sandy loam:

0 to 12 inches, dark grayish-brown, friable fine sandy loam mottled with light gray.
12 to 34 inches, light brownish-gray fine sandy loam mottled with light gray and yellowish brown; mottles are many and distinct.
34 to 55 inches +, mottled light-gray and light olive-brown fine sandy loam.

Atkins soils have a deep root zone, moderate permeability, moderately high moisture-supplying capacity, and low organic-matter content. They are acid and moderately low in fertility. Wetness is their major limitation, but drained areas respond favorably to liming and fertilization.

Barbourville Series

The Barbourville series consists of deep, well-drained, gently sloping to sloping colluvial soils that formed in material derived from acid sandstone and shale. Normally the surface layer of these soils is dark grayish-brown to very dark grayish-brown gravelly loam, and the subsoil is dark-brown to dark yellowish-brown silt loam or clay loam.

Barbourville soils occur with the Cotaco, Zaleski, and Jefferson soils. They are better drained than the Cotaco and Zaleski soils. Their surface layer is darker than that of the Jefferson soils, and their profile is less developed.

Barbourville soils have a fairly large total acreage in the survey area. They occur throughout the area, mainly in the (Db) Dekalb-Muskingum-Berks, the (Dg) Dekalb-Muskingum-Gilpin-Jefferson, the (Gd) Gilpin-Upshur-Dekalb, the (Jm) Jefferson-Muskingum-Holston-Dekalb, and the (Ps) Pope-Stendal-Allegheny soil associations. Most of the acreage has been cleared of its native mixed hardwoods and is used primarily for cultivated crops. Good to high yields of row crops and vegetables can be obtained.

Profile description of Barbourville gravelly loam, 6 to 12 percent slopes:

0 to 11 inches, very dark grayish-brown gravelly loam with granular structure.
11 to 23 inches, dark-brown gravelly loam with weak, subangular blocky structure.
23 to 33 inches, dark-brown gravelly clay loam with subangular blocky structure.
33 to 40 inches +, yellowish-brown gravelly clay loam with a few brownish-gray mottles.

Barbourville soils have a deep root zone, moderately rapid permeability, moderately high moisture-supplying capacity, and medium organic-matter content. They are moderate in natural fertility and are medium acid or strongly acid. These soils respond well to fertilization and other good management and are easily kept in good tilth.

Berks Series

Soils of the Berks series are moderately deep, excessively drained, and steep or very steep. They developed on the uplands in material that weathered from siltstone and shale. Uneroded areas of these soils normally have a dark grayish-brown stony silt loam surface layer. In most places the subsoil is yellowish-brown silt loam containing many fragments of siltstone and shale.

The Berks soils occur with the Dekalb and Muskingum soils. They are somewhat less excessively drained and finer textured throughout than the Dekalb soils and contain more coarse fragments in the subsoil, or B horizon, than the Muskingum soils.

Berks soils are common on steep slopes in most associations in the survey area, but they have a smaller total acreage than the Muskingum soils. They are covered mainly by mixed stands of hardwoods, but scattered areas have been cleared and are used for pasture or are left idle. Because these soils are steep and stony, they are best suited to trees.

Profile description of Berks stony soils, 30 to 50 percent slopes:

0 to 7 inches, dark grayish-brown, very friable stony silt loam.
7 to 14 inches +, yellowish-brown, friable silt loam containing many fragments of siltstone and shale.

Berks soils have a shallow to moderately deep root zone, moderately rapid permeability, low moisture-supplying capacity, and low organic-matter content. As they occur naturally, these soils are low in fertility and are strongly acid, but they respond fairly well to additions of lime and fertilizer. In cleared areas, stones interfere with management and the erosion hazard is severe.

Bruno Series

In the Bruno series are excessively drained, level to strongly sloping soils that formed on stream bottoms in alluvial material derived from acid sandstone and shale. These soils normally have a brown to yellowish-brown loamy fine sand or loamy sand surface layer that is underlain by yellowish-brown loamy fine sand or sand.

Bruno soils occur with the Pope soils in level to sloping areas but are coarser textured and more excessively drained. In nearly level areas the Bruno soils adjoin the moderately well drained Philo soils, the somewhat poorly drained Stendal soils, and the poorly drained Atkins soils. Bruno soils are better drained then the Philo, Stendal, and Atkins soils and are browner and coarser textured throughout their profile.

The Bruno soils are somewhat extensive along the major streams and occur mainly in the (Db) Dekalb-Muskingum-Berks, the (Jm) Jefferson-Muskingum-Holston-Dekalb, and the (Ps) Pope-Stendal-Allegheny soil associations. For the most part, their native vegetation of mixed hardwoods has been cleared, and the soils are now mainly in cultivated crops or meadow. Yields of row crops and meadow are good if good management is practiced.

Profile description of Bruno loamy fine sand, 0 to 2 percent slopes:

0 to 13 inches, brown, very friable loamy fine sand.
13 to 36 inches, yellowish-brown, loose loamy fine sand.

Bruno soils have a deep root zone, rapid permeability, moderately low moisture-supplying capacity, and low organic-matter content. As they occur naturally, these soils are moderately low in fertility and are strongly acid. They respond well to liming and fertilization and are fairly easy to work.

Built-up Areas

These areas consist of towns and villages and of railroad and highway rights-of-way on the valley floors and their adjacent foot slopes. Generally, these areas have been excavated or graded, and the original soil does not remain. Approximately 23,670 acres of Built-up areas occurs throughout this survey area.

Cotaco Series

Soils of the Cotaco series are in gently sloping to sloping colluvial areas and are moderately well drained or somewhat poorly drained. They formed in material derived from sandstone and shale. These soils normally have a dark grayish-brown to very dark grayish-brown loam or gravelly loam surface layer. Their subsoil is normally dark grayish-brown to light yellowish-brown gravelly loam or light silty clay loam.

Cotaco soils occur with the Zaleski, Barbourville, and Jefferson soils. They are, however, less well drained than those soils and generally have less profile development than the Jefferson soils.

Cotaco soils occur throughout the (Db) Dekalb-Muskingum-Berks, the (Jm) Jefferson-Muskingum-Holston-Dekalb, and the (Ps) Pope-Stendal-Allegheny soil associations, but they have a small total acreage. Most of the acreage has been cleared of its native mixed hardwoods and is now used primarily for cultivated crops. These soils are best suited to pasture, but if drained, they can be used for row crops.

Profile description of Cotaco loam, 2 to 6 percent slopes:

0 to 8 inches, very dark grayish-brown, very friable loam.
8 to 26 inches, dark grayish-brown to dark-brown, friable loam with weak, subangular blocky structure; brownish-gray mottles common in the lower part.
26 to 36 inches, yellowish-brown light silty clay loam with weak, subangular blocky structure; many gray mottles; few sandstone pebbles and fragments of shale.
36 to 48 inches +, mottled light brownish-gray and light yellowish-brown light silty clay loam to fine sandy clay loam; small fragments of sandstone and shale are common.

Cotaco soils have a deep root zone, moderate permeability, moderately high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderately fertile and are strongly acid. They respond to additions of lime and fertilizer and are easily kept in good tilth.

Dekalb Series

In the Dekalb series are moderately deep, excessively drained, sloping to very steep soils that developed in material weathered from sandstone and siltstone on uplands. Uneroded areas have a dark grayish-brown or brown fine sandy loam or loam surface layer. The subsoil is generally yellowish-brown fine sandy loam or loam and contains many fragments of sandstone or siltstone.

The Dekalb soils occur closely with the Gilpin, Muskingum, and Berks soils on uplands and less closely with the Jefferson soils along the foot slopes. Dekalb soils are coarser textured than the Berks, Muskingum, and Gilpin soils and have less developed horizons than the Gilpin and Jefferson soils.

Dekalb soils are extensive throughout the survey area and occur in all except the (Ps) Pope-Stendal-Allegheny soil association. They are mainly in mixed stands of hardwoods, but scattered areas have been cleared and are used for pasture and cultivated crops, or are idle. Because Dekalb soils are steep and stony, they are generally best suited to trees.

Profile description of Dekalb stony loam, 30 to 50 percent slopes:

0 to 6 inches, dark grayish-brown, very friable stony loam.
6 to 30 inches +, yellowish-brown, friable loam with many rock fragments.

Dekalb soils have a shallow to moderately deep root zone, moderately rapid permeability, low moisture-supplying capacity, and low organic-matter content. As they occur naturally, these soils are low in fertility and are strongly acid. They respond fairly well to liming and fertilization but are difficult to till and manage because they are stony and steep. The erosion hazard is severe on the steeper slopes.

Enders Series

Soils of the Enders series are on uplands and are well drained and sloping to strongly sloping. These soils were derived from acid siltstone and shale. Uneroded areas normally have a brown silt loam surface layer and a yellowish-red silty clay subsoil.

Enders soils occur with the Rarden, Wellston, and Upshur soils on the less sloping upper slopes and adjoin the Muskingum soils on the steeper lower slopes. The subsoil of the Enders soils is less red and coarser textured than that of the Rarden and Upshur soils. The Enders soils are deeper and have better developed horizons than the Muskingum soils. They have a redder and finer textured subsoil than the Wellston soils.

The Enders soils occur mainly in the (Gw) Gilpin-Upshur-Wellston-Muskingum and the (Md) Muskingum-Dekalb-Gilpin-Wellston soil associations, in small, scattered areas along the ridgetops in Bell, Harlan, and Lawrence Counties. Their total acreage is small. Most areas of these soils have been cleared of their native mixed hardwoods and are used for pasture and cultivated crops. They are best suited to pasture and meadow and, if well managed, are suited to some row crops.

Profile description of Enders silt loam, 6 to 12 percent slopes:

0 to 6 inches, brown, friable silt loam.
6 to 13 inches, yellowish-brown to strong-brown silty clay loam.
13 to 26 inches, yellowish-red silty clay with strong, blocky structure.
26 to 36 inches +, variegated red, strong-brown, and yellowish-red, firm silty clay.

Enders soils have a moderately deep root zone, moderate permeability, high moisture-supplying capacity, and medium organic-matter content. They are moderate to moderately low in natural fertility and are strongly acid.

Their response to lime and fertilizer is fair, but their erosion hazard is moderate on the steep slopes.

Gilpin Series

In the Gilpin series are moderately deep, well-drained, sloping to steep soils that developed from interbedded, acid siltstone and shale. Uneroded areas of these soils normally have a dark grayish-brown silt loam surface layer and a yellowish-brown heavy silt loam or light silty clay loam subsoil.

These soils occur with the Berks, Dekalb, Muskingum, and Wellston soils, and with the Upshur soils in the (Gd) Gilpin-Upshur-Dekalb and the (Gw) Gilpin-Upshur-Wellston-Muskingum soil associations. They have a thinner solum than the Wellston and Upshur soils and generally less clay in the subsoil. Gilpin soils, however, contain more clay in the subsoil than the Berks, Dekalb, and Muskingum soils.

Gilpin soils occur throughout the survey area and are extensive in the (Dg) Dekalb-Muskingum-Gilpin-Jefferson, the (Gd) Gilpin-Upshur-Dekalb, and the (Gw) Gilpin-Upshur-Wellston-Muskingum soil associations. Many of them have been cleared of their native mixed hardwoods and are now used for cultivated crops or pasture, or are left idle. On the steeper slopes the soils are best suited to trees.

Profile description of Gilpin silt loam, 12 to 20 percent slopes:

0 to 7 inches, dark grayish-brown, friable silt loam.
7 to 22 inches, yellowish-brown light silty clay loam.
22 to 28 inches, yellowish-brown gravelly clay loam.

Gilpin soils have a moderately deep root zone, moderate permeability, moderately high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderate in fertility and are strongly acid. They respond well to additions of lime and fertilizer and, with good management, are easily kept in good tilth. The erosion hazard is severe on steep slopes.

Gullied Land

This land consists of areas that have had their soil material washed away except in small patches between the deep gullies. It is not useful for crops or pasture unless it is reclaimed extensively, but some of it is being reforested. Approximately 1,030 acres of Gullied land occurs in the survey area.

Hayter Series

The Hayter series consists of deep, well-drained, gently sloping to strongly sloping colluvial soils that formed in material derived from sandstone and shale. Uneroded areas of these soils have a very dark grayish-brown gravelly loam or loam surface layer. The subsoil is brown to dark-brown gravelly clay loam or clay loam.

These soils occur on the foot slopes in close association with the Jefferson, Barbourville, Zaleski, and Cotaco soils. Hayter soils are older and more developed than the Barbourville, Zaleski, and Cotaco soils and are less mottled and better drained than the moderately well drained Zaleski and the somewhat poorly drained Cotaco soils. They have a browner subsoil than the Jefferson soils.

Hayter soils occur mainly in the (Jm) Jefferson-Muskingum-Holston-Dekalb soil association, as scattered areas within Bell, Breathitt, and Lawrence Counties. The total acreage is small. Most areas of these soils have been cleared of their native mixed hardwoods and are used for cultivated crops on the gentle slopes and for meadow and pasture on the stronger slopes. The soils are well suited to row crops if good management is practiced, but their steeper slopes should be kept in meadow and pasture.

Profile description of Hayter gravelly loam, 6 to 12 percent slopes:

0 to 8 inches, very dark grayish-brown gravelly loam.
8 to 34 inches, dark-brown gravelly clay loam with moderate, subangular blocky and blocky structure.
34 to 42 inches +, dark yellowish-brown gravelly clay loam with moderate, blocky structure.

Hayter soils have a deep root zone, moderately rapid permeability, high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderate in fertility and are strongly acid. They respond well to additions of lime and fertilizer and are easy to keep in good tilth.

Holston Series

In the Holston series are deep, well-drained, gently sloping to strongly sloping soils on stream terraces. These soils formed in material derived from acid sandstone and shale. Uneroded areas normally have a dark grayish-brown silt loam to fine sandy loam surface layer. The subsoil is yellowish-brown to brownish-yellow light silty clay loam to fine sandy clay loam.

These soils occur with the Purdy and Tyler soils in level or nearly level areas and with the Monongahela soils in level to sloping areas. Holston soils adjoin the Allegheny soils on slopes. They are better drained than the Purdy, Tyler, and Monongahela soils and, unlike those soils, do not have a fragipan. They are lighter colored than the Allegheny soils and have a yellower subsoil.

Holston soils are moderately extensive and occur in the (Db) Dekalb-Muskingum-Berks, the (Dg) Dekalb-Muskingum-Gilpin-Jefferson, the (Jm) Jefferson-Muskingum-Holston-Dekalb, and the (Ps) Pope-Stendal-Allegheny soil associations. Their native vegetation of mixed hardwoods has been mostly cleared, and the soils are used primarily for cultivated crops, meadow, and pasture. They are well suited to row crops and special horticultural crops on the gentle slopes but are better suited to pasture and meadow on steep slopes.

Profile description of Holston loam, 6 to 12 percent slopes:

0 to 6 inches, dark grayish-brown, friable loam.
6 to 30 inches, brownish-yellow light clay loam with subangular blocky structure.
30 to 65 inches +, stratified beds of yellowish-brown, red, and gray sandy clay, sand, and gravel.

Holston soils have a deep root zone, moderate permeability, very high moisture-supplying capacity, and low organic-matter content. As they occur naturally, these soils are moderate in fertility and are strongly acid. They respond well to fertilization and liming and are easily kept in good tilth.

Huntington Series

The Huntington series consists of well-drained, level to nearly level alluvial soils on the stream bottoms. These soils formed in mixed material derived from limestone, sandstone, and shale. Normally, their surface layer is dark-brown silt loam or fine sandy loam, and their subsoil is dark-brown to brown silt loam or fine sandy loam.

These soils occur with the mottled Newark soils but are better drained and are fairly free of mottles.

The Huntington soils occur on the stream bottoms adjacent to the Pine Mountain fault in Bell, Harlan, Letcher, and Pike Counties. These soils have a small total acreage and occur mainly in the (Ps) Pope-Stendal-Allegheny soil association. They have been cleared and are used primarily for cultivated row crops and for meadow. Huntington soils are probably the most productive soils in the survey area and are suitable for crops that require intensive cultivation. Also, they produce high yields of meadow.

Profile description of Huntington silt loam:

0 to 8 inches, dark-brown, friable silt loam.
8 to 38 inches, dark-brown to brown, friable silt loam with weak, fine, granular structure.
38 to 48 inches +, brown to dark yellowish-brown silt loam with few, fine, light brownish-gray mottles.

Huntington soils have a deep root zone, moderately rapid permeability, high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are high in fertility and are slightly acid to neutral. They respond well to fertilization and are easy to keep in good tilth.

Jefferson Series

In the Jefferson series are deep, well-drained, gently sloping to moderately steep colluvial soils that formed in material derived from acid sandstone and shale. Uneroded areas of these soils normally have a dark grayish-brown gravelly loam or stony loam surface layer. The subsoil is yellowish-brown gravelly silt loam or clay loam.

These soils occur closely with the Hayter, Barbourville, Zaleski, and Cotaco soils on the foot slopes and fans. Jefferson soils are more developed than the Barbourville, Zaleski, and Cotaco soils and are better drained than the Zaleski and Cotaco soils. They are not so brown in the subsoil as the Hayter soils.

The Jefferson soils are widespread in the (Db) Dekalb-Muskingum-Berks, the (Dg) Dekalb-Muskingum-Gilpin-Jefferson, the (Jm) Jefferson-Muskingum-Holston-Dekalb, and the (Ps) Pope-Stendal-Allegheny soil associations. For the most part, they have been cleared of their native mixed hardwoods and are now used for cultivated crops on the gentle slopes and for meadow and pasture on the steep slopes. Good to high yields of pasture, meadow, corn, and special crops can be obtained.

Profile description of Jefferson gravelly loam, 12 to 20 percent slopes:

0 to 9 inches, dark grayish-brown to brown, very friable gravelly loam with granular structure.
9 to 29 inches, yellowish-brown, friable gravelly clay loam with subangular blocky structure.
29 to 39 inches +, yellowish-brown, somewhat firm clay loam streaked with brownish red.

Jefferson soils have a deep root zone, moderately rapid permeability, high moisture-supplying capacity, and low to medium organic-matter content. As they occur naturally, these soils are moderate in fertility and are strongly acid. They respond to lime and fertilizer and are easy to keep in good tilth, but on some of them, stones interfere with tillage.

Mine Spoil

Mine spoil is made up of waste around auger mines and deep mines and at loading points. Around auger mines this waste generally consists of rock, shale, and soil material (fig. 9). At strip mines and loading points the waste is mostly low-grade coal, rock, and shale. Spoil around the mouth of mines, at tipples, and at other loading points normally cannot produce worthwhile plants, because this material is generally very strongly acid and occurs on steep slopes. After the spoil has been sufficiently leached, a few smooth areas can be reforested. Reforesting is difficult in most places, however, because the spoil is eroded, is on irregular and steep slopes, has poor water-holding capacity, and is very strongly acid. About 2,000 acres of Mine spoil occurs in this part of Kentucky.

Monongahela Series

In the Monongahela series are moderately well drained soils that formed on stream terraces in material derived from acid sandstone and shale. Uneroded areas normally have a dark grayish-brown silt loam to fine sandy loam surface layer. The subsoil ranges from yellowish brown to brownish yellow in color and from loam to light silty clay loam in texture. A fragipan occurs at a depth of about 24 inches.

These soils occur with the Purdy and Tyler soils on level or nearly level stream terraces; they adjoin the more strongly sloping Allegheny and Holston soils. The Monongahela soils are better drained than the Purdy and Tyler soils. They are less well drained than the Allegheny and Holston soils and, unlike those soils, have a fragipan.

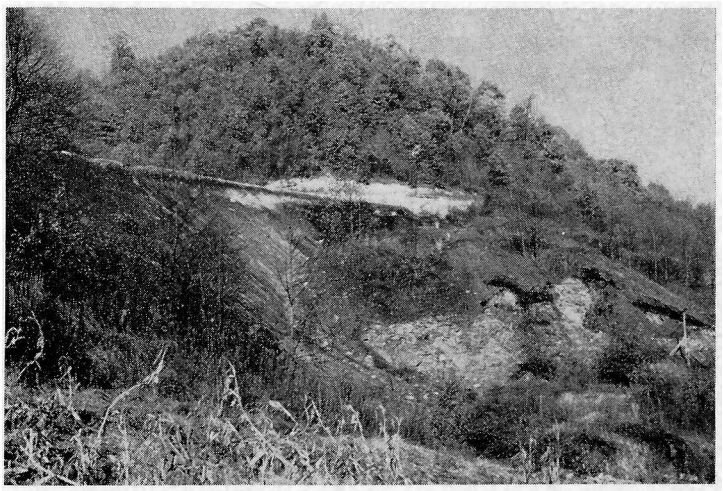

Figure 9.—**In middle background, scar left by auger mining. In foreground, debris, or spoil, below the auger trail.**

The Monongahela soils have a fairly small total acreage, but they occur throughout the survey area, mainly in the (Jm) Jefferson-Muskingum-Holston-Dekalb and the (Ps) Pope-Stendal-Allegheny soil associations. Most areas of these soils have been cleared of their native mixed hardwoods and are used mainly for cultivated crops, meadow, and pasture. The soils are well suited to pasture and produce fair to good yields of shallow-rooted row crops.

Profile description of Monongahela silt loam, 2 to 6 percent slopes:

0 to 6 inches, dark grayish-brown, friable silt loam.
6 to 11 inches, yellowish-brown silt loam with subangular blocky structure.
11 to 23 inches, brownish-yellow light silty clay loam with subangular blocky structure; few light-gray mottles in the lower part.
23 to 37 inches +, fragipan consisting of mottled light yellowish-brown and gray, compact, brittle silty clay loam.

Monongahela soils have a moderately deep root zone, moderate to slow permeability, moderately high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderately fertile and strongly acid. They respond fairly well to additions of fertilizer and lime and, if well managed, are easily kept in good tilth.

Muse Series

The Muse series consists of deep, well-drained, sloping to strongly sloping colluvial soils that formed in material derived from acid sandstone and shale. Uneroded areas of these soils normally have a dark-brown silt loam surface layer and a strong-brown to yellowish-red silty clay loam or silty clay subsoil.

The Muse soils occur closely with the Jefferson, Zaleski, and Cotaco soils. They are better drained than the Zaleski and Cotaco soils and have a redder and finer textured subsoil than the Jefferson soils.

The Muse soils have a small total acreage and occur only in Clay County. Most areas of these soils have been cleared of their native mixed hardwoods and are used for cultivated crops and for pasture. They produce good yields of row crops on their gentle slopes but are better suited to pasture on their strong slopes.

Profile description of Muse silt loam, 12 to 20 percent slopes:

0 to 8 inches, dark-brown, friable silt loam.
8 to 22 inches, strong-brown silty clay loam with subangular blocky to blocky structure
22 to 38 inches, yellowish-red, firm silty clay with blocky structure.
38 to 48 inches +, variegated red, reddish-yellow, pink, and pale-brown silty clay; shale fragments and small pebbles are common.

Muse soils have a deep root zone, moderately slow permeability, high moisture-supplying capacity, and low to medium organic-matter content. As they occur naturally, these soils are moderately low in fertility and are strongly acid. Although their erosion hazard is moderately high, Muse soils respond to fertilization and other good management and are fairly easy to keep in good tilth.

Muskingum Series

In the Muskingum series are moderately deep, well-drained, sloping to very steep soils that developed in material weathered from interbedded siltstone and shale on the uplands. Uneroded areas of these soils normally have a dark grayish-brown to light yellowish-brown silt loam surface layer. The subsoil is normally yellowish-brown silt loam.

Muskingum soils occur closely with the Berks, Dekalb, and Gilpin soils on the steep uplands. They also occur with the Wellston soils on the smooth uplands and with the Jefferson soils on foot slopes. The Muskingum soils have less developed horizons than the Gilpin, Jefferson, and Wellston soils, and generally a thinner solum. They are less stony than the Berks soils and are finer textured than the Dekalb soils.

Muskingum soils occur in most of the soil associations. They are mainly in mixed hardwoods, but scattered areas have been cleared and are used for cultivated crops, for pasture, or are left idle. Because these soils are steep and, in some places, are stony, they are best suited to trees.

Profile description of Muskingum silt loam, 12 to 20 percent slopes:

0 to 5 inches, dark grayish-brown, friable silt loam.
5 to 20 inches +, yellowish-brown, friable silt loam with a few fragments of siltstone and shale.

Muskingum soils have a moderately deep root zone, moderately rapid permeability, low moisture-supplying capacity, and low organic-matter content. As they occur naturally, these soils are low in fertility and are strongly acid. They respond fairly well to additions of lime and fertilizer and are easy to keep in good tilth, but the erosion hazard is severe on steep slopes.

Newark Series

The Newark series consists of somewhat poorly drained, neutral, nearly level alluvial soils that formed on stream bottoms in mixed material derived from limestone, sandstone, and shale. The soils of this series normally have a dark grayish-brown silt loam surface layer and a mottled grayish-brown silt loam subsoil.

The Newark soils occur with the Huntington soils but are less well drained than those soils.

Newark soils occur in Bell, Harlan, Letcher, and Pike Counties on stream bottoms adjacent to the Pine Mountain fault. They occur primarily in the (Ps) Pope-Stendal-Allegheny soil association and have a small total acreage. Most of their acreage has been cleared and is used for cultivated crops and for pasture. The Newark soils are well suited to intensive cropping.

Profile description of Newark silt loam:

0 to 11 inches, dark grayish-brown, friable silt loam
11 to 18 inches, grayish-brown silt loam mottled with gray and brown.
18 to 48 inches +, mottled light brownish-gray, light olive-brown, strong-brown, and yellowish-brown silt loam.

Newark soils have a deep root zone, moderate permeability, very high moisture-supplying capacity, and medium organic-matter content. They are moderately high in natural fertility and are slightly acid to neutral. They respond well to fertilization and are easily kept in good tilth. These soils are limited in use mainly by wetness, but they respond well to tile drainage.

Philo Series

In the Philo series are moderately well drained, nearly level alluvial soils that formed on stream bottoms in ma-

terial derived from acid sandstone and shale. These soils normally have a dark grayish-brown silt loam or fine sandy loam surface layer. Their subsoil is dark-brown silt loam or fine sandy loam that is mottled in the lower part.

The Philo soils occur with the Atkins, Bruno, Pope, and Stendal soils. They are less well drained than the Bruno and Pope soils but are better drained than the Atkins and Stendal.

The Philo soils are widespread, but their total acreage is small. They occur mainly in the (Ps) Pope-Stendal-Allegheny soil association. Most of their acreage has been cleared and is used for cultivated crops and for pasture, but meadow and cultivated crops are also well suited.

Profile description of Philo silt loam:

0 to 10 inches, dark grayish-brown, friable silt loam with weak, granular structure.
10 to 19 inches, dark-brown, friable silt loam with granular structure.
19 to 45 inches +, brown, friable silt loam mottled with brownish gray; mottles are grayer and more numerous in the lower part.

Philo soils have a deep root zone, rapid to moderately rapid permeability, moderately high to high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderately high in fertility and are strongly acid. They respond well to fertilizer and lime and are easy to keep in good tilth.

Pope Series

In the Pope series are well-drained, level to sloping alluvial soils that formed on stream bottoms in material derived from acid sandstone and shale. These soils normally have a dark grayish-brown silt loam or fine sandy loam surface layer and a dark-brown silt loam or fine sandy loam subsoil.

The Pope soils occur with the Atkins, Bruno, Philo, and Stendal soils. They are better drained than the Atkins, Philo, and Stendal soils and are finer textured than the Bruno soils and not so excessively drained.

The Pope soils are widespread throughout the survey area and are dominant in the (Ps) Pope-Stendal-Allegheny soil association. Most of their acreage has been cleared of mixed hardwoods and is used for cultivated crops and for pasture. These soils produce high yields of many kinds of row crops and good to high yields of meadow.

Profile description of Pope silt loam, 0 to 2 percent slopes:

0 to 10 inches, dark grayish-brown, friable silt loam.
10 to 26 inches, dark-brown, friable silt loam with weak, granular structure.
26 to 38 inches +, stratified yellowish-brown silt loam and fine sandy loam.

Pope soils have a deep root zone, moderately rapid permeability, high to very high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderately high in fertility and are strongly acid. They respond well to fertilization and liming and are easy to keep in good tilth.

Purdy Series

Soils of the Purdy series are poorly drained and nearly level. They developed on stream terraces in material derived from acid sandstone and shale. These soils normally have a grayish-brown silt loam surface layer and a gray silt loam subsoil. A fragipan generally occurs at a depth of 14 to 18 inches.

The Purdy soils occur with the Tyler, Monongahela, Holston, and Allegheny soils but are less well drained than those soils. They are grayer throughout than the Tyler soils and are generally less deep to the fragipan.

The Purdy soils have a small total acreage and occur mainly in the (Jm) Jefferson-Muskingum-Holston-Dekalb and the (Ps) Pope-Stendal-Allegheny soil associations. Most areas have been cleared and are used for pasture and cultivated crops. The Purdy soils are best suited to pasture but, if drained, may be used for row crops.

Profile description of Purdy silt loam:

0 to 9 inches, grayish-brown, friable silt loam with a few light-gray mottles.
9 to 17 inches, gray silt loam with common light-gray and yellowish-brown mottles; weak, angular blocky structure.
17 to 23 inches, light-gray silt loam with yellowish-brown and brown mottles; coarse, angular blocky structure; firm and compact.
23 to 36 inches +, mottled light-gray, strong-brown, and yellowish-brown silt loam; firm and compact.

Purdy soils have a shallow to moderately deep root zone, moderate permeability, moderately low moisture-supplying capacity, and low organic-matter content. As they occur naturally, these soils are low in fertility and are strongly acid. They respond favorably to fertilizer and lime and, if well managed, are easily kept in good tilth. Use of the Purdy soils is limited, mainly because these soils are wet and shallow.

Rarden Series

The Rarden series consists of well drained to moderately well drained, sloping to strongly sloping soils that developed on uplands in material weathered from acid clay shale. These soils are generally eroded and normally have a dark-gray, brown, or grayish-brown silt loam surface layer and a red silty clay or clay subsoil.

The Rarden soils occur on ridgetops with the Muskingum, Wellston, Enders, Tilsit, and Upshur soils. They are redder and finer textured than the Muskingum, Wellston, and Enders soils; are finer textured and better drained than the Tilsit soils; and are generally more variegated, less plastic, and less red than the Upshur soils.

Rarden soils have a very small total acreage in the survey area. They occur in Floyd, Johnson, and Lawrence Counties, primarily in the (Md) Muskingum-Dekalb-Gilpin-Wellston soil association. Some areas have been cleared and are used for pasture and cultivated crops, but they are best used for pasture and trees.

Profile description of Rarden silt loam, 6 to 12 percent slopes:

0 to 5 inches, dark grayish-brown, friable silt loam.
5 to 10 inches, yellowish-brown, friable silty clay loam with subangular blocky structure.
10 to 20 inches, red, firm silty clay with blocky structure.
20 to 30 inches, red, variegated clay with strong, blocky structure.
30 inches +, red, variegated clay with massive structure; shale fragments

These soils have a moderately deep root zone, slow permeability, moderately high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, they are low in fertility and are strongly acid.

They respond fairly well to fertilization and liming but are hard to keep in good tilth and are susceptible to severe erosion.

Riverwash

Riverwash is sandy, gravelly, or stony alluvial land along the major streams. It is mostly barren and is generally subject to frequent overflow and to shifting during high water. Approximately 2,500 acres of Riverwash occurs in this survey area.

Rock Land

Rock land consists chiefly of rock outcrops, ledges, and boulders, among which pockets of stony fine sandy loam or stony silt loam are intermixed. In some places Rock land has some value for timber and light grazing and for recreation. Approximately 88,100 acres of Rock land occurs in this survey area (fig. 10).

Figure 10.—**Rock land in foreground and outcropping of sandstone in background. This land occurs throughout the survey area.**

Sequatchie Series

The Sequatchie series consists of deep, somewhat excessively drained, nearly level to sloping soils that formed on low stream terraces in material derived from sandstone and shale. Soils of this series normally have a dark-brown fine sandy loam surface layer and a strong-brown or brown fine sandy loam subsoil.

The Sequatchie soils occur with the Whitwell soils on terraces and with the Pope soils on stream bottoms. They occur more closely with the Whitwell soils and generally are coarser textured. They have more strongly developed horizons than the Pope soils.

Sequatchie soils are dominant in the (Ps) Pope-Stendal-Allegheny soil association, and they are fairly extensive in the survey area. They were formerly in mixed hardwoods, but most areas have been cleared and are used primarily for cultivated crops.

Profile description of Sequatchie fine sandy loam, 2 to 6 percent slopes:

0 to 8 inches, dark-brown, very friable fine sandy loam.
8 to 26 inches, brown, friable fine sandy loam with weak, fine to medium, subangular blocky structure.
26 to 40 inches, strong-brown fine sandy loam with weak to moderate, medium, subangular blocky structure.
40 to 50 inches +, stratified beds of sand and silt; water-rounded pebbles and cobbles are common.

The Sequatchie soils have a deep root zone, moderately rapid permeability, and moderate to moderately low moisture-supplying capacity and fertility. They contain a medium to moderately small amount of organic matter, and they are medium acid to strongly acid. Their erosion hazard is slight.

Stendal Series

In the Stendal series are somewhat poorly drained, strongly acid, nearly level alluvial soils that formed on stream bottoms in material derived from sandstone and shale. Normally, these soils have a surface layer of dark grayish-brown silt loam or fine sandy loam and a subsoil of mottled grayish-brown silt loam or fine sandy loam.

These soils occur with the Atkins, Bruno, Philo, and Pope soils. Stendal soils are better drained than the Atkins soils but are less well drained than the Bruno, Philo, and Pope soils.

The Stendal soils are widespread in this survey area, but their largest acreage is in the (Db) Dekalb-Muskingum-Berks and the (Ps) Pope-Stendal-Allegheny soil associations. A large part of these soils has been cleared of its mixed hardwoods and is used for cultivated crops and for pasture. The soils are suited to row crops and to meadow, but they need to be drained for good yields of corn.

Profile description of Stendal silt loam:

0 to 10 inches, dark grayish-brown, friable silt loam.
10 to 17 inches, grayish-brown silt loam mottled with gray and brown
17 to 48 inches, mottled light-gray, strong-brown, and yellowish-brown silt loam.

Stendal soils have a deep root zone, moderate to moderately rapid permeability, very high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderate to moderately high in fertility and are strongly acid. They respond favorably to lime and fertilizer and are easily kept in good tilth. Excess water is the main limitation, but it can be removed by tile drains.

Strip Mines

Strip mines have had the overburden of soil, shale, and other rock removed so that the underlying coal could be mined. Most areas have been graded and have short, very steep, irregular slopes. They generally have not been planted, because revegetation is difficult. Approximately 520 acres of this survey area consists of Strip mines.

Tilsit Series

Soils of the Tilsit series are moderately well drained and gently sloping. They developed on uplands in material derived from acid sandstone and shale. Uneroded areas normally have a dark grayish-brown silt loam surface layer and a yellowish-brown silty clay loam subsoil. A fragipan occurs at a depth of about 24 inches.

The Tilsit soils occur on the broad ridgetops with the Muskingum, Wellston, Enders, and Upshur soils but are less well drained than those soils. They are less red and coarser textured than the Enders and Upshur soils.

The Tilsit soils occur in Clay and Lawrence Counties in the (Md) Muskingum-Dekalb-Gilpin-Wellston soil association. Their total acreage is very small. Most of it has been cleared of mixed hardwoods and is used primarily for pasture and cultivated crops. Under good management these soils can be used for row crops and meadow. They are well suited to pasture.

Profile description of Tilsit silt loam, 2 to 6 percent slopes:

0 to 5 inches, dark grayish-brown, friable silt loam.
5 to 10 inches, light yellowish-brown, friable silt loam with subangular structure.
10 to 24 inches, yellowish-brown light silty clay loam mottled with pale yellow and pale brown in lower half; underlain by fragipan.
24 to 30 inches, light yellowish-brown, firm, compact light silty clay loam mottled with light gray and strong brown.
30 to 45 inches +, very firm, compact silty clay loam mottled with light gray and strong brown.

Tilsit soils have a moderately deep root zone, moderately slow permeability in the lower subsoil, moderately high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderate in fertility and are strongly acid. They respond well to fertilization and liming and are easy to keep in good tilth, but their erosion hazard is moderate.

Tyler Series

In the Tyler series are somewhat poorly drained, nearly level soils that developed on stream terraces in material derived from acid sandstone and shale. Normally these soils have a surface layer of dark grayish-brown silt loam and a subsoil of light yellowish-brown silt loam. A fragipan generally occurs at a depth of about 20 inches.

The Tyler soils occur with the Purdy, Holston, Monongahela, and Allegheny soils. They are better drained than the Purdy soils but less well drained than the Allegheny, Holston, and Monongahela soils.

Tyler soils are widespread in this survey area but have a fairly small total acreage. They occur mainly in the (Jm) Jefferson-Muskingum-Holston-Dekalb and the (Ps) Pope-Stendal-Allegheny soil associations. Most of their acreage has been cleared of timber and is used for cultivated crops, meadow, and pasture. These soils are best suited to pasture. They are too wet for deep-rooted row crops, and their fragipan limits the depth of the root zone.

Profile description of Tyler silt loam:

0 to 7 inches, dark grayish-brown, friable silt loam.
7 to 14 inches, brown silt loam with weak, subangular blocky structure.
14 to 21 inches, light yellowish-brown silt loam mottled with light gray and strong brown; subangular blocky structure.
21 to 42 inches +, mottled light-gray, strong-brown, and yellowish-red silt loam (fragipan); coarse, blocky to massive structure; firm, compact, and brittle.

Tyler soils have a moderately deep root zone, moderately slow permeability, moderately high moisture-supplying capacity, and low organic-matter content. As they occur naturally, these soils are moderately low in fertility and are strongly acid. They respond well to fertilizer and lime and are easy to keep in good tilth if they are well managed. Wetness and the shallowness to the fragipan are the main limitations to their use.

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Upshur Series

In the Upshur series are well-drained, sloping to moderately steep soils that develop from weakly calcareous clay shale on the uplands. These soils are generally eroded and normally have a dark-brown or reddish-brown silty clay surface layer and a red or reddish-brown clay subsoil.

These soils occur on ridgetops and benches with the Muskingum, Wellston, Enders, Tilsit, and Rarden soils. Upshur soils are redder and finer textured than the Muskingum, Wellston, and Enders soils and are better drained and finer textured than the Tilsit soils. They are less variegated and more plastic in the subsoil than the Rarden soils and are generally redder and finer textured in the upper subsoil.

In the survey area Upshur soils occur only in Lawrence County, primarily in the (Gd) Gilpin-Upshur-Dekalb and the (Gw) Gilpin-Upshur-Wellston-Muskingum soil associations. Their total acreage is small. More than half of it has been cleared of mixed hardwoods and is used mainly for pasture and meadow, the best uses for these soils.

Profile description of Upshur silty clay, 12 to 20 percent slopes, eroded:

0 to 6 inches, dark-brown, friable silty clay.
6 to 18 inches, reddish-brown, firm, plastic silty clay to clay with blocky structure.
18 to 32 inches, red, firm, plastic clay with blocky structure.
32 to 45 inches +, variegated, massive, red clay; neutral.

The Upshur soils have a moderately deep root zone, slow permeability, low moisture-supplying capacity, and medium organic-matter content. They are naturally medium acid to strongly acid in the surface layer. Upshur soils respond favorably to fertilizer and lime, but they are hard to keep in good tilth and are susceptible to severe erosion.

Wellston Series

In the Wellston series are well-drained, gently sloping to strongly sloping soils that developed on uplands in material derived from interbedded acid sandstone and shale. Uneroded areas of these soils normally have a dark grayish-brown silt loam surface layer and a yellowish-brown silty clay loam subsoil.

These soils occur on ridgetops with the Muskingum, Gilpin, Rarden, Tilsit, and Upshur soils. Wellston soils have stronger horizons and generally a thicker solum than the Gilpin and Muskingum soils. They are better drained than the Tilsit soils and have a browner, coarser textured subsoil than the Rarden, Enders, and Upshur soils.

In this survey area Wellston soils are fairly widespread, but they have a small total acreage, which is mostly in the (Md) Muskingum-Dekalb-Gilpin-Wellston soil association. Part of their acreage has been cleared of mixed hardwoods and is used for pasture, meadow, and cultivated crops. These soils are suited to pasture and, if they are well managed, produce good yields of row crops. Also, they probably could produce fruit trees.

Profile description of Wellston silt loam, 6 to 12 percent slopes:

0 to 7 inches, dark grayish-brown, friable silt loam.
7 to 20 inches, yellowish-brown silty clay loam with subangular blocky and angular blocky structure.
20 to 34 inches +, yellowish-brown silty clay loam; few fragments of sandstone and shale in the lower half.

The Wellston soils have a moderately deep root zone, moderate permeability, and high moisture-supplying capacity. They have medium organic-matter content and are naturally strongly acid. These soils respond favorably to additions of fertilizer and lime and are easy to keep in good tilth; their susceptibility to erosion is generally moderate.

Whitwell Series

In the Whitwell series are somewhat poorly drained and moderately well drained, nearly level soils that developed on low stream terraces in material derived from acid sandstone and shale. Their surface layer is normally dark grayish-brown loam, and their subsoil is yellowish-brown silt loam or light silty clay loam.

These soils occur with the Sequatchie soils on the low stream terraces and, less closely, with the Stendal soils on the bottom lands. Whitwell soils are less well drained than the Sequatchie soils. They have more strongly developed horizons than the Stendal soils and generally are slightly better drained.

The Whitwell soils are widespread in the survey area, but their small total acerage is largely in the (Db) Dekalb-Muskingum-Berks and the (Ps) Pope-Stendal-Allegheny soil associations. Most of their acreage has been cleared and is used for pasture and cultivated crops. These soils are well suited to meadow and pasture.

Profile description of Whitwell loam:

0 to 7 inches, dark grayish-brown, friable loam.
7 to 21 inches, yellowish-brown silt loam with few, fine, faint, light-gray mottles in lower part.
21 to 30 inches, light yellowish-brown loam with many light-gray and strong-brown mottles; weak, subangular blocky structure.
30 to 36 inches +, mottled light-gray, dark-brown, and strong-brown loam and fine sandy loam with coarse, subangular blocky structure.

Whitwell soils normally have a deep root zone, moderate permeability, very high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderate in fertility and are strongly acid. They respond well to liming and fertilization and are easy to keep in good tilth, but wetness limits their use.

Zaleski Series

The Zaleski series consists of moderately well drained, gently sloping colluvial soils that formed in material derived from acid sandstone and shale. Uneroded areas of these soils normally have a brown silt loam surface layer and a yellowish-brown silty clay loam subsoil.

These soils occur on foot slopes and fans in close association with the Jefferson, Barbourville, and Cotaco soils. Zaleski soils are better drained than the somewhat poorly drained Cotaco soils and are less well drained than the Barbourville and Jefferson soils.

The Zaleski soils have a small total acreage in the survey area and make up small parts of the (Db) Dekalb-Muskingum-Berks, the (Dg) Dekalb-Muskingum-Gilpin-Jefferson, the (Jm) Jefferson-Muskingum-Holston-Dekalb, and the (Ps) Pope-Stendal-Allegheny soil associations. For the most part, these soils have been cleared of their native mixed hardwoods and are used for pasture and cultivated crops. Good to high yields of pasture and meadow may be obtained, as well as medium to good yields of corn, other row crops, and special crops.

Profile description of Zaleski silt loam, 2 to 6 percent slopes:

0 to 9 inches, brown, friable silt loam with granular structure.
9 to 22 inches, yellowish-brown, friable to firm silty clay loam with subangular blocky or blocky structure.
22 to 31 inches, yellowish-brown silty clay loam mottled with gray and strong brown; coarse, subangular blocky and blocky structure.
31 to 43 inches +, yellow silty clay loam with gray and strong-brown mottles; medium to coarse, subangular blocky structure.

Zaleski soils have a moderately deep root zone, moderate permeability, high moisture-supplying capacity, and medium organic-matter content. As they occur naturally, these soils are moderate in fertility and are strongly acid. They respond to additions of lime and fertilizer and are easily kept in good tilth.

Use and Management of Soils

This section discusses the use and management of soils as woodland and for producing wildlife, agronomic crops, and horticultural crops. It also discusses use of the soils for roads, sewage disposal areas, farm ponds, drainageways, and other engineering structures built to conserve soil and water.

Use of Soils as Woodland[3]

This subsection first describes the history and present condition of the woodland in the 14 counties and then discusses the use and management of this woodland by soil associations and by woodland suitability groups. The soil associations are landscapes of the geographic extent shown on the soil maps that accompany this report. The woodland groups are groups of soils that are about alike in characteristics determining their suitability for trees and that respond to management in about the same way. Thus, those who want general information will prefer to read the discussion on woodland by soil associations, and those wanting more detailed knowledge, the descriptions of the woodland groups.

History and present condition of the woodland

At the time of settlement nearly all of the survey area was wooded. Yellow-poplar, white oak, black walnut, and other desirable hardwoods dominated the north and east slopes. Black oak, scarlet oak, and hickory dominated the south and west slopes. Chestnut oak, together with a few shortleaf and pitch pines, occupied most of the upper slopes and the narrow ridges.

[3] By E. A. Oren, woodland conservationist, and E. V. Huffman, assistant State soil scientist, Soil Conservation Service.

By 1920 nearly all the virgin timber had been removed. Now, the woodland consists mostly of low-grade trees because for many decades it has been overgrazed, frequently burned, and repeatedly harvested of its best trees. During the past two decades woodland grazing has ceased to be widespread. Much progress has been made in preventing and controlling forest fires, though fires still cause much damage. Recently many trees have been planted for conservation. A few landowners now practice adequate woodland management on a small acreage. A more widespread use of adequate management is prevented, mainly by a lack of public and private roads, which are needed for fire control and logging.

Markets for logs of good to high quality are fair, but the supply of these logs is short. Practically no markets exist for the huge amount of poor-quality timber available. Lumbering has declined in recent years, but several small sawmills still operate (fig. 11).

In this part of Kentucky, as elsewhere, the importance of woodland in watersheds is recognized, and controversy about the effects of strip mining on flood control, sedimentation, and the quality of water is considerable. Some woodland on many of the steep slopes has been permanently damaged by cultivation, repeated burning, and grazing of livestock.

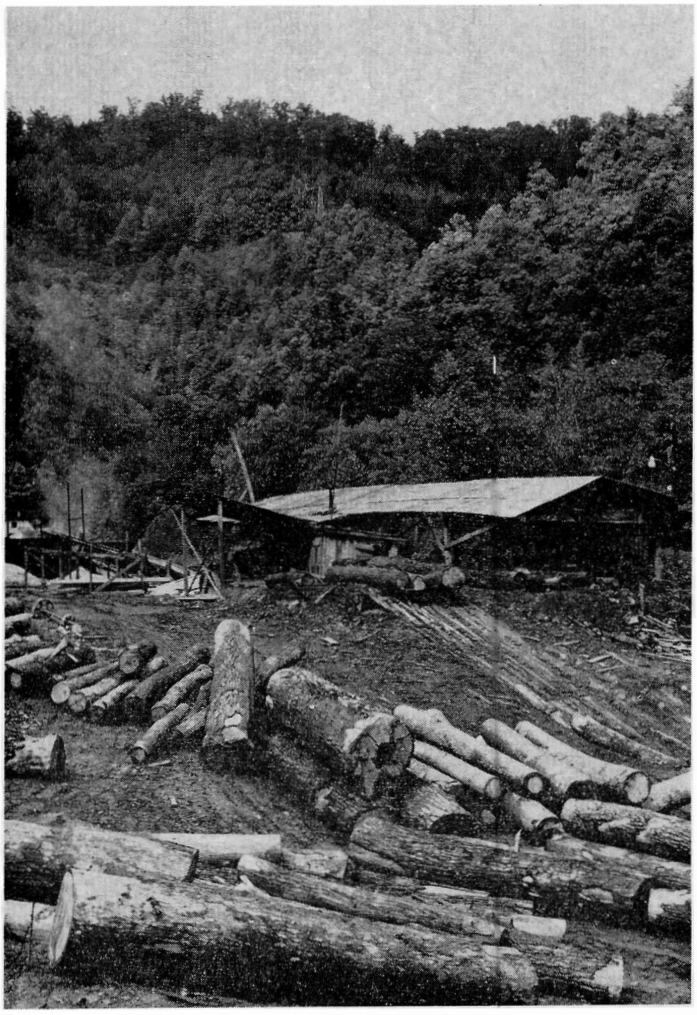

Figure 11.—Sawmill in eastern Kentucky.

Except for chestnut blight, attacks by insects and damage by diseases have not been epidemic and have not seriously damaged woodland in this survey area. Nevertheless, borers cause high losses each year, particularly in oak trees. Also, heart rot as a result of fire scars has caused great loss of trees.

Woodland management by soil associations

This subsection gives the amount of woodland in the soil associations and names the trees to favor in management. It also gives some of the difficulties met in establishing stands of desirable trees.

(Dg) DEKALB-MUSKINGUM-GILPIN-JEFFERSON AND (Jm) JEFFERSON-MUSKINGUM-HOLSTON-DEKALB SOIL ASSOCIATIONS

These soil associations are enough alike in soil characteristics that affect woodland management to permit combining them for the purpose of making woodland interpretations. In these associations about 35,000 acres, or 40 percent of the combined acreage, is woodland. Because nearly all of this woodland is on Jefferson, Dekalb, Berks, Gilpin, and Muskingum soils, this discussion applies only to those soils.

In these associations the potential productivity of trees is high and justifies intensive management. If they occur in a stand, trees to favor in management are yellow-poplar, black walnut, white oak, northern red oak, basswood, sugar maple, and hemlock. White pine, shortleaf pine, and loblolly pine are preferred for plantings on open land, but yellow-poplar, black walnut, and black locust are also suitable for planting.

Plant competition is severe after stands have been opened by harvesting or by thinning. To obtain stands of desirable trees, weeding is needed soon after the stands have been opened because undesirable trees and brush volunteer readily. Competition is too severe for interplanting or for conversion planting. Abandoned pasture and cropland generally grow up naturally in dense stands of trees that may not be wanted.

(Db) DEKALB-MUSKINGUM-BERKS SOIL ASSOCIATION

About 2,240,000 acres, or 70 percent of this soil association, is woodland. Dekalb, Muskingum, and Berks stony soils on moderately steep to very steep slopes amount to about 3 million acres, or 93 percent of the association.

The potential productivity of trees in the mountainous terrain of this soil association is affected by aspect, or the direction toward which a slope faces, and by the position of the trees on the slope. Production normally is greater on slopes facing north and east than it is on slopes facing south and west. It is less on the upper part of the long slopes than it is on the lower part. Production is also less on severely eroded soils than it is on comparable soils that are slightly or moderately eroded.

For the purpose of making woodland interpretations, the soils of this association can be discussed in six groups according to their degree of erosion, position on the slope, and aspect.

Slightly eroded to moderately eroded soils on the lower four-fifths of slopes facing north and east.—These soils occupy about 1,040,000 acres of the (Db) Dekalb-Muskingum-Berks association, or 33 percent of its total acreage.

Their potential productivity of trees is high and justifies intensive management.

If they occur in a stand, trees to favor in management are yellow-poplar, black walnut, white oak, northern red oak, basswood, and cucumbertree. White pine, shortleaf pine, and loblolly pine are preferred for plantings on open land, but yellow-poplar, black walnut, and black locust are also suitable for planting.

Plant competition is severe after stands have been opened by harvesting or by thinning. Because many trees volunteer readily, early weeding generally is needed to obtain a stand of desirable trees. Competition is generally too severe for interplanting or for conversion planting. In abandoned pastures or on cropland, trees normally reseed naturally, and they rapidly form dense stands.

Severely eroded soils on the lower four-fifths of slopes facing north and east.—These soils occupy about 160,000 acres of the (Db) Dekalb-Muskingum-Berks soil association, or 5 percent of its total acreage. The potential productivity of trees is fair and justifies moderately intensive management.

If they occur in stands, trees to favor in management are shortleaf pine, Virginia pine, black oak, chestnut oak, and scarlet oak. Shortleaf pine, loblolly pine, and white pine are preferred for plantings on open land and are also suitable for interplanting or for conversion planting. If enough seed trees are adjacent, abandoned cropland and pasture reforest in a fairly short time.

Slightly eroded to moderately eroded soils on the lower two-thirds of slopes facing south and west.—These soils occupy about 610,000 acres of the (Db) Dekalb-Muskingum-Berks soil association, or 19 percent of its total acreage. The potential productivity of trees is fair and justifies moderately intensive management.

Trees to favor in management, if they occur in a stand, are shortleaf pine, Virginia pine, black oak, and white oak. White pine, shortleaf pine, and loblolly pine are the preferred trees for plantings on open land. Abandoned cropland and pasture reforest naturally to desirable pines only if there are three to five seed trees per acre nearby.

Severely eroded soils on the lower two-thirds of slopes facing south and west.—These soils occupy about 380,000 acres of the (Db) Dekalb-Muskingum-Berks soil association, or 12 percent of its total acreage. Their potential productivity of trees is low for hardwood and is moderately low for pines. Only limited management is justified.

If they occur in a stand, trees to favor in management are shortleaf pine, Virginia pine, black oak, and scarlet oak. Shortleaf pine and loblolly pine are preferred trees for plantings on open land. Much conversion planting or interplanting is needed. Abandoned cropland and pasture reforest naturally to desirable pines only if an adequate number of seed trees is nearby. Dry periods lasting 2 to 3 weeks occur early in many growing seasons and cause severe losses of volunteer pines or of planted seedlings.

Soils on very narrow ridges, on the upper third of slopes facing south and west, and on the upper fifth of slopes facing north and east.—These soils occupy about 810,000 acres of the (Db) Dekalb-Muskingum-Berks soil association, or 25 percent of its total acreage. Their potential productivity of trees is low and justifies little management.

Trees to favor in management, if they occur in stands, are shortleaf pine, pitch pine, Virginia pine, chestnut oak, and scarlet oak. Shortleaf pine is preferred for plantings on open land or in openings in woodland. Natural reforestation of desirable timber is slow on abandoned cropland and pasture. Mortality of naturally reseeded trees or of planted trees is severe because these soils do not hold enough moisture.

Mainly deep, well-drained soils on benches, footslopes, terraces, and bottoms.—These soils account for about 200,000 acres, or 6 percent, of the (Db) Dekalb-Muskingum-Berks soil association. Their potential productivity of trees is very high and justifies intensive management.

If they occur in a stand, trees to favor in management are yellow-poplar, black walnut, white oak, northern red oak, basswood, cucumbertree, sugar maple, and hemlock. White pine, shortleaf pine, and loblolly pine are preferred for plantings on open land, but yellow-poplar, black walnut, and black locust are also suitable.

Plant competition is severe after stands have been opened by harvesting or by thinning. Because many trees volunteer readily, early weeding is generaly needed to obtain a stand of desirable trees. Through natural seeding, dense stands of trees quickly take over abandoned pasture and cropland. Planted trees generally need to be cultivated during their first growing season.

(Ps) POPE-STENDAL-ALLEGHENY SOIL ASSOCIATION

About 8,000 acres, or 5 percent of this soil association is woodland. This woodland is almost entirely on the somewhat poorly drained and poorly drained Stendal and Atkins soils. These soils have very high potential productivity that justifies intensive management for trees.

If they occur in a stand, trees to favor in management are cottonwood, sweetgum, silver maple, red maple, sycamore, and pin oak. These trees are also suitable for planting.

The well-drained soils in this soil association are wooded in only a few places. The potential productivity of the well-drained soils is very high and justifies intensive management. The kind of trees to favor in management is influenced by the frequency and duration of floods. In areas where floods are infrequent and generally last for less than 1 day, the trees to favor are yellow-poplar, black walnut, white oak, and other upland hardwoods of high value. Where floods are frequent and generally last for more than 1 day, cottonwood, sweetgum, silver maple, pin oak, and other water-tolerant trees should be favored. If the soils are susceptible to flooding, only hardwoods should be planted, for young pine trees are seriously damaged by floods.

On both the well-drained and poorly drained soils in this association, plant competition is severe after forest stands have been opened by harvesting or by thinning. To insure the dominance of desirable trees, early weeding may be necessary because dense stands of seedlings and saplings establish themselves rapidly. Through natural reseeding, abandoned cropland and pasture are invaded rapidly by trees and brush. Open land planted to trees normally needs at least one cultivation to control plant competition.

(Gw) GILPIN-UPSHUR-WELLSTON-MUSKINGUM SOIL ASSOCIATION

About 500 acres, or 20 percent of this soil association, is woodland, nearly all of which is on the Dekalb, Muskingum, Gilpin, and Upshur soils. The potential productivity of trees ranges from moderately low to fair and justifies only moderate practices of management.

If they occur in a stand, trees to favor in management are shortleaf pine, Virginia pine, black oak, and white oak. Shortleaf pine and loblolly pine are preferred for plantings on open land, but white pine is also suitable for planting. White pine grows well on the Dekalb, Muskingum, and Gilpin soils but not on the Upshur.

Plant competition is moderately severe after stands have been opened by harvesting or by thinning. In many places weeding is necessary in cutover woodland to permit growth of desirable trees. Plant competition among planted trees is generally slight on recently abandoned cropland and pasture.

(Gd) GILPIN-UPSHUR-DEKALB SOIL ASSOCIATION

About 18,000 acres, or 60 percent of this soil association, is woodland, nearly all of which is on the Berks, Dekalb, Muskingum, Gilpin, and Upshur soils. These are discussed in two groups because they vary widely in their potential productivity and in their suitability for trees.

Moderately steep to very steep soils that face north and east.—This group consists of some Muskingum and Gilpin soils and of all Dekalb and Berks soils in this association. These soils have high potential productivity that justifies intensive management.

If they occur in a stand, trees to favor in management are yellow-poplar, black walnut, white oak, northern red oak, basswood, and sugar maple. White pine, shortleaf pine, and loblolly pine are preferred for plantings on open land, but yellow-poplar, black walnut, and black locust are also suitable for planting.

Plant competition is severe after stands have been opened by harvesting or by thinning. To obtain stands of desirable trees, weeding is needed soon after the stands have been opened, because undesirable trees and brush volunteer readily. Competition is generally too severe for interplanting or for conversion planting. In abandoned cropland and pasture dense stands of trees that may not be wanted generally grow up naturally.

Soils on ridges and on slopes that face south and west, and all the Upshur soils.—In this group are some of the Muskingum and Gilpin soils in this association and all the Upshur soils. The potential productivity is fair and justifies moderately intensive management.

Trees to favor in management, if they occur in a stand, are shortleaf pine, Virginia pine, black oak, chestnut oak, and scarlet oak. Shortleaf pine and loblolly pine are preferred for plantings on open land. Abandoned cropland and pasture reseed naturally to desirable pine trees only if enough seed trees grow nearby.

(Rd) ROCK LAND-DEKALB SOIL ASSOCIATION

Nearly all of this soil association is wooded, but potential productivity is low and justifies little management. About 83 percent of the association is Rock land, which consists of intermingled soils and rocks. About half of this land can produce timber.

If they occur in a stand, trees to favor in management are shortleaf pine, pitch pine, Virginia pine, chestnut oak, and scarlet oak. Because the soils in this association lack water, openings in the woodland are reforested very slowly. Planted seedlings survive only if rain is abundant during the early part of the growing season.

(Md) MUSKINGUM-DEKALB-GILPIN-WELLSTON SOIL ASSOCIATION

About 80 percent of the 30,000 acres in this soil association is woodland. The potential productivity is moderately high and justifies intensive management.

Trees to favor in management, if they occur in a stand, are white oak, black oak, chestnut oak, scarlet oak, shortleaf pine, and Virginia pine. White pine, shortleaf pine, and loblolly pine are preferred for planting.

Plant competition is moderately severe after stands have been opened by harvesting or by thinning. Because many trees volunteer readily, early weeding is needed to insure a stand of desirable trees. Interplantings or conversion plantings also need some weeding. Preferred pine trees seed naturally on open land only if enough seed trees grow nearby.

Woodland management by suitability groups

This subsection discusses woodland management by groups of soils. The soils in each of the woodland suitability groups in the area are listed, and ways to overcome hazards are discussed. Table 12 is a woodland interpretation in which are listed (1) the potential productivity of each group, expressed as site indexes for specified trees, (2) trees to favor in existing woodland and in open plantations, and (3) management hazards.

The potential productivity of a soil for a specified kind of tree is expressed as a *site index*. A site index for a given soil is the height, in feet, that a specified kind of tree growing on that soil will reach in 50 years. For cottonwood, it is the height reached in 30 years. The site index of a soil is determined mainly by the capacity of the soil to provide moisture and growing space for tree roots. It provides a basis for determining the feasibility of woodland conservation. The site index shown in table 12 is an average for all the soils in the suitability group. The index for any one soil in the group may differ somewhat from the average.

The trees to favor in existing plantations and in open plantations are listed in table 12 in order of preference. Generally, pines are the best trees to plant on uplands, and cottonwood on lowlands.

The information in table 12 was based on studies made on approximately 200 sites in the 14 counties in eastern Kentucky and in similar areas. As nearly as possible, these studies were confined to well-stocked, unmanaged stands of naturally occurring, even-aged trees that have not been damaged by fire, grazing, insects, or diseases. If a site suitable for measurement of a specified tree was not available on a particular soil, the site index of a similar soil was used.

The management hazards listed in table 12 are plant competition, gully erosion, equipment limitations, and seedling mortality. Although wildfires are not listed in table 12, they must be guarded against on all woodland, mainly because the terrain is rough and access roads are few. Consequently, a small fire has a good chance to spread before it can be brought under control.

Plant competition is likely when a woodland is disturbed by fire, cutting, grazing, or some other means. Undersirable brush, trees, and other plants may invade and compete with the desirable trees and hinder their establishment and growth.

TABLE 12.—*Interpretations of woodland suitability groups*

[See text for description of each woodland suitability group]

Woodland suitability group	Brief description of soils	Potential productivity		Preferred trees for—		Management hazards
		Tree	Site index [1]	Existing woodland	Open plantations	
1	Dominantly well-drained, deep, level to strongly sloping soils on bottoms, foot slopes, and terraces; soils are mainly loamy and silty but are sandy in a few areas; erosion is generally slight to moderate but is severe in a small acreage of moderately steep soils.	Upland oak Yellow-poplar Virginia pine Shortleaf pine	80±4 104±8 77±5 77±4	Yellow-poplar, black walnut, white oak, northern red oak, basswood, cucumbertree, sugar maple, and hemlock.	White pine, shortleaf pine, loblolly pine, black locust, yellow-poplar, and black walnut.	Plant competition, gully erosion on slopes of more than 6 percent; equipment limitations on slopes of more than 12 percent.
2	Dominantly somewhat poorly drained to poorly drained, loamy soils on bottoms subject to long periods of flooding, included is Tyler silt loam, an inextensive terrace soil with a fragipan.	Cottonwood Pin oak Sweetgum Yellow-poplar	95 to 110 95 to 105 85 to 100 95 to 105	Cottonwood, sweetgum, pin oak, silver maple, and red maple.	Cottonwood, sweetgum, pin oak, and silver maple.	Plant competition and equipment limitations.
3	Dominantly moderately deep, moderately well drained, silty soils on sandstone and shale, on gently sloping to strongly sloping uplands and terraces; fragipan restricts root penetration to a depth of about 22 inches; some sloping areas are moderately eroded.	Upland oak Virginia pine Shortleaf pine	73±2 84 78±4	Shortleaf pine, black oak, shortleaf red oak, and Virginia pine.	Shortleaf pine, white pine, and loblolly pine.	Plant competition, gully erosion on slopes of more than 6 percent, equipment limitations on slopes of more than 12 percent.
4	Dominantly moderately deep, loamy soils that are on sloping to strongly sloping uplands and are underlain by sandstone and shale; some areas are very stony Upshur soils are clayey and are so intermingled with Gilpin soils in a few areas of Lawrence County that separation in mapping is not practical. Also in the group are Mine spoil and Strip mines.	Upland oak Virginia pine Shortleaf pine	65±5 70±4 74±5	Shortleaf pine, black oak, southern red oak, and Virginia pine	Shortleaf pine, loblolly pine, and white pine.	Plant competition, gully erosion, and equipment limitations.
5	Dominantly moderately deep, somewhat excessively drained, loamy soils on the lower two-thirds of moderately steep to steep, hot slopes, some areas are very stony. Upshur soils are clayey in Lawrence County and are so intermingled with Gilpin soils that separation in mapping is not practical. Also in the group are Mine spoil and Strip mines.	Upland oak Virginia pine Shortleaf pine	62±5 60±4 62±4	Shortleaf pine, black oak, white oak, and Virginia pine	White pine, shortleaf pine, and loblolly pine	Gully erosion and equipment limitations.
6	Dominantly moderately deep, excessively drained, loamy soils on the lower four-fifths of moderately steep to steep, cool upland slopes; some areas very stony. Upshur soils are clayey and in Lawrence County are so intermingled with Gilpin soils that separation in mapping is not practical.	Upland oak Yellow-poplar Virginia pine Shortleaf pine	75±6 93±9 75±3 80±8	Yellow-poplar, black walnut, white oak, northern red oak, basswood, cucumber tree, and hemlock.	White pine, shortleaf pine, loblolly pine, black locust, yellow-poplar, and black walnut.	Plant competition, gully erosion, and equipment limitations.

See footnote at end of table.

TABLE 12.—*Interpretations of woodland suitability groups*—Continued

Woodland suitability group	Brief description of soils	Potential productivity		Preferred trees for—		Management hazards
		Tree	Site index [1]	Existing woodland	Open plantations	
7	Severely eroded, shallow, loamy soils ranging from sloping to steep, some areas very stony. Upshur soils are clayey and in Lawrence County are so intermingled with Gilpin soils that separation in mapping is not practical. Soils in this group occupy all aspects of the entire slope in all sloping to strongly sloping areas, but occupy only the hot aspects of the lower two-thirds of slopes in moderately steep to steep areas.	Upland oak Shortleaf pine Virginia pine	45 to 55 45 to 55 50 to 60	Shortleaf pine, Virginia pine, black oak, and scarlet oak.	Shortleaf pine and loblolly pine.	Gully erosion, equipment limitations, and seedling mortality.
8	Severely eroded, shallow, somewhat excessively drained, loamy soils occupying the lower four-fifths of moderately steep to very steep slopes on the cool aspects, some areas very stony. Upshur soils are clayey and in Lawrence County are so intermingled with Gilpin soils that separation in mapping is not practical.	Upland oak Virginia pine Shortleaf pine	55 to 60 55 to 65 55 to 60	Shortleaf pine, Virginia pine, chestnut oak, black oak, and scarlet oak.	Shortleaf pine, loblolly pine, and white pine.	Gully erosion and equipment limitations.
9	Moderately deep, loamy soils occupying very narrow ridgetops and the upper part of moderately steep to very steep slopes; erosion ranges from slight to severe. Upshur soils in this group are clayey and in Lawrence County are so intermingled with Gilpin soils that separation in mapping is not practical.	Upland oak Virginia pine Shortleaf pine	58±4 52±4 52±4	Shortleaf pine, Virginia pine, chestnut oak, pitch pine, and scarlet oak.	Shortleaf pine	Gully erosion, equipment limitations, and seedling mortality.
10	Dominantly sloping to strongly sloping, well-drained soils underlain by shale on uplands; moderately clayey to clayey subsoil; erosion ranges from slight to moderate.	Upland oak Virginia pine Shortleaf pine	61±5 64±6 64	Shortleaf pine, black oak, white oak, Virginia pine, hickory, and southern red oak.	Shortleaf pine, loblolly pine, and white pine.	Plant competition; gully erosion on slopes of more than 6 percent; equipment limitations on slopes of more than 12 percent.
11	Sloping to moderately steep, well-drained, eroded clays that have a very plastic subsoil.	Upland oak Redcedar	45 to 50 35 to 40	Redcedar	Redcedar	Gully erosion, equipment limitations, and seedling mortality.

[1] Average height of dominant trees in stand at 30 years of age for cottonwood and at 50 years of age for all other trees. Curves were used to obtain the site indexes for all trees except redcedar. The indexes for redcedar were based on 271 observations made in the summer of 1948 by foresters of the TVA on plots throughout the Tennessee Valley. Listed below for the other trees are the sources of the curves used to determine the site indexes

For yellow-poplar, curve constructed by WARREN T. DOOLITTLE, research forester, Division of Forest Management Research, Southeastern Forest Experiment Station, Asheville, N.C.
For sweetgum and pin oak, Forest Serv. Occas. Paper 176 (*11*).
For cottonwood, Forest Serv. Occas. Paper 178 (*12*).
For upland oaks, Forest Serv. Tech. Bul. 560 (*8*).
For shortleaf pine, COILE and SCHUMACHER, Journal of Forestry, v. 51: 432–35 (*2*)
For Virginia pine, N.C. Agr. Exp. Sta. Tech. Bul. 100 (*4*).

Gully erosion is a hazard in the whole survey area on all slopes of more than 6 percent. Because runoff concentrates in cleared areas and forms gullies, it is necessary to locate, construct, and maintain roads and skid trails properly.

Equipment limitations are severe on all soils in the survey area that have slopes of more than 12 percent. Track-type equipment and power winches are needed on these soils for efficient harvesting.

In table 13, for each soil association, is the estimated acreage of the soils in each woodland suitability group. Table 14 estimates average yearly growth of yellow-poplar, Virginia pine, and shortleaf pine, and table 15 estimates the average yearly growth of upland oaks.

TABLE 13.—*Estimated acreages in soil associations by woodland suitability groups*

Woodland suitability group	Soil association							
	Jm	Db	Dg	Ps	Gw	Gd	Rd	Md
1	43, 170	110, 110	1, 990	99, 690		1, 380		
2	3, 460	20, 450	400	46, 450		120		
3	2, 080	1, 480	320	1, 810	90	60		290
4	5, 290	9, 590	1, 690		1, 880	2, 630	1, 680	19, 470
5	3, 790	808, 630	2, 370			6, 590	3, 060	2, 220
6	6, 850	983, 110	3, 440			2, 600	3, 660	5, 580
7	2, 860	521, 180	1, 380		140	9, 610	800	1, 680
8	1, 270	92, 820	660			3, 800	912	910
9	2, 710	655, 750	3, 330		20	3, 950	2, 450	2, 450
10	540	990	180		220	130		800
11					270	660		

TABLE 14.—*Approximate average yearly growth, per acre, on well-stocked, unthinned stands of trees on uplands*

[Yields in board feet from trees up to 60 years old. Yields in cords from trees up to 35 years old. Absence of data means trees do not grow on the soils or are not important]

Woodland suitability group	Yellow-poplar [1]		Virginia pine [2]		Shortleaf pine [3]	
	Bd ft (International rule)	*Cords (rough)*	*Bd ft (International rule)*	*Cords (rough)*	*Bd ft (International rule)*	*Cords (rough)*
1	770	1. 9	490	1 3	600	1. 5
2	700	1 8				
3			535	1. 3	610	1 6
4			450	1 2	555	1 5
5			370	1 0	395	1 1
6	590	1 6	480	1. 2	640	1 6
7			320	8	220	9
8			370	1 0	325	1 1
9			290	. 7	250	9
10			400	1 1	420	1 2
11						

[1] Data interpreted from Forest Serv. Tech. Bul. 356 (*7*)
[2] Data interpreted from N.C Agr Expt Sta. Tech Bul. 100 (*4*).
[3] Data interpreted from U S. Dept. Agr. Misc Pub. 50 (*6*)

TABLE 15.—*Approximate average yearly growth, per acre, of upland oak in well-managed stands* [1]

Woodland suitability group	Yearly growth	
	Bd ft (International ¼-in rule)	*Cords (rough)*
1	350	1. 2
2 [2]		
3	285	1 0
4	220	. 9
5	200	8
6	300	1 1
7	130	. 6
8	165	. 8
9	165	. 8
10	195	8
11	120	. 6

[1] Yields in board feet are based on age periods ranging from 65 to 80 years. Yields in cords are based on age periods ranging from 30 to 60 years Data interpreted from Forest Serv. Tech Bul. 560 (*8*).
[2] Estimates not given for group 2, because it consists of soils on bottoms

WOODLAND SUITABILITY GROUP 1

In this group are dominantly well-drained, deep, level to strongly sloping soils that occur on bottoms, foot slopes, and terraces. These soils are generally loamy or silty, but they are sandy in a few places. Most of the soils are uneroded or moderately eroded, but a few of the moderately steep soils are severely eroded. The soils in this group are—

Allegheny fine sandy loam, 6 to 12 percent slopes.
Allegheny loam, 2 to 6 percent slopes.
Allegheny loam, 6 to 12 percent slopes.
Allegheny loam, 6 to 12 percent slopes, eroded.
Allegheny loam, 12 to 20 percent slopes, eroded.
Allegheny silt loam, 0 to 2 percent slopes.
Allegheny silt loam, 2 to 6 percent slopes.
Allegheny silt loam, 6 to 12 percent slopes, eroded.
Barbourville gravelly loam, 2 to 6 percent slopes.
Barbourville gravelly loam, 6 to 12 percent slopes.
Bruno loamy fine sand, 0 to 2 percent slopes.
Cotaco gravelly loam, 2 to 6 percent slopes
Cotaco gravelly loam, 6 to 12 percent slopes.
Cotaco loam, 2 to 6 percent slopes.
Hayter gravelly loam, 2 to 6 percent slopes.
Hayter gravelly loam, 6 to 12 percent slopes.
Hayter gravelly loam, 12 to 20 percent slopes.

Holston loam, 2 to 6 percent slopes.
Holston loam, 6 to 12 percent slopes.
Holston loam, 12 to 20 percent slopes, eroded.
Holston fine sandy loam, 2 to 6 percent slopes.
Holston fine sandy loam, 6 to 12 percent slopes.
Holston fine sandy loam, 12 to 20 percent slopes, eroded.
Holston silt loam, 2 to 6 percent slopes
Holston silt loam, 6 to 12 percent slopes
Holston silt loam, 6 to 12 percent slopes, eroded.
Huntington fine sandy loam.
Huntington silt loam.
Jefferson gravelly loam, 2 to 6 percent slopes
Jefferson gravelly loam, 6 to 12 percent slopes
Jefferson gravelly loam, 6 to 12 percent slopes, eroded.
Jefferson gravelly loam, 12 to 20 percent slopes.
Jefferson gravelly loam, 12 to 20 percent slopes, eroded.
Jefferson gravelly loam, 12 to 20 percent slopes, severely eroded.
Jefferson gravelly loam, 20 to 30 percent slopes.
Jefferson gravelly loam, 20 to 30 percent slopes, severely eroded
Jefferson stony loam, 6 to 12 percent slopes.
Jefferson stony loam, 12 to 20 percent slopes.
Jefferson stony loam, 12 to 20 percent slopes, severely eroded.
Jefferson stony loam, 20 to 30 percent slopes
Jefferson stony loam, 20 to 30 percent slopes, severely eroded.
Philo fine sandy loam
Philo silt loam
Pope gravelly fine sandy loam.
Pope fine sandy loam, 0 to 2 percent slopes.
Pope fine sandy loam, 6 to 12 percent slopes.
Pope silt loam, 0 to 2 percent slopes.
Pope silt loam, 6 to 12 percent slopes.
Sequatchie fine sandy loam, 0 to 2 percent slopes.
Sequatchie fine sandy loam, 2 to 6 percent slopes
Sequatchie fine sandy loam, 6 to 12 percent slopes.
Whitwell loam.
Zaleski silt loam, 2 to 6 percent slopes.

Potential productivity is high and justifies intensive management.

Plant competition is severe because available moisture is abundant during the growing season. Low-quality trees that tolerate shade establish themselves in the understory of saw-log stands and, unless they are weeded, prevent desirable trees from getting a start after the sawtimber is cut. Because of severe competition, interplantings and conversion plantings are not feasible. Trees planted in open fields generally require one cultivation or more.

The hazard of gully erosion is severe on slopes of more than 6 percent and becomes more severe as the slope increases. To avoid gully erosion, roads and skid trails should be located, constructed, and maintained with care.

Equipment limitations are severe on slopes of more than 12 percent. Steepness of slopes limits the use of ordinary farm equipment. Track-type equipment is required for efficient harvesting of trees.

WOODLAND SUITABILITY GROUP 2

In this group are dominantly somewhat poorly drained to poorly drained, loamy soils on bottom lands. These soils are likely to be flooded periodically and for long periods. They are—

Alluvial escarpment.
Atkins fine sandy loam.
Atkins silt loam.
Newark silt loam
Stendal gravelly fine sandy loam.
Stendal fine sandy loam.
Stendal silt loam.
Tyler silt loam.

Tyler silt loam is on stream terraces and has a fragipan. Its total acreage is small.

Potential productivity is high on all these soils and justifies intensive management.

Plant competition is severe because available moisture is abundant during the growing season. Low-quality trees that tolerate shade establish themselves in the understory of saw-log stands and, unless they are weeded, generally prevent the establishment of desirable trees after the sawtimber is cut. Because competition is severe, interplantings and conversion plantings generally are not feasible. Trees planted in open fields generally require one cultivation or more.

Equipment limitations are severe because these soils are wet for periods totaling more than 3 months each year. During these wet periods the use of equipment is limited.

WOODLAND SUITABILITY GROUP 3

In this group are dominantly moderately deep, moderately well drained, silty soils underlain by sandstone and shale, on gently sloping to strongly sloping uplands and terraces. A fragipan at a depth of about 22 inches limits the penetration of roots. Some of the sloping soils in this group are moderately eroded. In this group are—

Monongahela loam, 2 to 6 percent slopes.
Monongahela fine sandy loam, 2 to 6 percent slopes.
Monongahela fine sandy loam, 6 to 12 percent slopes.
Monongahela fine sandy loam, 6 to 12 percent slopes, eroded.
Monongahela silt loam, 2 to 6 percent slopes.
Monongahela silt loam, 6 to 12 percent slopes.
Tilsit silt loam, 2 to 6 percent slopes.

Potential productivity is moderately high and justifies intensive management.

Plant competition is severe because moisture is ample during the growing season. Low-quality trees that tolerate shade establish themselves in the understory of saw-log stands and, when the overstory is removed by logging, generally prevent the satisfactory growth of desirable trees. One or more weedings are normally required to insure the dominance of desirable trees. Because of this intensive weeding, interplantings and conversion plantings are not generally feasible. Competition is severe for trees newly planted on cropland and pasture that have been abandoned for 2 years or more.

Mainly because of soil texture, the hazard of gully erosion is severe on slopes of more than 6 percent and increases as slopes become steeper. These soils tend to gully. In areas where water concentrates, roads and skid trails need to be located, constructed, and maintained with care.

Equipment limitations are severe on slopes of more than 12 percent. Because the slopes are too steep for ordinary farm equipment to be used, track-type equipment is required for efficient harvesting of trees.

WOODLAND SUITABILITY GROUP 4

In this group are dominantly moderately deep, sloping to strongly sloping, loamy soils of the uplands that are underlain by sandstone and shale. Some areas are very stony. Also in the group are Mine spoil and Strip mines. The soils are—

Dekalb fine sandy loam, 6 to 12 percent slopes.
Dekalb fine sandy loam, 12 to 20 percent slopes.
Dekalb stony loam, 12 to 20 percent slopes.
Gilpin-Upshur complex, 6 to 12 percent slopes.
Gilpin-Upshur complex, 12 to 20 percent slopes.
Muskingum-Gilpin silt loams, 6 to 12 percent slopes.
Muskingum-Gilpin silt loams, 12 to 20 percent slopes.

Wellston silt loam, 6 to 12 percent slopes.
Wellston silt loam, 12 to 20 percent slopes.
Wellston silt loam, 12 to 20 percent slopes, eroded.

The Upshur soils are clayey and occur only in a few places in Lawrence County.

Potential productivity on all these soils is moderately high and justifies intensive management.

Plant competition is severe because moisture is ample during the growing season. Generally, low-quality trees that tolerate shade establish themselves in the understory of saw-log stands and, when the overstory is removed by logging, prevent the satisfactory growth of desirable trees. One or more weedings are generally required to insure the growth of desirable trees. Because of this intensive weeding, interplantings and conversion plantings generally are not feasible. Plant competition is severe for trees newly planted on cropland and pasture that have been abandoned for 2 years or more.

The hazard of gully erosion is severe because these soils are steep and loamy. They tend to gully readily in areas where water is concentrated. Consequently, roads and skid trails should be located, constructed, and maintained properly.

Equipment limitations are severe. The use of ordinary farm equipment is limited because slopes are steep, the terrain is rough, and rocks crop out. Track-type equipment and power winches are required for efficient harvesting of trees.

WOODLAND SUITABILITY GROUP 5

In this group are Mine spoil and Strip mines, and those parts of the following soils on the lower two-thirds of hot slopes.

Dekalb fine sandy loam, 20 to 30 percent slopes.
Dekalb stony loam, 20 to 30 percent slopes.
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes.
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes.
Gilpin-Upshur complex, 20 to 30 percent slopes.
Gilpin-Upshur complex, 30 to 50 percent slopes.

These soils are dominantly moderately deep, somewhat excessively drained, and loamy, but some areas are very stony. The Upshur soils are clayey in Lawrence County. Some areas are severely eroded (fig. 12).

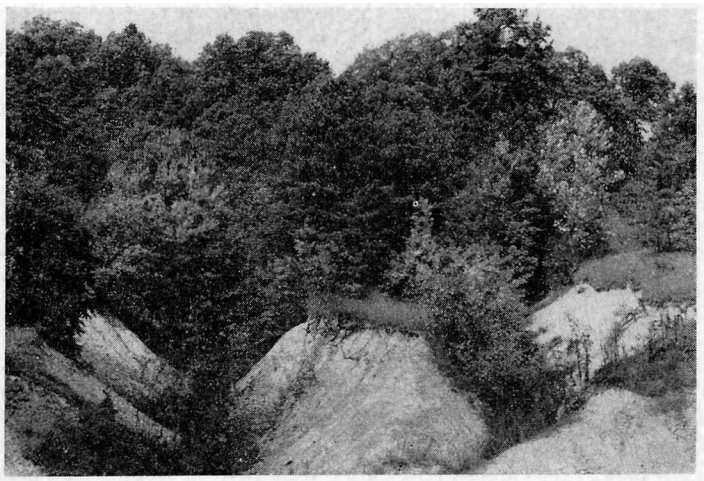

Figure 12.—**Severely gullied land along foothills. Woodland suitability group 5.**

Potential productivity on all these soils is generally fair and justifies moderately intensive management. Production of trees ranges from high on the deep Mine spoil to low on the shallow Mine spoil.

The hazard of gully erosion is severe because these soils are steep and loamy. They tend to gully readily if water is concentrated on them. Consequently, roads and skid trails need to be properly located, constructed, and maintained.

Equipment limitations are severe. The use of ordinary farm equipment is limited because the slopes are steep, the terrain is rough, and rocks crop out. Track-type equipment and power winches are required for efficient harvesting.

WOODLAND SUITABILITY GROUP 6

In this group are those parts of the following soils on the lower four-fifths of cool slopes.

Dekalb fine sandy loam, 20 to 30 percent slopes.
Dekalb stony loam, 20 to 30 percent slopes.
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes.
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes.
Gilpin-Upshur complex, 20 to 30 percent slopes.
Gilpin-Upshur complex, 30 to 50 percent slopes.
Muskingum-Gilpin silt loams, 20 to 30 percent slopes.

These soils are dominantly moderately deep, moderately steep to steep, excessively drained, and loamy. Some areas are very stony. The Upshur soils are clayey and are only in Lawrence County.

Potential productivity is generally high and justifies intensive management. The Upshur soils in the Gilpin-Upshur complexes are less productive than the Gilpin soils.

Plant competition is severe because the soils have ample moisture during the growing season. Generally, low-quality trees that tolerate shade establish themselves in the understory of saw-log stands and, when the overstory is removed by logging, prevent desirable trees from getting a start. One or more weedings are normally required to insure the dominance of desirable trees. Because of intensive weeding, interplantings and conversion plantings are not feasible. Plant competition is severe for trees newly planted on cropland or pasture that has been abandoned for 2 years or more.

The hazard of gully erosion is severe because the soils are steep and loamy. They tend to gully readily if water is concentrated on them. Consequently, roads and skid trails need to be properly located, constructed, and maintained.

Equipment limitations are severe. The use of ordinary farm equipment is limited because slopes are steep, the terrain is rough, and rocks crop out. Track-type equipment and power winches are required for efficient harvesting.

WOODLAND SUITABILITY GROUP 7

This group consists of severely eroded soils on slopes of not more than 20 percent, and of those parts of steeper soils on the lower two-thirds of hot slopes. The soils on slopes of not more than 20 percent are—

Dekalb stony loam, 12 to 20 percent slopes.
Muskingum-Gilpin silt loams, 6 to 12 percent slopes.
Muskingum-Gilpin silt loams, 12 to 20 percent slopes.

The soils of which only the lower two-thirds of hot slopes are in a group are—

Dekalb stony loam, 20 to 30 percent slopes, severely eroded.
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes, severely eroded.
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes, severely eroded.
Gilpin-Upshur complex, 20 to 30 percent slopes, severely eroded.
Gilpin-Upshur complex, 30 to 50 percent slopes, severely eroded.
Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded.

These severely eroded soils range from sloping to steep and are loamy. Some areas are very stony. The Upshur soils are clayey and are only in Lawrence County.

Potential productivity is low on all these soils and justifies only a little management.

Equipment limitations are severe. The use of ordinary farm equipment is limited because the slopes are steep, the terrain is rough, and rocks crop out. Track-type equipment and power winches are required for efficient harvesting.

The hazard of gully erosion is severe because these soils are steep and loamy. They tend to gully readily if water concentrates on them. Consequently, roads and skid trails should be properly located, constructed, and maintained.

Seedling mortality is severe. Droughty periods lasting 2 or 3 weeks occur during the early part of some growing seasons and cause moderate to severe losses of newly planted and naturally seeded trees.

WOODLAND SUITABILITY GROUP 8

In this group are those parts of the following soils on the lower four-fifths of cool slopes.

Dekalb stony loam, 20 to 30 percent slopes, severely eroded.
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes, severely eroded.
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes, severely eroded.
Gilpin-Upshur complex, 20 to 30 percent slopes, severely eroded.
Gilpin-Upshur complex, 30 to 50 percent slopes, severely eroded.
Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded.

These soils are severely eroded, shallow, loamy, and somewhat excessively drained. Some areas are very stony. The Upshur soils are clayey and are only in Lawrence County.

Potential productivity is fairly low and justifies only limited investment in management.

Equipment limitations are severe. Because the soils are steep, the terrain is rough, and rocks crop out, the use of ordinary farm equipment is limited and track-type equipment and power wenches are required for efficient harvesting.

The hazard of gully erosion is severe because these soils are steep and loamy. They tend to gully readily if water is concentrated on them. Consequently, roads and skid trails should be properly located, constructed, and maintained.

WOODLAND SUITABILITY GROUP 9

In this group are those parts of the following soils that occur on the upper fifth of cool slopes, on the upper third of hot slopes, and on very narrow ridges.

Dekalb fine sandy loam, 20 to 30 percent slopes.
Dekalb stony loam, 20 to 30 percent slopes.
Dekalb stony loam, 20 to 30 percent slopes, severely eroded.
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes.
Dekalb-Muskingum-Berks stony soils, 30 to 50 percent slopes, severely eroded.
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes.
Dekalb-Muskingum-Berks stony soils, 50+ percent slopes, severely eroded.
Gilpin-Upshur complex, 20 to 30 percent slopes.
Gilpin-Upshur complex, 20 to 30 percent slopes, severely eroded.
Gilpin-Upshur complex, 30 to 50 percent slopes.
Gilpin-Upshur complex, 30 to 50 percent slopes, severely eroded.
Muskingum-Gilpin silt loams, 20 to 30 percent slopes.
Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded.
Rock land.

These soils are loamy and moderately deep, but some areas are stony. Potential productivity is low and justifies only limited management. About half of Rock land is nonproductive.

Equipment limitations are severe. The use of ordinary farm equipment is limited by steep slopes, rough terrain, and rock outcrops. Track-type equipment and power winches are required for efficient harvesting.

The hazard of gully erosion is severe because slopes are steep and the texture is loamy. Because these soils tend to gully readily where water is concentrated on them, roads and skid trails should be properly located, constructed, and maintained.

Seedling mortality is severe. Droughty periods 2 to 3 weeks long occur during the early part of some growing seasons and cause moderate to severe losses of newly planted trees. Generally, natural seedlings establish themselves so slowly that they do not provide adequate cover.

WOODLAND SUITABILITY GROUP 10

The soils in this group are on uplands and are dominantly sloping to strongly sloping and well drained. These soils have a moderately clayey to clayey subsoil that is underlain by shale. They are susceptible to slight or moderate erosion. The soils are—

Enders silt loam, 6 to 12 percent slopes.
Enders silt loam, 12 to 20 percent slopes.
Muse silt loam, 6 to 12 percent slopes.
Muse silt loam, 12 to 20 percent slopes, eroded.
Rarden silt loam, 6 to 12 percent slopes, eroded.
Rarden silt loam, 12 to 20 percent slopes, eroded.

Potential productivity is fair and justifies moderately intensive management.

The hazard of gully erosion is severe on slopes of more than 6 percent and increases on steeper slopes. Because the soils tend to gully readily where water is concentrated on them, roads and skid trails should be properly located, constructed, and maintained.

Equipment limitations are severe on slopes of more than 12 percent. The slopes are too steep for the use of ordinary farm equipment, and track-type equipment is required for efficient harvesting.

Plant competition is severe because moisture is ample during the growing season. Normally, low-quality trees that tolerate shade establish themselves in the understory of saw-log stands and, when the overstory is removed by logging, generally prevent desirable trees from getting a start. One or more intensive weedings are required in most places to insure the dominance of desirable trees.

TABLE 16.—*Wildlife productivity groups of soils and estimated acreage by soil associations*

Wildlife productivity group	Soil association							
	Jm	Db	Dg	Ps	Gw	Gd	Rd	Md
1	9, 590	34, 950	710	67, 920		660		
2	20, 080	74, 180	1, 360	59, 530	260	310		2, 420
3	18, 090	3, 067, 940	12, 160	6, 340	520	4, 640	83, 980	31, 240

Interplantings and conversion plantings generally are not feasible. Undesirable plants compete severely with newly planted trees on cropland or pasture that has been abandoned for 2 years or more.

WOODLAND SUITABILITY GROUP 11

In this group are sloping to moderately steep, well-drained soils. These soils are eroded and have a very plastic subsoil. They are—

Upshur silty clay, 6 to 12 percent slopes, eroded
Upshur silty clay, 12 to 20 percent slopes, eroded.
Upshur silty clay, 20 to 30 percent slopes, eroded.

Potential productivity is fair for redcedar but is poor for other trees. It justifies little management.

The hazard of gully erosion is severe because these soils are steep. They tend to gully readily if water is concentrated on them, and roads and skid trails need to be properly located, constructed, and maintained.

Equipment limitations are severe. The slopes are too steep for the use of ordinary farm equipment. Track-type equipment is required for efficient harvesting.

Seedling mortality is moderately severe because droughty periods lasting 2 to 3 weeks occur during the early part of some growing seasons. These dry periods cause moderate to severe losses of newly planted trees and of natural seedlings.

Use of Soils for Wildlife[4]

This subsection consists of three main parts. The first part lists the kinds of wildlife that live in eastern Kentucky and names the soil associations in which each kind is numerous. The second part describes habitats suitable for the kinds of wildlife that live in this area. In the third part some soils in the survey area are listed in three wildlife productivity groups, and each group is discussed. A wildlife productivity group is made up of soils that respond to management for wildlife in about the same way. Table 16 lists, for each soil association, the estimated acreage of the soils listed in each wildlife productivity group.

Wildlife in eastern Kentucky

The main kinds of wildlife in eastern Kentucky are cottontail rabbit, gray squirrel, raccoon, opossum, skunk, muskrat, red and gray fox, quail (bobwhite), and ruffed grouse. Less numerous are fox squirrel, whitetailed deer, mink, mourning dove, wild turkey, and ducks and geese. Many kinds of songbirds and nongame mammals are also present.

The streams in this area contain the kinds of fish commonly found in the State. These fish can be classified as game fish, pan fish, and rough fish. Among the game fish are largemouth bass and walleye. Bluegill and other small sunfish are pan fish, and carp and bullhead are rough fish. Most of the farm ponds have been stocked with game and pan fish by the Kentucky Department of Fish and Wildlife Resources.

Cottontail rabbit are common, but their number fluctuates from year to year. They thrive in large numbers on the (Jm) Jefferson-Muskingum-Holston-Dekalb and the (Ps) Pope-Stendal-Allegheny soil associations and are less numerous on the (Gw) Gilpin-Upshur-Wellston-Muskingum and the (Gd) Gilpin-Upshur-Dekalb associations.

Gray squirrel are common in most of the survey area and in some places are abundant. They are most numerous on the (Db) Dekalb-Muskingum-Berks, the (Dg) Dekalb-Muskingum-Gilpin-Jefferson, the (Rd) Rock land-Dekalb, and the (Md) Muskingum-Dekalb-Gilpin-Wellston soil associations.

Fox squirrel are few in the survey area and are most likely to be on the (Ps) Pope-Stendal-Allegheny soil association.

Quail (bobwhite) are generally confined to the (Jm) Jefferson-Muskingum-Holston-Dekalb and the (Ps) Pope-Stendal-Allegheny associations, where their average density is about one and one-half coveys per 100 acres.

Whitetailed deer are now rare, but the Kentucky Department of Fish and Wildlife Resources is restocking them, and they are thought to be increasing. Possibly, in a few years there will be enough whitetailed deer for hunting to be permitted. Although most of the survey area contains habitat suitable for deer, these animals seem to prefer the (Db) Dekalb-Muskingum-Berks, the (Dg) Dekalb-Muskingum-Gilpin-Jefferson, the (Rd) Rock land-Dekalb, and the (Md) Muskingum-Dekalb-Gilpin-Wellston soil associations.

Raccoon and muskrat are common, but *mink* are rare in most places and are abundant in some. These three furbearers are most numerous on the (Ps) Pope-Stendal-Allegheny association, but they are also in other areas.

Red fox, gray fox, skunk, and opossum are common on all the soil associations, but red fox seem to prefer the (Gd) Gilpin-Upshur-Dekalb association and gray fox probably prefer the (Rd) Rock land-Dekalb association.

Ruffed grouse are common and in some parts are abundant. They are mainly on the (Dg) Dekalb-Muskingum-Gilpin-Jefferson association, but large numbers are also on the (Db) Dekalb-Muskingum-Berks, the (Rd) Rock land-

[4] By WILLIAM H. CASEY, biologist, Soil Conservation Service.

Dekalb, and the (Md) Muskingum-Dekalb-Gilpin-Wellston associations.

Mourning dove are rare and are found only in the intensively farmed parts of the (Jm) Jefferson-Muskingum-Holston-Dekalb and the (Ps) Pope-Stendal-Allegheny associations.

Ducks and geese are rare, but they can be seen along the major streams of the (Ps) Pope-Stendal-Allegheny soil association.

Songbirds are common throughout the area, but they vary in kinds and number according to the food and cover available. Most of the 228 species known to visit the State are probably in the area at one time or another.

Fish are abundant in the Cumberland River, the South, Middle, and North Forks of the Kentucky River, Levisa Fork, Tug Fork, and the major tributaries of these streams. Although game and pan fish are found in all these streams, and are even common in some localities, they are much less numerous than rough fish, which are abundant. Dewey Lake, made by impounding Johns Creek in Floyd and Pike Counties, offers some fishing and other recreation.

Habitat requirements

Cottontail rabbit.—Rabbits are most abundant in agricultural areas. They are vegetarians and eat so many kinds of plants that lack of food is seldom a problem. Brier patches provide their best cover. Farms that have fields in crops and pasture are most productive of rabbits if the fields are separated by wide, brushy fence rows. Rabbits use burrows abandoned by groundhogs during periods of bitter cold.

Gray squirrel.—For their homes these squirrels prefer large, unbroken expanses of hardwood forest. Forests that contain many mature or decayed hardwoods produce the most squirrels because these trees furnish most of the hollows required for dens. Because squirrels eat nuts and other seeds, their population varies greatly according to the fruiting success of trees that produce these foods. Among the trees that produce food for squirrels are shagbark hickory, white oak, black oak, walnut, hackberry, sassafras, dogwood, and blackgum. Squirrels are also fond of the food supplied by mulberry and osage-orange.

Fox squirrel.—Unlike the gray squirrel, the fox squirrel prefers small woodlots with parklike openings. Also, for some reason not clearly understood, fox squirrels seem to be more at home on bottom lands along streams than gray squirrels. Fox squirrels and gray squirrels need the same kinds of trees for dens and food.

Quail (bobwhite).—Quail thrive best in agricultural areas where there are pastures, crop fields, and woodlots. The fields ought to be less than 10 acres in size and separated by wide, brushy fence rows. These birds require grass and other herbaceous cover for nesting, cultivated crops and other seed-bearing plants for food, and brush and trees for protection from the weather and their natural enemies. Because they obtain enough moisture from the insects, berries, and fleshy fruits they eat, quail do not need water for drinking, except possibly in extremely droughty periods.

Ruffed grouse.—Ruffed grouse live in forests, but they are attracted to natural or manmade openings because many of their preferred food plants grow there. Among these food plants are blackberry, wild cherry, flowering dogwood, and domesticated apple trees. Grouse eat insects and acorns if they are available. During winter, when other foods are scarce or nonexistent, they feed almost exclusively on buds of woody plants. The male grouse needs a log to drum on so that he can perform his courtship display. He prefers an old, decaying log that is more than 20 inches in diameter.

Whitetailed deer.—Deer are generally considered animals of the forest, but they thrive in agricultural areas where crop fields and pastures are interspersed with a large amount of woodland. The deer browse rather than graze, but their food habits vary with the seasons. They eat tender grasses and clovers in spring, leaves of herbs, shrubs, and trees in summer, and acorns in fall. Most of their browsing in winter is on tender twigs of shrubs and trees. Deer are also fond of corn and of apples from domesticated trees. Especially during dry periods, they need water for drinking.

Raccoon.—Raccoon are likely to be found wherever woodland contains large, hollow trees for dens. They are especially attracted to wooded areas near streams and other bodies of water. Their principal plant foods are persimmons, pecans, acorns, grapes, pokeberries, and corn. Animal foods include crayfish, insects, frogs, and small mammals.

Muskrat.—Muskrats require an aquatic habitat. Along streams and by farm ponds, they ordinarily live in burrows that they build in the banks. In marshes, they build houses of aquatic vegetation. Their main food consists of the stems and roots of cattails, rushes, and other aquatic plants. Sometimes they eat frogs, turtles, and fish. Muskrats may leave the ponds or streams in which they live if the food supply is short or if they are kept out by farmers. However, they constantly come back to farm ponds from which they have been removed.

Mink.—Mink also prefer wooded areas along streams and lakes. Their home is generally a brush pile or a burrow in a streambank. They spend most of their life near water, where they feed on sick muskrats, aquatic insects, crayfish, frogs, and small fish. Occasionally when food is scarce in their normal habitat, mink travel a considerable distance from water.

Red fox.—These animals prefer rolling or hilly areas that contain cropland, meadow, and fairly open woodland. Their den is generally an abandoned groundhog burrow. Rabbits and mice make up about 45 percent of their food, birds 15 percent, insects 20 percent, persimmons, grapes, and other vegetable matter 20 percent.

Gray fox.—Gray foxes prefer river bottoms, bluffs or cliffs, and fairly open brushland. Their dens are more secret than those of red foxes and are in a hollow log or a hole in a cliff instead of an abandoned burrow. Gray foxes can climb trees. They eat about the same kinds of food as red foxes, but they probably eat more vegetable matter.

Skunk.—These beneficial animals live mainly in agricultural areas that contain a well-balanced mixture of woodland, brushland, and grassland. Skunks seldom stray farther than a mile or two from water. They generally use holes in the ground for dens but at times use old buildings as temporary shelters. Their food consists of insects, mice, eggs, fruits, and berries.

Opossum.—Although opossums are commonly found on farms, they are primarily woodland animals. They make

their dens in abandoned groundhog burrows, under brush piles or old buildings, or in hollow trees. Their diet consists of fruits, particularly persimmons, and insects, mice, garbage, and carrion. The best habitats contain water for drinking.

Mourning dove.—These birds are migratory, but a few probably remain in the area throughout the winter. They eat seeds and are attracted by grain crops in agricultural areas. Partly because they do not eat insects, they require open water for drinking and are attracted to areas with farm ponds. Most doves nest in pine, elm, or other trees with rather open foliage, but a few nest on the ground. Preferred nesting places are evergreens, which may occur either as pine plantations or as ornamentals in urban parks and in cemeteries.

Wild turkey.—Wild turkeys prefer wooded areas, but they reproduce satisfactorily if half of their habitat is cultivated. Because flocks range widely in their daily and seasonal wanderings, about 20,000 acres is needed for one management unit. Principal foods are acorns, beechnuts, blueberries, huckleberries, blackberries, and grapes. Turkey poults, like other young birds, feed extensively on insects. Flocks of turkeys have been known to exist without standing water for drinking, but they generally need it.

Ducks and geese.—Wood ducks possibly nest in this area, but other waterfowl ordinarily do not, though a few alight when water and food are available. Preferred foods for ducks are millet, corn, smartweed, soybeans, and small acorns, especially those from pin oak. Although ducks sometimes feed in dry cornfields, ordinarily their food plants need to be flooded to a depth of 1 to 12 inches. They are attracted, therefore, to periodically flooded bottoms if food is there. Geese also eat grain, not necessarily flooded. Geese can feed in a dry cornfield and are especially fond of feeding on winter wheat and ladino clover.

Songbirds.—The requirements of songbirds for food and cover vary greatly. Some songbirds nest on the ground, some in shrubs, some in tall trees, and some in hollows of dead trees. Some songbirds eat mostly seeds, insects, and fruits, but others eat mostly small animals. The areas that have the most kinds and largest amounts of vegetation have birds in the greatest diversity and number.

Game fish, pan fish, and rough fish.—Large numbers of these kinds of fish normally do not live in the same body of water, because each kind requires water of markedly different physical and chemical properties. Generally, rough fish can tolerate water that contains less oxygen than is required by game and pan fish. Rough fish feed largely by taste and smell, but game fish and pan fish feed by sight. Consequently, rough fish do not need such clear water. Also, rough fish can live sometimes in silt-laden, chemically polluted water, but game and pan fish generally cannot.

Wildlife productivity groups of soils

In this subsection the major soils in the survey area are grouped according to their suitability for food and cover that attract wildlife. The soils vary greatly in the kinds and amounts of plants they produce.

WILDLIFE PRODUCTIVITY GROUP 1

The soils in this group have high to very high moisture-supplying capacity and moderately high to high natural fertility. They are the most productive soils in the survey area and are suited to many kinds and large amounts of vegetation. The major soils in this group are—

Allegheny silt loam, 0 to 2 percent slopes.
Allegheny silt loam, 2 to 6 percent slopes.
Barbourville gravelly loam, 2 to 6 percent slopes.
Barbourville gravelly loam, 6 to 12 percent slopes.
Jefferson gravelly loam, 2 to 6 percent slopes.
Jefferson gravelly loam, 6 to 12 percent slopes.
Jefferson gravelly loam, 6 to 12 percent slopes, eroded.
Philo silt loam.
Pope silt loam, 0 to 2 percent slopes.
Pope silt loam, 6 to 12 percent slopes.
Pope fine sandy loam, 0 to 2 percent slopes.
Pope fine sandy loam, 2 to 6 percent slopes.

Because the soils in this group are mainly in cultivation, rabbits, quail, and songbirds are probably most numerous, but these soils can support large numbers of most other kinds of wildlife common in the area. Habitat for quail can be improved by establishing hedgerows around large fields. The quail and other wildlife benefit from protecting the hedgerows, woodland, and idle land from fire and grazing.

Fishponds in Kentucky have been known to produce between 200 and 1,000 pounds of fish per surface acre without fertilization. Fishponds constructed on these soils probably can be expected to produce between 600 and 1,000 pounds.

WILDLIFE PRODUCTIVITY GROUP 2

The soil in this group are moderately low to high in moisture-supplying capacity and are moderate to moderately low in natural fertility. Almost as many kinds of plants are suited to these soils as are suited to the soils in wildlife productivity group 1, but the vegetation is less abundant because the soils are less fertile. The major soils in this group are—

Alluvial escarpment.
Bruno loamy fine sand, 0 to 2 percent slopes.
Holston fine sandy loam, 6 to 12 percent slopes.
Jefferson gravelly loam, 12 to 20 percent slopes.
Jefferson gravelly loam, 12 to 20 percent slopes, eroded.
Jefferson gravelly loam, 12 to 20 percent slopes, severely eroded.
Jefferson gravelly loam, 20 to 30 percent slopes.
Jefferson stony loam, 12 to 20 percent slopes.
Pope gravelly fine sandy loam
Sequatchie fine sandy loam, 0 to 2 percent slopes.
Sequatchie fine sandy loam, 2 to 6 percent slopes
Stendal gravelly fine sandy loam.
Stendal silt loam.
Stendal fine sandy loam.
Tyler silt loam.
Wellston silt loam, 6 to 12 percent slopes.
Whitwell loam.

Roughly half of the acreage of soils in this group is wooded, and half is used for cultivated crops and for pasture. On these soils there probably are more ruffed grouse, deer, wild turkey, opossum, skunk, raccoon, red fox, and songbirds than are on soils in groups 1 and 3. Because vegetation is not abundant, the number of wildlife is limited. Fishponds constructed on these soils probably can be expected to produce between 400 and 600 pounds of fish per surface acre.

WILDLIFE PRODUCTIVITY GROUP 3

The soils in this group are not suited to many kinds or to large amounts of vegetation, because some are droughty, and some, though highly fertile, are wet. Even those soils that contain an adequate supply of moisture are limited in

their suitability for plants because they are low in fertility. The major soils in the group are—

Atkins silt loam.
Dekalb, Muskingum, Berks stony soils, 30 to 50 percent slopes.
Dekalb, Muskingum, Berks stony soils, 30 to 50 percent slopes, severely eroded.
Dekalb, Muskingum, Berks stony soils, 50+ percent slopes.
Dekalb, Muskingum, Berks stony soils, 50+ percent slopes, severely eroded.
Dekalb stony loam, 12 to 20 percent slopes.
Dekalb stony loam, 12 to 20 percent slopes, severely eroded.
Dekalb stony loam, 20 to 30 percent slopes.
Dekalb stony loam, 20 to 30 percent slopes, severely eroded.
Gilpin-Upshur silty clay loams, 20 to 30 percent slopes.
Gilpin-Upshur silty clay loams, 30 to 50 percent slopes.
Gilpin-Upshur clays, 30 to 50 percent slopes, severely eroded.
Jefferson gravelly loam, 20 to 30 percent slopes, severely eroded.
Jefferson stony loam, 20 to 30 percent slopes.
Muskingum-Gilpin silt loams, 6 to 12 percent slopes.
Muskingum-Gilpin silt loams, 12 to 20 percent slopes.
Muskingum-Gilpin silt loams, 20 to 30 percent slopes.
Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded.
Riverwash.
Rock land.

The soils in this group are considerably less well suited to wildlife than are the soils in groups 1 and 2. Because only a small acreage is cultivated or used for pasture, quail, rabbit, and mourning dove are few. The number of other wildlife native to the area ranges from small to medium.

Habitat for deer, ruffed grouse, and wild turkey can be improved by making openings in thick forest and by seeding them to palatable grasses and legumes. These animals and gray squirrel benefit if livestock is kept out of the woods. Probably the best way to improve wildlife habitat, however, is by using conservation practices that improve the soil. Fishponds constructed on these soils probably can be expected to produce as much as 200 pounds of fish per surface acre without fertilization.

Use and Management of Soils for Agronomic Crops[5]

This subsection has two main parts. The first part discusses general practices of management suitable for the soils in this area. In the second part the capability classification is explained, and use and management for the soils in each subclass are described.

Table 17 lists, by soil associations, the total acreage in each capability class and subclass, as well as the total acreage in the 14 counties.

General management

In the 14 counties the soils that are used for agronomic crops should be managed so that (1) soil structure is maintained, (2) fertilization is according to need, (3) weeds and brush are controlled, (4) areas are pastured as required, and (5) erosion is controlled. These practices are discussed in the following paragraphs.

Maintaining soil structure.—Soil structure determines, to a great extent, the ability of a soil to sustain high yields. If cultivation is intensive, the structure is difficult to maintain unless suitable management is practiced. It is best (1) to work the soil as little as possible; (2) to return large quantities of plant residue to the soil; and (3) to use sod crops, cover crops, and green-manure crops in the cropping system.

[5] By JAMES H. LEE, soil specialist, and D. A. COLSON, conservation agronomist, Soil Conservation Service, and KENNETH EVANS, resource development specialist in agronomy, Kentucky Agricultural Experiment Station.

TABLE 17.—*Acreage by soil association of soils in each capability class and subclass*

Class and subclass	Soil associations								Total area in 14 counties	Extent of 14 counties
	Jm	Db	Dg	Ps	Gw	Gd	Rd	Md		
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Percent*
Class I	640	4, 910	270	55, 070	0	380	0	0	61, 270	1. 69
Class II	12, 770	49, 480	850	67, 190	110	600	0	720	131, 720	3. 63
Subclass IIe	7, 360	14, 750	420	26, 490	110	280	0	720	50, 130	1. 38
Subclass IIw	3, 670	20, 820	330	33, 340	0	320	0	0	58, 480	1. 61
Subclass IIs	1, 740	13, 910	100	7, 360	0	0	0	0	23, 110	. 64
Class III	16, 310	33, 840	1, 460	25, 110	840	1, 500	100	6, 010	85, 170	2. 35
Subclass IIIe	15, 260	30, 850	1, 330	8, 230	840	1, 500	100	6, 010	64, 120	1 77
Subclass IIIw	960	2, 070	130	9, 820	0	0	0	0	12. 980	. 36
Subclass IIIs	90	920	0	7, 060	0	0	0	0	8, 070	. 22
Class IV	12, 950	31, 700	1, 400	2, 990	890	590	440	10, 560	61, 520	1 70
Subclass IVe	12, 950	31, 130	1, 400	670	890	590	440	10, 560	58, 630	1. 62
Subclass IVw	0	60	0	370	0	0	0	0	430	. 01
Subclass IVs	0	510	0	1, 950	0	0	0	0	2, 460	. 07
Class VI	15, 630	62, 920	2, 940	30	960	6, 780	1, 670	12, 300	103, 230	2. 84
Subclass VIe	8, 040	38, 710	2, 730	0	910	6, 580	560	8, 970	66, 500	1. 83
Subclass VIs	7, 590	24, 210	210	30	50	200	1, 110	3, 330	36, 730	1 01
Class VII	6, 980	3, 018, 450	8, 840	9, 970	0	22, 380	81, 930	9, 230	3, 157, 780	87. 07
Subclass VIIe	560	3, 990	330	0	0	18, 940	0	80	23, 900	. 66
Subclass VIIs	6, 420	3, 014, 460	8, 510	9, 970	0	3, 440	81, 930	9, 150	3, 133, 880	86. 41
Built-up areas	6, 700	2, 020	0	14, 950	0	0	0	0	23, 670	65
Strip mine	40	480	0	0	0	0	0	0	520	. 01
Mine spoil	0	2, 000	0	0	0	0	0	0	2, 000	06
Total	72, 020	3, 205, 800	15, 760	175, 310	2, 800	32, 230	84, 140	38, 820	3, 626, 880	100. 00

Fertilizing according to need.—Most soils in this survey area formed in material weathered from sandstone and acid shale and are, consequently, low in the nutrients required for agronomic crops. They are normally strongly acid and need additions of lime, fertilizer, or both, if satisfactory yields are to be obtained. The soils should be tested to determine the amounts needed. If testing is not possible, the need for fertilizer and lime can be estimated by considering (1) past use of the soils, (2) past fertilizing and liming, (3) previous removal of crops, (4) soil texture, and (5) the kind of crop to be grown. The cost of liming is fairly high in the area because the lime has to be transported a long distance.

Controlling weeds and brush.—Weeds and brush compete with the desirable plants and should be controlled. This can be done by mechanical or chemical means.

Establishing and maintaining pasture.—From time to time some areas suitable for field crops are planted to pasture because pasture is needed for grazing or because the soil should be improved. To produce good pasture that lasts a long time and controls erosion, (1) prepare a proper seedbed, (2) apply fertilizer and lime in amounts determined by soil tests, (3) seed at the proper time and rate, (4) use plants that are suited to the kind of soil, (5) permit plants to become well established before grazing is started, and (6) do not permit overgrazing.

Controlling erosion.—Some soils are so sloping that the erosion hazard is severe and field crops cannot be grown on them. These soils should be kept in trees or in grass or another close-growing crop. Soils that are less susceptible to erosion can support more intensive cropping systems. On these soils erosion may be controlled by using, alone or in combination, (1) sod, (2) cover crops, (3) crop residue, (4) terraces, (5) contour stripcropping, and (6) contour cultivation. The cropping systems and other conservation practices used to reduce loss of soil and water should fit the needs of the farm.

The loss of soil is greatly reduced by using *sod crops*. The amount of soil lost depends on the density of the sod and on the length of time the sod is used in a cropping system with row crops. To be most effective, sod should be established as soon as possible after a row crop is harvested.

Planting a *cover crop* that will protect the soil after a row crop is harvested helps to reduce erosion and to maintain soil structure. The cover crop should be seeded as early as possible and adequately fertilized to permit good growth before the growing season ends. Good cover can be maintained much of the year by seeding grasses, small grains, or legumes during the last cultivation of row crops and by turning them under before planting time the next year. Additional nitrogen may be needed if large quantities of small grains, grasses, or other nonlegumes are turned under.

If it is managed properly, *crop residue* helps to control erosion. Cornstalks or other residue should be left on or near the surface after harvest, whether the next crop is a row crop or a small grain. Added nitrogen may be needed to hasten decay of the residue. Cornstalks are more effective in controlling erosion if they are shredded.

Erosion is greatly reduced by *terraces* on soils suited to them. Row crops can be grown frequently on terraced soils.

Where feasible, *stripcropping on the contour* greatly reduces erosion and the loss of soil. Few soils in this survey area, however, are suited to stripcropping.

Erosion can also be reduced by using *contour cultivation* in areas suitable for it.

Diversions are generally built at the base of steep slopes to divert surface water and seepage water from the fields below.

Permanent *grassed waterways* are needed for safe disposal of water, for they can remove large quantities of water quickly and safely.

Good *fertilization* helps to maintain high yields and, thus, to increase the amount of crop residue. This residue, in turn, helps to reduce erosion.

Capability classification

The capability classification is a grouping of soils that shows, in a general way, how suitable the soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to management.

In this report each kind of soil is designated at two levels, the capability class and the subclass. (Tables 4 to 11, beginning on page 4, give the subclass designation for each soil in the area.) Eight classes are used in the capability classification and are shown by Roman numerals I through VIII, but none of the soils in the 14 counties are in classes V and VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations.

The subclasses indicate major kinds of limitations within the classes. In this survey area a class may have as many as three subclasses. The subclass is indicated by adding a small letter, *e*, *w*, or *s* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing cover is maintained; *w* means that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony. Some soils have more than one kind of limitation, but only the most severe limitation is indicated for a given subclass. In class I there are no subclasses, because the soils of this class have few or no limitations.

Soils are classified in capability classes and subclasses according to their degree and kind of permanent limitations. Consideration is not given to major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; nor are possible but unlikely major reclamation projects considered.

In the discussion that follows, the soils in each capability class and subclass are not listed in groups, but the user of this part of the report can turn to tables 4 to 11 and learn the class or subclass of any soil in the area. Then he can read the discussion of that class or subclass in this subsection.

CLASS I SOILS THAT HAVE FEW LIMITATIONS THAT RESTRICT THEIR USE

In this class, which has no subclasses, are nearly level, deep, well-drained soils that are not susceptible to erosion. These soils have high moisture-supplying capacity and produce high yields. Although they account for less than

2 percent of the total survey area, they are agriculturally important.

Tobacco, corn (fig. 13), and small grain produce high yields if the level of management is high. Also requiring a high level of management are Kentucky bluegrass, orchardgrass, timothy, sweetclover, Kobe lespedeza, and alfalfa. Well suited under a medium or high level of management are Kentucky 31 fescue, redtop, ladino clover, red clover, Korean lespedeza, and sericea lespedeza.

Many of the soils in class I are subject to overflow, especially in winter and early in spring. Flooding, however, does not damage the soil, but it may occasionally damage small grains and legumes used as cover crops. Kentucky 31 fescue seeded at the last cultivation of a row crop provides good cover and withstands flooding without damage. Because of their position at or near the base of long, steep slopes, most of these soils need diversions and waterways.

CLASS II SOILS THAT HAVE SOME LIMITATIONS THAT REDUCE THE CHOICE OF PLANTS OR REQUIRE MODERATE CONSERVATION PRACTICES

Subclass IIe.—Soils subject to moderate erosion if they are cultivated and are not protected

In this group are gently sloping, well drained or moderately well drained soils with a deep or moderately deep root zone. The moisture-supplying capacity is high. The soils in this group make up less than 2 percent of the total survey area, but they are important to its agriculture. High to moderate yields can be expected.

If the level of management is high, tobacco, corn, and small grain produce moderately high or high yields. Also requiring a high level of management are Kentucky bluegrass, orchardgrass, timothy, alfalfa, sweetclover, and Kobe lespedeza. Well suited under a medium or high level of management are Kentucky 31 fescue, redtop, ladino clover, red clover, Korean lespedeza, and sericea lespedeza.

Included in this subclass is a small acreage of moderately well drained, moderately deep soil that is not suited to alfalfa.

Subclass IIw.—Soils that have moderate limitations because of excess water

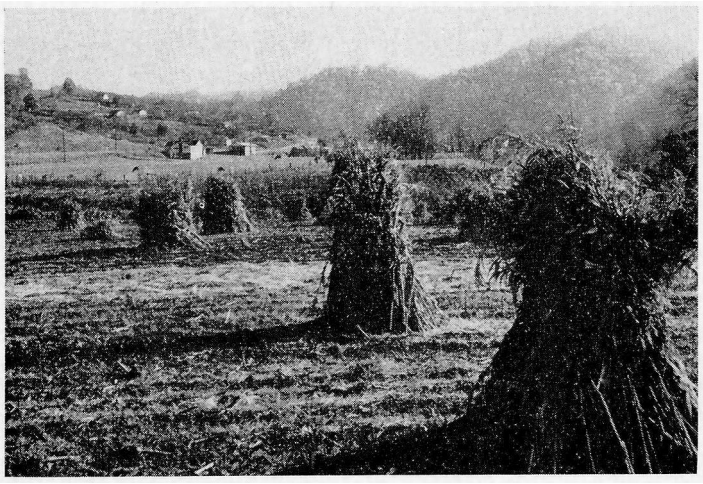

***Figure 13.*—Corn on Pope soils in foreground; rotation pasture on Allegheny soils in near background.**

In this group are nearly level, mainly somewhat poorly drained, deep soils on stream bottoms. These soils are not generally susceptible to erosion. They respond well to drainage by tile and by open ditches and other surface drains. They are easy to till, have a high moisture-supplying capacity, and produce moderately high yields. Except during very wet seasons, they produce moderate yields of suited crops without artificial drainage.

Included in this subclass is a small acreage of slightly wet soils that generally are not suited to tile drainage. These soils are moderately deep to a fragipan, have moderately high moisture-supplying capacity, and produce moderate yields.

The soils in this group amount to only about 1½ percent of the total survey area. Only 1 percent of the (Db) Dekalb-Muskingum-Berks soil association is made up of soils in subclass IIw. This acreage, however, is important because it accounts for 19 percent of the area in that association suited to row crops.

If the soils are adequately drained and managed at a high level, tobacco, corn, and small grain produce moderately high yields. Also requiring a high level of management are orchardgrass, Kentucky bluegrass, bromegrass, timothy, reed canarygrass, and sericea lespedeza. Well suited if the level of management is medium or high are Kentucky 31 fescue, redtop, alsike clover, ladino clover, red clover, Kobe lespedeza, and Korean lespedeza.

Subclass IIs.—Soils that have moderate limitations of moisture capacity and tilth because of their gravel and sand content

In this group are nearly level, deep, well-drained or somewhat excessively drained soils on gravelly stream bottoms. Because they are gravelly, these soils are somewhat difficult to till. They are not generally susceptible to erosion. They have moderate moisture-supplying capacity and produce moderate yields.

The soils in this subclass are fairly inextensive and account for only about 0.6 percent of the total survey area, but they are agriculturally important in the (Jm) Jefferson-Muskingum-Holston-Dekalb, the (Db) Dekalb-Muskingum-Berks, and the (Ps) Pope-Stendal-Allegheny soil associations.

If management is at a high level, tobacco, corn, and small grain produce moderate yields. Also requiring a high level of management are Kentucky bluegrass, bromegrass, reed canarygrass, orchardgrass, timothy, alfalfa, ladino clover, sweetclover, and Kobe lespedeza. Well suited under a medium or high level of management are Kentucky 31 fescue, redtop, alsike clover, red clover, Korean lespedeza, and sericea lespedeza.

CLASS III SOILS THAT HAVE SEVERE LIMITATIONS THAT REDUCE THE CHOICE OF PLANTS, OR REQUIRE SPECIAL CONSERVATION PRACTICES, OR BOTH

Subclass IIIe.—Soils subject to severe erosion if they are cultivated and are not protected

In this group are sloping, well drained or moderately well drained soils with a deep or moderately deep root zone. These soils have high or moderately high moisture-supplying capacity and produce high to moderately low yields.

Tobacco, corn, and small grain produce moderate to high yields if the level of management is high, but row crops should not be grown more than once in 3 years. Also requiring a high level of management are Kentucky blue-

grass, orchardgrass, timothy, sweetclover, and Kobe lespedeza. Well suited under a medium or high level of management are Kentucky 31 fescue, redtop, ladino clover, red clover, Korean lespedeza, and sericea lespedeza.

Subclass IIIw.—Soils that have severe limitations because of excess water

In this group are nearly level, poorly drained soils on stream bottoms and somewhat poorly drained soils on terraces. The soils on stream bottoms are deep and respond fairly well to tile drainage. Those on terraces are moderately deep to a pan and respond fairly well to drainage by open ditches and to other surface drainage, but tile drainage generally is not feasible. The soils in this group have moderate or moderately high moisture-supplying capacity, are moderately low in organic-matter content, and produce low yields. They are not subject to erosion.

If these soils are adequately drained and otherwise well managed, they produce moderate yields of corn. Orchardgrass, timothy, and red clover can be grown, but they need a high level of management. Well suited under a medium or high level of management are Kentucky 31 fescue, redtop, reed canarygrass, alsike clover, ladino clover, Kobe lespedeza, and Korean lespedeza.

Subclass IIIs.—Soils that have severe limitations of moisture capacity because they are sandy

In this group are nearly level, deep, excessively drained soils on stream bottoms. These soils are not susceptible to erosion. They are, however, low in moisture-supplying capacity and in organic-matter content. The soils are coarse textured and slightly difficult to till, but they can be tilled within a wide range of moisture content. They are moderately low in fertility and produce low yields.

These soils are used for cultivated crops and meadow. Melons and truck crops produce moderate yields under a high level of management. Also requiring a high level of management are orchardgrass, timothy, redtop, alfalfa, red clover, sweetclover, and Korean lespedeza. Bermudagrass, Kentucky 31 fescue, and sericea lespedeza are suited under a medium or high level of management.

Although the soils in this subclass are not susceptible to erosion, they need additions of organic matter, fertilizer, and lime. Many of these soils are subject to overflow, especially in winter and early in spring. Flooding does not damage the soils, but it may occasionally damage small grain and legumes used as cover crops. Kentucky 31 fescue seeded at the last cultivation of a row crop gives good cover and is not damaged by flooding.

CLASS IV SOILS THAT HAVE VERY SEVERE LIMITATIONS THAT RESTRICT THE CHOICE OF PLANTS, REQUIRE VERY CAREFUL MANAGEMENT, OR BOTH

Subclass IVe.—Soils subject to very severe erosion if they are cultivated and are not protected

In this group are strongly sloping, well-drained, deep and moderately deep soils. These soils are moderately low to high in moisture-supplying capacity and produce moderately low to high yields. They should be protected by permanent vegetation.

Tobacco, corn, and small grain produce moderate to high yields if the level of management is high, but row crops should not be grown more than once in 4 to 6 years. Also requiring a high level of management are Kentucky bluegrass, orchardgrass, redtop, timothy, alfalfa, alsike clover, ladino clover, red clover, and Kobe lespedeza. Bermudagrass, Kentucky 31 fescue, Korean lespedeza, and sericea lespedeza are suited under a medium or high level of management.

Subclass IVw.—Soils that have very severe limitations to cultivation because of excess water

In this group are nearly level, poorly drained soils on stream terraces. These soils are not susceptible to erosion, but their root zone is moderately deep to shallow and is limited by a slowly permeable pan. The soils are low in organic-matter content and are moderately low in fertility and in moisture-supplying capacity. They produce moderately low yields.

These soils are difficult to drain, and they should be examined to determine whether artificial drainage is feasible. Adequately drained areas produce moderate yields of corn and small grain. Fairly well suited under a high level of management are bermudagrass, Kentucky bluegrass, orchardgrass, timothy, redclover, and Korean lespedeza. Suitable under a medium or high level of management are Kentucky 31 fescue, redtop, reed canarygrass, alsike clover, ladino clover, and Kobe lespedeza.

Subclass IVs.—Soils that have very severe limitations of stoniness, low moisture capacity, or other soil features

In this group are sloping, deep, excessively drained soils on stream bottoms. These soils are low in moisture-supplying capacity and in organic-matter content and are slightly susceptible to erosion. Because they are sandy, they are difficult to till, especially on slopes, but they can be tilled within a wide range of moisture content. Fertility and yields are moderately low.

Melons and truck crops produce moderate yields under a high level of management. Also requiring a high level of management are orchardgrass, timothy, redtop, alfalfa, red clover, sweetclover, and Korean lespedeza. Bermudagrass, Kentucky 31 fescue, and sericea lespedeza are suited under a medium or high level of management.

CLASS VI SOILS THAT HAVE SEVERE LIMITATIONS THAT MAKE THEM GENERALLY UNSUITABLE FOR CULTIVATION AND THAT LIMIT THEIR USE LARGELY TO PASTURE, WOODLAND, OR WILDLIFE FOOD AND COVER

Subclass VIe.—Soils severely limited, chiefly by risk of erosion, if protective cover is not maintained

In this group are moderately steep or steep, shallow to deep, well-drained soils on uplands and foot slopes. The soils are low to moderately high in moisture-supplying capacity and produce low to moderately high yields of forage crops.

Row crops are not suited to these soils. Suitable under a high level of management are Kentucky bluegrass, orchardgrass, redtop, timothy, ladino clover, red clover, and sweetclover. Kentucky 31 fescue, Korean lespedeza, and sericea lespedeza are well suited under a medium or high level of management.

Subclass VIs.—Soils generally unsuitable for cultivation and limited for other uses by their moisture capacity, stones, or other features

In this group are well-drained, stony soils on uplands and foot slopes. These soils range from shallow to deep and from sloping to moderately steep. Stones in the surface layer make tillage and the operation of conventional farm machinery difficult. Fertility and the moisture-supplying capacity range from moderate to low. Yields of forage crops are low.

Orchardgrass, ladino clover, and red clover are fairly well suited to these soils, but they require a high level of management. If the level of management is medium or high, bermudagrass, Kentucky 31 fescue, redtop, Korean lespedeza, and sericea lespedeza can be grown. Continuous cover of forage plants or of trees is needed to protect the soils from erosion.

CLASS VII SOILS THAT HAVE VERY SEVERE LIMITATIONS THAT MAKE THEM UNSUITABLE FOR CULTIVATION WITHOUT MAJOR RECLAMATION, AND THAT RESTRICT THEIR USE LARGELY TO GRAZING, WOODLAND, OR WILDLIFE

Subclass VIIe.—Soils very severely limited, chiefly by risk of erosion, if protective cover is not maintained

The soils in this group are on moderately steep and steep, well-drained to excessively drained uplands. They are low in fertility and in moisture-supplying capacity. Grazing should be limited because yields of forage are very low and adequate ground cover is difficult to maintain.

Under a high level of management, Kentucky bluegrass, bermudagrass, orchardgrass, sweetclover, and Kobe lespedeza can be grown. Kentucky 31 fescue, redtop, Korean lespedeza, and sericea lespedeza are suited under a medium or high level of management.

Subclass VIIs.—Soils that are very severely limited by moisture capacity, stones, or other soil features

In this group are dominantly very steep, rocky, moderately deep to shallow soils on side slopes in the uplands. Included is a small area of Rock land, which consists of many rock outcrops among silty or sandy soil materials, and a small area of very sandy, rocky, or gravelly Riverwash.

The soils in this group, which account for about 86 percent of the total acreage, are the most extensive soils in the survey area. They are best suited to trees and to food and cover for wildlife. Forage plants are difficult to maintain and, if used for grazing, should be grazed lightly. Kentucky 31 fescue, redtop, Korean lespedeza, and sericea lespedeza can be grown, but they produce low yields even if managed at a high level.

Use and Management of Soils for Horticultural Crops[6]

In this subsection the use and management of soils for the production of horticultural crops are discussed. The relative suitability of these crops for soils in the survey area is shown in table 18.

The acreage of horticultural crops grown in the survey area can be increased. The tillable areas of land are generally too small to be readily suited to general farming, but they can often be well utilized in growing horticultural crops. A good supply of labor is also available to handle and care for these crops.

Use and management of soil associations for horticultural crops

In this subsection the use and management of the soil associations for horticultural crops are discussed. Most soil associations are discussed separately, but some are combined because the soils in them and their management are smiliar.

[6] By ROBERT L. BLEVINS, assistant professor of agronomy, and ROBERT SHEPHERD, resource development specialist in horticulture, Kentucky Agricultural Experiment Station.

(Db) DEKALB-MUSKINGUM-BERKS AND (Dg) DEKALB-MUSKINGUM-GILPIN-JEFFERSON SOIL ASSOCIATIONS

These soil associations are enough alike to permit combining them for making horticultural interpretations. Most of the acreage in these associations is too steep for horticultural crops. About 95 percent of the (Db) Dekalb-Muskingum-Berks association consists of moderately deep, somewhat excessively drained Dekalb, Muskingum, and Berks soils on steep to very steep slopes. Most of the (Dg) Dekalb-Muskingum-Gilpin-Jefferson association consists of Dekalb, Muskingum, and Gilpin soils on moderately steep to steep slopes.

The Pope, Stendal, and Atkins soils occur in narrow bands on bottom lands of small streams and are bordered by Jefferson, Hayter, Cotaco, and Barbourville soils on the foot slopes. These soils are in small areas but are well suited to vegetables and to black walnuts, hazelnuts, Chinese chestnuts, and pecans. Where air drainage is good, the Hayter, Jefferson, Holston, and Allegheny soils are suited to apples, peaches, and other small fruits. Because all these alluvial soils are in small, scattered areas, crops are grown mainly for home use.

If no other land is available, the steep Muskingum soils may be needed for crops. Fair yields may be produced if the soils are mulched and tilled on the contour. Mulching increases the moisture-supplying capacity, helps to control erosion, and improves tilth. The many piles of sawdust near operating or abandoned sawmills provide mulching material. The sawdust can be used as mulch for 1 year and the next year can be disked or plowed under to supply organic matter. Soils mulched with sawdust, however, need nitrogen in somewhat larger amounts than is indicated by soil tests. In most places these soil associations need special, intensive practices if yields are to be good.

(Gd) GILPIN-UPSHUR-DEKALB SOIL ASSOCIATION

This association is in the rough, broken, hilly part of Lawrence County and consists largely of Gilpin, Dekalb, Muskingum, and Upshur soils on steep slopes. Most of it is not suited to horticultural crops, but small areas of the sloping to strongly sloping Upshur soils have some potential for fruit trees. Small, scattered areas of Hayter, Jefferson, Barbourville, and Cotaco soils occur on foot slopes in this association and are well suited to all the commonly grown horticultural crops. Wellston, Tilsit, and Rarden soils occur on ridgetops and are suited to apples and peaches. Small areas in Pope, Sequatchie, and Allegheny soils occur on bottom lands and terraces and are well suited to vegetables and nuts.

This soil association is similar to the (Dg) Dekalb-Muskingum-Gilpin-Jefferson association; both associations consist mainly of moderately steep to steep soils and are not suited to commercial production of crops. Only small areas of gently sloping soils occur.

Special, intensive practices are needed if crops are to grow well on the soils of this association. For abundant yields, fertility should be increased and organic matter added to the soils. Throughout most of this association contour tillage and mulches are needed to control erosion and to conserve moisture.

TABLE 18.—*Suitability of soils in the survey area for horticultural crops*

Soil or land type	Apples, peaches, and grapes	Small fruits [1]	Vegetables [2]	Nuts [3]
Allegheny fine sandy loam, 6 to 12 percent slopes	Well suited	Well suited	Well suited	Well suited.
Allegheny loam, 2 to 6 percent slopes	Well suited	Well suited	Well suited	Well suited.
Allegheny loam, 6 to 12 percent slopes	Well suited	Well suited	Well suited	Well suited.
Allegheny loam, 6 to 12 percent slopes, eroded	Well suited	Well suited	Well suited	Well suited.
Allegheny loam, 12 to 20 percent slopes, eroded	Suited	Suited	Suited	Suited.
Allegheny silt loam, 0 to 2 percent slopes	Well suited	Well suited	Well suited	Well suited.
Allegheny silt loam, 2 to 6 percent slopes	Well suited	Well suited	Well suited	Well suited.
Allegheny silt loam, 6 to 12 percent slopes	Suited	Well suited	Well suited	Well suited.
Allegheny silt loam, 6 to 12 percent slopes, eroded	Suited	Well suited	Well suited	Well suited.
Atkins fine sandy loam	Not suited	Not suited	Poorly suited	Not suited.
Atkins silt loam	Not suited	Not suited	Poorly suited	Not suited.
Barbourville gravelly loam, 2 to 6 percent slopes	Poorly suited	Suited [4]	Well suited	Well suited.
Barbourville gravelly loam, 6 to 12 percent slopes	Poorly suited	Suited [4]	Well suited	Well suited.
Bruno loamy fine sand, 0 to 2 percent slopes	Poorly suited	Suited [4]	Suited [4]	Suited.
Bruno loamy fine sand, 2 to 6 percent slopes	Poorly suited	Suited	Suited [4]	Suited.
Bruno loamy fine sand, 6 to 12 percent slopes	Poorly suited	Suited	Suited [4]	Suited
Cotaco gravelly loam, 2 to 6 percent slopes	Poorly suited	Poorly suited	Suited	Suited
Cotaco gravelly loam, 6 to 12 percent slopes	Poorly suited	Poorly suited	Suited	Suited
Cotaco loam, 2 to 6 percent slopes	Poorly suited	Poorly suited	Suited	Suited.
Dekalb fine sandy loam, 6 to 12 percent slopes	Poorly suited	Poorly suited	Poorly suited	Poorly suited.
Dekalb fine sandy loam, 12 to 20 percent slopes	Poorly suited	Poorly suited	Poorly suited	Poorly suited.
Dekalb fine sandy loam, 20 to 30 percent slopes	Not suited	Not suited	Not suited	Not suited.
Dekalb stony loam, 6 to 12 percent slopes	Suited	Poorly suited	Poorly suited	Suited.
Dekalb stony loam, 12 to 20 percent slopes	Suited	Poorly suited	Poorly suited	Suited.
Dekalb stony loam, 12 to 20 percent slopes, severely eroded	Poorly suited	Not suited	Not suited	Poorly suited.
Dekalb stony loam, 20 to 30 percent slopes	Poorly suited	Poorly suited	Poorly suited	Poorly suited.
Dekalb stony loam, 20 to 30 percent slopes, severely eroded	Poorly suited	Poorly suited	Poorly suited	Poorly suited
Dekalb, Muskingum, Berks stony soils, 30 to 50 percent slopes.	Not suited	Not suited	Not suited	Not suited
Dekalb, Muskingum, Berks stony soils, 30 to 50 percent slopes, severely eroded.	Not suited	Not suited	Not suited	Not suited
Dekalb, Muskingum, Berks stony soils, 50+ percent slopes	Not suited	Not suited	Not suited	Not suited
Dekalb, Muskingum, Berks stony soils, 50+ percent slopes, severely eroded.	Not suited	Not suited	Not suited	Not suited.
Enders silt loam, 6 to 12 percent slopes	Well suited	Well suited	Well suited	Well suited.
Enders silt loam, 12 to 20 percent slopes	Well suited	Well suited	Well suited	Well suited.
Gilpin-Upshur complex, 6 to 12 percent slopes	Suited	Suited	Suited	Suited.
Gilpin-Upshur complex, 12 to 20 percent slopes	Suited	Poorly suited	Poorly suited	Suited
Gilpin-Upshur complex, 12 to 20 percent slopes, severely eroded.	Poorly suited	Not suited	Not suited	Poorly suited.
Gilpin-Upshur complex, 20 to 30 percent slopes	Not suited	Poorly suited	Poorly suited	Poorly suited.
Gilpin-Upshur complex, 20 to 30 percent slopes, severely eroded.	Not suited	Not suited	Not suited	Poorly suited.
Gilpin-Upshur complex, 30 to 50 percent slopes	Not sutied	Not suited	Not suited	Poorly suited.
Gilpin-Upshur complex, 30 to 50 percent slopes, severely eroded.	Not suited	Not suited	Not suited	Not suited
Hayter gravelly loam, 2 to 6 percent slopes	Well suited	Well suited	Well suited	Well suited.
Hayter gravelly loam, 6 to 12 percent slopes	Well suited	Well suited	Well suited	Well suited.
Hayter gravelly loam, 12 to 20 percent slopes	Well suited	Well suited	Well suited	Well suited.
Holston loam, 0 to 2 percent slopes	Well suited	Well suited	Well suited	Well suited.
Holston loam, 2 to 6 percent slopes	Well suited	Well suited	Well suited	Well suited.
Holston loam, 6 to 12 percent slopes	Well suited	Well suited	Well suited	Well suited
Holston loam, 12 to 20 percent slopes, eroded	Suited	Suited	Suited	Suited.
Holston fine sandy loam, 2 to 6 percent slopes	Well suited	Suited	Suited	Well suited.
Holston fine sandy loam, 6 to 12 percent slopes	Well suited	Suited	Suited	Well suited
Holston fine sandy loam, 12 to 20 percent slopes, eroded	Suited	Suited	Suited	Suited.
Holston silt loam, 2 to 6 percent slopes	Well suited	Well suited	Well suited	Well suited.
Holston silt loam, 6 to 12 percent slopes	Well suited	Well suited	Well suited	Well suited.
Holston silt loam, 6 to 12 percent slopes, eroded	Well suited	Well suited	Well suited	Well suited.
Huntington fine sandy loam	Poorly suited	Suited	Well suited	Well suited.
Huntington silt loam	Poorly suited	Suited	Well suited	Well suited.
Jefferson gravelly loam, 2 to 6 percent slopes	Well suited	Well suited	Well suited	Well suited.
Jefferson gravelly loam, 6 to 12 percent slopes	Well suited	Well suited	Well suited	Well suited.
Jefferson gravelly loam, 6 to 12 percent slopes, eroded	Well suited	Well suited	Well suited	Well suited.
Jefferson gravelly loam, 12 to 20 percent slopes	Well suited	Well suited	Suited	Well suited.
Jefferson gravelly loam, 12 to 20 percent slopes, eroded	Well suited	Well suited	Suited	Well suited.
Jefferson gravelly loam, 12 to 20 percent slopes, severely eroded.	Suited	Suited	Poorly suited	Suited.
Jefferson gravelly loam, 20 to 30 percent slopes	Poorly suited	Suited	Poorly suited	Suited.
Jefferson gravelly loam, 20 to 30 percent slopes, severely eroded.	Not suited	Not suited	Not suited	Poorly suited
Jefferson stony loam, 6 to 12 percent slopes	Suited	Poorly suited	Poorly suited	Suited.

See footnotes at end of table.

TABEL 18.—*Suitability of soils in the survey area for horticultural crops*—Continued

Soil or land type	Apples, peaches, and grapes	Small fruits [1]	Vegetables [2]	Nuts [3]
Jefferson stony loam, 12 to 20 percent slopes	Suited	Poorly suited	Poorly suited	Suited.
Jefferson stony loam, 12 to 20 percent slopes, severely eroded	Poorly suited	Not suited	Not suited	Poorly suited.
Jefferson stony loam, 20 to 30 percent slopes	Not suited	Not suited	Not suited	Poorly suited.
Jefferson stony loam, 20 to 30 percent slopes, severely eroded	Not suited	Not suited	Not suited	Not suited.
Monongahela loam, 0 to 2 percent slopes	Suited	Suited	Suited	Suited.
Monongahela loam, 2 to 6 percent slopes	Suited	Well suited	Suited	Suited.
Monongahela fine sandy loam, 2 to 6 percent slopes	Suited	Well suited	Suited	Suited.
Monongahela fine sandy loam, 6 to 12 percent slopes	Suited	Well suited	Suited	Suited.
Monongahela fine sandy loam, 6 to 12 percent slopes, eroded	Suited	Well suited	Suited	Suited.
Monongahela silt loam, 0 to 2 percent slopes	Suited	Suited	Suited	Suited.
Monongahela silt loam, 2 to 6 percent slopes	Suited	Well suited	Suited	Suited.
Muse silt loam, 6 to 12 percent slopes	Suited	Suited	Suited	Suited.
Muse silt loam, 12 to 20 percent slopes, eroded	Suited	Suited	Suited	Suited.
Muskingum-Gilpin silt loams, 6 to 12 percent slopes	Suited	Poorly suited	Poorly suited	Suited.
Muskingum-Gilpin silt loams, 6 to 12 percent slopes, severely eroded.	Suited	Poorly suited	Poorly suited	Suited.
Muskingum-Gilpin silt loams, 12 to 20 percent slopes	Suited	Poorly suited	Poorly suited	Suited.
Muskingum-Gilpin silt loams, 12 to 20 percent slopes, severely eroded	Poorly suited	Not suited	Not suited	Poorly suited.
Muskingum-Gilpin silt loams, 20 to 30 percent slopes	Poorly suited	Poorly suited	Poorly suited	Poorly suited.
Muskingum-Gilpin silt loams, 20 to 30 percent slopes, severely eroded.	Not suited	Not suited	Not suited	Not suited.
Newark silt loam	Poorly suited	Suited	Suited	Suited.
Philo fine sandy loam	Poorly suited	Suited	Well suited	Suited.
Philo silt loam	Poorly suited	Suited	Well suited	Well suited.
Pope gravelly fine sandy loam	Poorly suited	Suited	Suited	Suited.
Pope fine sandy loam, 0 to 2 percent slopes	Poorly suited	Suited	Well suited	Suited.
Pope fine sandy loam, 6 to 12 percent slopes	Poorly suited	Suited	Well suited	Suited.
Pope silt loam, 0 to 2 percent slopes	Poorly suited	Suited	Well suited	Well suited.
Pope silt loam, 6 to 12 percent slopes	Poorly suited	Suited	Well suited	Well suited
Purdy silt loam	Not suited	Poorly suited	Poorly suited	Not suited
Rarden silt loam, 6 to 12 percent slopes, eroded	Poorly suited	Poorly suited	Poorly suited	Poorly suited.
Rarden silt loam, 12 to 20 percent slopes, eroded	Poorly suited	Poorly suited	Poorly suited	Poorly suited.
Sequatchie fine sandy loam, 0 to 2 percent slopes	Suited	Well suited	Well suited	Well suited.
Sequatchie fine sandy loam, 2 to 6 percent slopes	Suited	Well suited	Well suited	Well suited.
Sequatchie fine sandy loam, 6 to 12 percent slopes	Suited	Well suited	Well suited	Well suited
Stendal gravelly fine sandy loam	Poorly suited	Poorly suited	Poorly suited	Poorly suited.
Stendal fine sandy loam	Poorly suited	Suited	Suited	Poorly suited.
Stendal silt loam	Poorly suited	Suited	Suited	Poorly suited.
Tilsit silt loam, 2 to 6 percent slopes	Suited	Suited	Suited	Suited.
Tyler silt loam	Not suited	Poorly suited	Poorly suited	Not suited.
Upshur silty clay, 6 to 12 percent slopes, eroded	Suited	Suited	Suited	Suited.
Upshur silty clay, 12 to 20 percent slopes, eroded	Suited	Suited	Suited	Suited.
Upshur silty clay, 20 to 30 percent slopes, eroded	Poorly suited	Poorly suited	Poorly suited	Poorly suited.
Wellston silt loam, 2 to 6 percent slopes	Well suited	Well suited	Well suited	Well suited.
Wellston silt loam, 6 to 12 percent slopes	Well suited	Well suited	Well suited	Well suited
Wellston silt loam, 12 to 20 percent slopes	Well suited	Suited	Suited	Well suited.
Wellston silt loam, 12 to 20 percent slopes, eroded	Suited	Suited	Suited	Suited.
Whitwell loam	Poorly suited	Suited	Suited	Suited.
Zaleski silt loam, 2 to 6 percent slopes	Suited	Suited	Suited	Suited.
Alluvial escarpment	Not suited	Not suited	Poorly suited	Suited.
Built-up areas	Not suited	Variable	Not suited	Not suited.
Gullied land	Not suited	Not suited	Not suited	Not suited.
Mine spoil	Not suited	Not suited	Poorly suited	Not suited.
Riverwash	Not suited	Not suited	Not suited	Not suited.
Rock land	Not suited	Not suited	Not suited	Not suited.
Strip mines	Poorly suited	Poorly suited	Not suited	Poorly suited.

[1] Strawberries, raspberries, blackberries, and blueberries
[2] Beans, sweet corn, potatoes, and other vegetables.
[3] Black walnuts, pecans, and Chinese chestnuts.
[4] Well suited to vegetables if irrigated.

(Gw) GILPIN-UPSHUR-WELLSTON-MUSKINGUM AND (Md) MUSKINGUM-DEKALB-GILPIN-WELLSTON SOIL ASSOCIATIONS

These soil associations are enough alike to permit combining them for making horticultural interpretations. They consist of well-drained to excessively drained soils on broad hilltops. The well-drained Muskingum and Gilpin soils and the excessively drained Dekalb soils account for about 85 percent of the (Md) Muskingum-Dekalb-Gilpin-Wellston association. Those soils, together with the well-drained Upshur soils, account for about 62 percent of the (Gw) Gilpin-Upshur-Wellston-Muskingum association.

The sloping to strongly sloping soils in these associations are suited or poorly suited to fruit trees, but because they are low in moisture-supplying capacity, they are not suited to the other horticultural crops. The deep, well-drained Wellston and Enders soils are well suited to all the crops commonly grown in the survey area. They are

ideal for fruit trees because they have excellent drainage of air and water.

The use of these soils for orchards is limited, mainly because there is not enough water for spraying and there are not enough roads. Because the soils are moderately deep to deep and are somewhat low in natural fertility, the farmer should do the following if orchards are to be established.

1. Test the soils to determine their need for lime and fertilizer.
2. Till on the contour.
3. Establish the crop by—
   - Sowing soybeans to be turned under as a green-manure crop that adds nitrogen and helps to maintain organic matter.
   - Sowing a winter cover crop that is disked into the soil at the time trees are planted.
   - Adding commercial fertilizer in amounts determined by soil tests and according to the needs of the plants.
4. Establish a sod crop to help control erosion.
5. Keep the sod crop clipped, and leave the clippings on the surface to supply organic matter.

(Jm) JEFFERSON-MUSKINGUM-HOLSTON-DEKALB SOIL ASSOCIATION

This soil association is well suited to many kinds of crops. About two-thirds of the association consists of deep, well-drained Jefferson and Holston soils and moderately deep Dekalb, Muskingum, and Gilpin soils. All these soils except the Holston are on foot slopes. The Holston soils are on terraces. Except for a small acreage of Pope and Stendal soils on bottom lands, the soils in this association are in places where air drainage and water drainage are good. The well-drained Pope, Sequatchie, and Barbourville soils are well suited to nearly all vegetables commonly grown in the survey area. The Jefferson, Hayter, and Cotaco soils on foot slopes and the Holston and Allegheny soils on terraces are well suited to apples, peaches, and grapes, and to raspberries, blackberries, strawberries, and other small fruits. Nearly all the soils are suited to Chinese chestnuts, black walnuts, pecans, and other nuts.

Intensive management is needed on the dominant soils of this association because they are somewhat low in fertility. Also, organic matter is not plentiful enough for berries, and cover crops are needed to maintain good yields. Fertilizer should be applied annually at rates indicated by soil tests. Tests are also needed every 3 to 5 years to determine the lime requirement. Sloping or steep soils should be tilled on the contour to control erosion and to conserve moisture.

(Ps) POPE-STENDAL-ALLEGHENY SOIL ASSOCIATION

This soil asociation has a greater potential for the commercial production of vegetables than any other association in this survey area. Approximately one-third of the association consists of deep, well-drained Pope soils on first bottoms. These soils are well suited to beans, tomatoes, sweet corn, potatoes, and other vegetables. Next in acreage are the somewhat poorly drained Stendal soils, which are also on first bottoms. These soils are fairly well suited to most vegetables and are very well suited to turnips, other kinds of greens, and other late-maturing crops.

Because the air drainage above them is poor, the Pope, Stendal, Philo, Atkins, Huntington, Newark, and Bruno soils on bottoms generally are not suited to apples, peaches, or grapes. However, the Sequatchie, Allegheny, Barbourville, Jefferson, and Holston soils are slightly above the first bottoms and can be used for growing apples, peaches, and small fruits. All of these soils except the poorly drained Atkins soils are well suited to nut trees.

Depending on the size of the streams and their watersheds, some parts of this soil association are susceptible to floods that may damage crops. These floods occur early in spring and, occasionally, late in summer or in fall.

Irrigation greatly increases yields of commercially produced vegetables on the somewhat excessively drained Bruno soils and other soils on bottoms. In many places there is enough water in the streams to supply a portable irrigation system.

The soils in the (Ps) Pope-Stendal-Allegheny association are normally acid and somewhat low in fertility. They should be tested to determine the amounts of lime and fertilizer needed for the crops grown. Blueberries, for example, require a fairly acid soil and generally should not have lime.

(Rd) ROCK LAND-DEKALB SOIL ASSOCIATION

This soil association is steep, very rocky, and droughty and, in most places, is not accessible to machinery. It is, therefore, not suited to horticultural crops.

Use of Soils for Engineering[7]

Soil engineering is a part of structural engineering and deals with soils as the foundation material on which structures rest and with soils used as a structural material. Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, sewage disposal systems, and many other structures. The properties most important to the engineer are permeability to water, strength against shearing, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and degree of acidity or alkalinity. Also important are topography, depth to the water table, and depth to bedrock. In tables 19 and 20, estimates for most of these properties are shown for each soil in the survey area.

The information in this report can be used to:

1. Make studies of soil and land use that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils for use in planning soil and water conservation systems, including those for surface and internal drainage and for storage and supply of water.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables, and in planning detailed investigations at the selected locations.

[7] By WILLIAM M. ADAMS, civil engineer, Soil Conservation Service.

4. Locate probable sources of sand and gravel for use in construction.
5. Correlate performance of engineering structures with the kinds of soil, and thus develop information that will be useful in planning, in designing, and in maintaining the structures.
6. Determine the suitability of soils for the cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps and reports and from aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Make other preliminary estimates of the suitability of a particular area for construction purposes.

It is not intended that this report will eliminate the need for on-site sampling and testing of the soils for design and construction of specific engineering works. The interpretations should be used primarily in planning more detailed field investigations to determine the in-place condition of the soils at the proposed sites for engineering works.

Some of the terms used by soil scientists may not be familiar to engineers or to others interested in the engineering interpretations of the properties of the soils. The terms used in this section, as well as in the rest of the report, are used according to their meaning to soil scientists and are so defined in the Glossary at the back of this report. Much information useful to engineers can be found in other parts of this report, particularly in the sections "Descriptions of Soil Series and Land Types" and "Soil Associations."

Engineering properties of soils

Table 19, beginning on page 62, lists the soil series in the survey area, shows in which soil associations and counties the soils occur, and gives estimates of the physical and chemical properties of the soils. It also shows, for each layer in the soil profile, the textural classification of the U.S. Department of Agriculture, the Unified engineering classification, and the classification used by the American Association of State Highway Officials. In addition, the permeability, available water capacity, and reaction are estimated.

In the description of the soil and site, the soils are described to a depth of 36 to 60 inches. The depth to rock is generally the depth to noncompressible material, in most places shale, sandstone, or limestone. Depth from the surface and the thickness of each layer are shown.

The permeability of each soil layer was estimated, in inches per hour, for soil material in place. Available water capacity, in inches per inch of soil depth, is the approximate amount of capillary water held in the soil when wet to field capacity. This amount of water will wet the air-dry soil material to a depth of 1 inch without deeper percolation.

The column showing reaction, expressed in pH values, gives the degree of acidity or alkalinity of the different layers in the profile. The pH scale is divided into 14 units, numbered from 1 to 14. Soils that have a pH value of 7 are neutral, those that have a pH below 7 are acid, and those that have a pH above 7 are alkaline.

Engineering properties are not described for the miscellaneous land types in the survey area, because their soil material is variable in characteristics.

Engineering classification systems

The classification of soil texture used by the U.S. Department of Agriculture (*10*) is primarily for agricultural use. In this classification, classes of soil texture are based on different proportions of sand (2.0 millimeters to 0.05 millimeter in diameter), silt (0.05 to 0.002 millimeter in diameter), and clay (less than 0.002 millimeter in diameter). The classes in order of increasing proportions of fine particles are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

The word *gravelly* refers to soils that contain particles between 2 millimeters and 3 inches in diameter, and *stony* refers to soils that contain stones more than 10 inches in diameter. *Shaly* soils contain flat fragments of shale that are less than 6 inches long along the longer axis. *Flaggy* soils contain fairly thin fragments of sandstone, limestone, schist, slate, or shale that are 6 to 15 inches long.

The Unified classification (*3*, *13*) was developed by the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation. It is based on textural and plasticity qualities, which are qualities that affect the performance of soils as construction materials. More specifically, the soils are identified (1) by determining the percentage of gravel, sand, and fines (fraction passing the No. 200 sieve); (2) by determining the shape of the grain-size distribution curve; and (3) by estimating the plasticity characteristics of the soil. The soils are divided into coarse-grained soils, fine-grained soils, and highly organic soils.

In the coarse-grained soils, which are subdivided into gravels (G) and sands (S), not more than 50 percent of the material passes the No. 200 sieve (0.074 millimeter). The gravels are those coarse-grained soils having the greater percentage of the coarse fraction (that part retained on the No. 200 sieve) retained on the No. 4 sieve (4.76 millimeters), and the sands are those having the greater part passing the No. 4 sieve. The soils in each of these two groups are further classified on the basis of their plasticity characteristics and the shape of the grain-size distribution curve. The symbols for the gravels are GW (well graded), GP (poorly graded), GM (silty), and GC (clayey); those of the sands are SW (well graded), SP (poorly graded), SM (silty), and SC (clayey).

The fine-graded soils contain more than 50 percent material that passes the No. 200 sieve. They are subdivided into silts (M) and clays (C), depending on their liquid limit and plasticity index. The soils in each of these groups are further classified according to whether their liquid limit is low (L) or high (H). The symbols for the silts are ML and MH, and those of the clays are CL and CH. Two additional fine-grained soils, identified by the symbols OL and OH, contain organic matter. The soils identified by OL have low plasticity and a liquid limit of less than 50; those identified by OH have medium to high plasticity and a liquid limit greater than 50.

TABLE 19.—*Brief descriptions of the soils and*

Soil series	Occurs in soil associations—[1]	Occurs in counties—	Description of soil and site	Depth to rock
				Feet
Allegheny	Db, Dg, Gd, Jm, and Ps.	All	Fine sandy loam, loam, or silt loam over silty clay loam or fine sandy clay loam, or silty clay loam over fine sandy clay loam, occurs in alluvium on well-drained stream terraces, 2 to 20 percent slopes.	4 to 12
Atkins	Db, Dg, Jm, and Ps	All	Fine sandy loam or silt loam over fine sandy loam or silt loam; occurs on poorly drained stream bottoms; 0 to 2 percent slopes.	2 to 6
Barbourville	Db, Dg, Gd, Jm, and Ps	All	Gravelly loam over gravelly silt loam or gravelly clay loam, occurs on well-drained toe slopes and colluvial fans, 2 to 12 percent slopes.	2 to 10
Berks	Db, Dg, Gd, Jm, Md, and Rd	All	Stony silt loam over gravelly silt loam, occurs on well-drained uplands underlain by sandstone and shale, 30 to 50+ percent slopes	2 to 2½
Bruno	Db, Jm, and Ps	All except Bell and Harlan.	Loamy sand or loamy fine sand over sand or loamy fine sand, occurs on excessively drained stream bottoms, 0 to 12 percent slopes.	20+
Cotaco	Db, Dg, Gd, Jm, and Ps	All	Loam or gravelly loam over silty clay loam, or gravelly loam over gravelly silt loam, or silty clay loam over gravelly silty clay loam or fine sandy loam; occurs on moderately well drained to poorly drained toe slopes and colluvial fans, 2 to 12 percent slopes.	2 to 10
Dekalb	All except Ps	All	Stony loam over gravelly loam, underlain by gravelly sandy loam interspersed with many medium to large fragments of sandstone and shale bedrock, occurs on well-drained, upland slopes of 30 to 50+ percent.	2 to 5
Dekalb-Muskingum-Berks stony soils.	All except Gw and Ps.	All	See Dekalb, Muskingum, and Berks soils	
Enders	Db, Gd, Gw, and Md.	Bell, Harlan, and Lawrence.	Silt loam over silty clay loam, underlain by silty clay, occurs along well-drained ridgetops, 6 to 20 percent slopes.	2 to 6
Gilpin	All except Ps	All	Silt loam over silty clay loam, underlain by gravelly clay loam, sandstone and shale bedrock; occurs on well-drained uplands; 6 to 12 percent slopes.	2 to 2½
Gilpin-Upshur	Db, Gd, and Gw	Lawrence	See Gilpin and Upshur soils.	
Hayter	Db, Dg, Gd, Jm, and Ps.	Breathitt, Clay, Johnson, and Lawrence.	Loam or gravelly loam over clay loam or gravelly clay loam; occurs on well-drained toe slopes and colluvial fans, 2 to 20 percent slopes.	5 to 12
Holston	Db, Dg, Jm, and Ps	All	Loam, silt loam, or fine sandy loam over silty clay loam or sandy clay loam, underlain by stratified sand, sandy clay, and gravel, occurs in alluvium on well-drained stream terraces; 0 to 20 percent slopes.	3 to 12
Huntington	Db, Jm, and Ps	Bell, Harlan, Letcher, and Pike.	Silt loam or fine sandy loam over silt loam or fine sandy loam; occurs on well-drained stream bottoms; 0 to 4 percent slopes.	5+
Jefferson	Db, Dg, Gd, Jm, and Ps	All	Gravelly loam or stony loam over gravelly clay loam, underlain by clay loam over fine sandy clay loam; occurs on well-drained toe slopes and colluvial fans, 2 to 30 percent slopes.	2 to 12

See footnote at end of table.

their estimated physical and chemical properties

Depth from surface	Classification			Permeability	Available water capacity	Reaction
	USDA texture	Unified	AASHO			
Inches				*Inches per hour*	*Inches per inch of soil*	*pH*
0–8	Fine sandy loam, loam, or silt loam	ML or CL	A–4 or A–6	2.0 – 5.0	0.13–0.22	4.0–5.0
8–15	Silty clay loam to fine sandy loam	CL or ML	A–4 or A–6	0.8 – 2.0	0.17–0.18	4.0–5.0
15–36+	Fine sandy clay loam	ML, CL, or SC	A–4 or A–6	0.8 – 2.0	0.17	4.0–5.0
0–12	Fine sandy loam or silt loam	ML, CL, SM, or SC	A–4 or A–6	0.8 – 2.0	0.13–0.22	5.0–6.5
12–55+	Fine sandy loam or silt loam	ML, CL, SM, or SC.	A–4 or A–6	0.8 – 2.0	0.13–0.22	5.0–6.5
0–23	Gravelly loam	ML or CL	A–4 or A–6	2.0 – 5.0	0.12–0.18	5.0–6.5
23–40+	Gravelly silt loam or gravelly clay loam	ML or CL	A–4 or A–6	2.0 – 5.0	0.12–0.15	4.0–5.0
0–7	Stony silt loam	GM or GC	A–2	2.0 – 5.0	0.20	4.0–5.0
7–26+	Gravelly silt loam	GM or GC	A–2	2.0 – 5.0	0.08–0.10	4.0–5.0
0–13	Loamy sand or loamy fine sand	SM or ML	A–2 or A–4	5.0 –10.0	0.07–0.08	4.0–5.0
13–36+	Sand or loamy fine sand	SM or ML	A–2 or A–4	5.0 –10.0	0.03–0.08	4.0–5.0
0–8	Loam or gravelly loam	ML or CL	A–4 or A–6	2.0 – 5.0	0.12–0.18	4.0–5.0
8–26	Silty clay loam or gravelly silt loam	ML or CL	A–4 or A–6	0.8 – 2.0	0.12–0.19	4.0–5.0
26–36	Gravelly silt loam or silty clay loam	ML or CL	A–4 or A–6	0.8 – 2.0	0.15–0.19	4.0–5.0
36–48+	Gravelly silty clay loam or fine sandy loam	ML, CL, SM, or SC.	A–4 or A–6	0.8 – 2.0	0.13	4.0–5.0
0–6	Stony loam	GM, SM, or GC	A–2	2.0 – 5.0	0.17	4.0–5.0
6–18	Gravelly loam	GM, SM, or GC	A–2	2.0 – 5.0	0.08–0.12	4.0–5.0
18–28+	Gravelly silt loam	GM, SM, or GC	A–2	2.0 – 5.0	----------	4.0–5.0
0–3	Silt loam	ML or CL	A–4 or A–6	0.8 – 2.0	0.22	4.0–5.0
3–13	Silty clay loam	ML, CL, or CH	A–7 or A–6	0.8 – 2.0	0.19	4.0–5.0
13–36+	Silty clay	MH or CH	A–7	0.8 – 2.0	0.16	4.0–5.0
0–9	Silt loam	ML or CL	A–4 or A–6	0.8 – 2.0	0.22	4.0–5.0
9–22	Silty clay loam	ML or CL	A–4 or A–6	0.8 – 2.0	0.19	4.0–5.0
22–28+	Gravelly clay loam	GC	A–2	0.8 – 2.0	0.07–0.12	4.0–5.0
0–8	Loam or gravelly loam	ML or CL	A–4 or A–6	2.0 – 5.0	0.12–0.18	4.0–5.0
8–42+	Clay loam or gravelly clay loam	CL, MH, or CH	A–6 or A–7	2.0 – 5.0	0.12–0.18	4.0–5.0
0–6	Loam, silt loam, or fine sandy loam	ML or CL	A–4 or A–6	2.0 – 5.0	0.13–0.22	4.0–5.0
6–30	Silty clay loam or sandy clay loam	CL or ML	A–4 or A–6	0.8 – 2.0	0.17–0.19	4.0–5.0
30–65+	Stratified sand, sandy clay, and gravel	CL, ML, or SM	A–4 or A–6	0.8 – 2.0	0.10–0.15	4.0–5.0
0–8	Silt loam or fine sandy loam	ML, CL, or SM	A–4 or A–6	2.0 – 5.0	0.13–0.22	5.5–7.3
8–48+	Silt loam or fine sandy loam	ML, CL, or SM	A–4 or A–6	2.0 – 5.0	0.13–0.22	5.5–7.3
0–9	Gravelly loam or stony loam	ML or CL	A–4 or A–6	2.0 – 5.0	0.12	4.0–5.0
9–29	Gravelly clay loam	ML or CL	A–4 or A–6	2–0 – 5.0	0.12	4.0–5.0
29–39+	Fine sandy clay loam or clay loam	ML, CL, or SC	A–4 or A–6	2.0 – 5.0	0.17–0.18	4.0–5.0

TABLE 19.—*Brief descriptions of the soils and*

Soil series	Occurs in soil associations—[1]	Occurs in counties—	Description of soil and site	Depth to rock
				Feet
Monongahela	Db, Dg, Jm, and Ps	All	Loam, silt loam, or fine sandy loam over silty clay loam; occurs on moderately well drained stream terraces; 0 to 12 percent slopes, fragipan at a depth of about 24 inches.	3 to 4
Muse	Db and Jm	Clay	Silt loam over silty clay loam; underlain by silty clay; occurs on well-drained, sloping benches or toe slopes, 6 to 20 percent slopes	4 to 10
Muskingum	All	All	Silt loam or loam over silt loam; gravel and fragments of sandstone and shale in lower subsoil; occurs on excessively drained uplands; 6 to 50+ percent slopes	0 to 4
Muskingum-Gilpin	All except Ps	All	See Muskingum and Gilpin soils.	
Newark	Ps and Jm	Bell, Harlan, Letcher, and Pike	Silt loam over silt loam, occurs on poorly drained stream bottoms adjacent to the Pine Mountain fault, 0 to 4 percent slopes.	6 to 10
Philo	Db, Gd, Jm, and Ps, mainly Ps	All	Silt loam or fine sandy loam over silt loam or fine sandy loam; occurs on moderately well drained stream bottoms, 0 to 4 percent slopes.	6+
Pope	Db, Dg, Gd Jm, and Ps	All	Silt loam, fine sandy loam, or gravelly fine sandy loam over silt loam, fine sandy loam, or gravelly silt loam, occurs on well-drained stream bottoms, 0 to 12 percent slopes	8+
Purdy	Db and Ps	Floyd, Johnson, Martin, and Pike.	Silt loam over silt loam; fragipan at a depth of about 14 to 18 inches, occurs on poorly drained stream terraces, 0 to 4 percent slopes.	20+
Rarden	Db, Dg, Gd, Gw, and Md.	Floyd, Johnson, and Lawrence.	Silt loam over silty clay loam; underlain by silty clay over clay; shale or sandstone bedrock, occurs on well drained to moderately well drained ridgetops; 6 to 30 percent slopes.	3½
Sequatchie	Db, Dg, Jm, and Ps	All	Fine sandy loam over clay loam or fine sandy clay loam; underlain by stratified silt, sand, clay, and gravel; occurs on low, well-drained stream terraces, 0 to 12 percent slopes.	6 to 12+
Stendal	Db, Dg, Gd, Jm and Ps; mainly Db and Ps	All	Silt loam, fine sandy loam, or gravelly fine sandy loam over silt loam, fine sandy loam, or gravelly fine sandy loam; occurs on poorly drained stream bottoms, 0 to 4 percent slopes.	10+
Tilsit	Dg, Gd, Gw, and Md	Clay and Lawrence	Silt loam over silty clay loam; fragipan at a depth of about 24 inches; occurs on broad, moderately well drained ridgetops; 2 to 6 percent slopes.	3 to 5½
Tyler	Db, Dg, Jm, and Ps.	All	Silt loam over silt loam, fragipan at a depth of about 24 inches; occurs on poorly drained stream terraces, 0 to 4 percent slopes.	4 to 12+
Upshur	Db, Gd, and Gw	Lawrence	Silty clay over clay: underlain by clay shale, occurs on well-drained ridgetops and benches, 6 to 30 percent slopes	5+
Wellston	All except Ps and Rd	All	Silt loam over silty clay loam, underlain by shale and sandstone; occurs on well-drained ridgetops; 2 to 20 percent slopes.	3

See footnote at end of table

their estimated physical and chemical properties—Continued

Depth from surface	Classification			Permeability	Available water capacity	Reaction
	USDA texture	Unified	AASHO			
Inches				*Inches per hour*	*Inches per inch of soil*	*pH*
0–11	Loam, silt loam, or fine sandy loam	SM, SC, ML, or CL	A–4 or A–6	0 8 – 2 0	0 13–0 18	4. 0–5. 0
11–37+	Silty clay loam	CL	A–4 or A–6	0 2 – 0. 8	0 19	4 0–5. 0
0–8	Silt loam	ML or CL	A–4 or A–6	0 8 – 2. 0	0 22	4. 0–5 0
8–26	Silty clay loam	ML, CL, or CH	A–6 or A–7	0 2 – 0 8	0 19	4. 0–5 0
26–48+	Silty clay	CL, CH, or MH	A–6 or A–7	0 2 – 0 8	0. 16	4 0–5 0
0–10	Silt loam or loam	ML or CL	A–4 or A–6	2 0 – 5 0	0 18–0 22	4. 0–5 0
10–25	Silt loam	ML or CL	A–4 or A–6	0 8 – 2 0	0 22	4 0–5. 0
25+	Bedrock					
0–11	Silt loam	ML or CL	A–4 or A–6	0. 8 – 2 0	0 22	5 5–7. 3
11–48+	Silt loam	ML or CL	A–4 or A–6	0 8 – 2. 0	0 22	5 5–7. 3
0–10	Silt loam or fine sandy loam	ML or CL	A–4 or A–6	2. 0 – 5 0	0. 13–0. 22	4 0–5. 0
10–45+	Silt loam or fine sandy loam	ML or CL	A–4 or A–6	2. 0 – 5. 0	0. 13–0. 22	4. 0–5. 0
0–10	Silt loam, fine sandy loam, or gravelly fine sandy loam.	SM or ML	A–2 or A–4	2. 0 – 5. 0	0. 09–0. 22	4. 0–5. 0
10–26	Silt loam, fine sandy loam, or gravelly fine silt loam.	SM or ML	A–2 or A–4	2. 0 – 5. 0	0. 09–0. 22	4. 0–5. 0
26–38+	Stratified silt loam and fine sandy loam	SM or ML	A–2 or A–4	2. 0 – 5. 0	0. 09–0. 22	4 0–5. 0
0–9	Silt loam	ML or CL	A–4 or A–6	0 8 – 2. 0	0. 22	4. 0–5 0
9–36+	Silt loam	ML or CL	A–4 or A–6	0. 8 – 2. 0	0. 22	4 0–5. 0
0–5	Silt loam	ML or CL	A–4 or A–6	0. 2 – 0 8	0. 22	4 0–5. 0
5–10	Silty clay loam	CL or MH–CH	A–7–6	0 2 – 0. 8	0 19	4. 0–5. 0
10–20	Silty clay	CH	A–7–6	0. 05– 0. 2	0 16	4 0–5. 0
20–30+	Clay	CH or MH–CH	A–7–6	0. 05– 0. 2	0. 14	4 0–5. 0
0–7	Fine sandy loam	SM or ML	A–4 or A–6	2. 0 – 5. 0	0. 12	4 0–5. 0
7–35	Clay loam or fine sandy clay loam	SC, ML, or CL	A–4 or A–6	2. 0 – 5. 0	0. 17–0 18	4. 0–5. 0
35–42+	Stratified silt, sand, clay, and gravel	SC, ML, or CL	A–4 or A–6	2. 0 – 5. 0	0. 17–0 18	4. 0–5. 0
0–10	Silt loam, fine sandy loam, or gravelly fine sandy loam.	SM, SC, ML, or CL	A–4 or A–6	2. 0 – 5 0	0. 09–0. 22	4. 0–5. 0
10–48+	Silt loam, fine sandy loam, or gravelly fine sandy loam.	SM, SC, ML, or CL	A–4 or A–6	2 0 – 5. 0	0. 09–0. 22	4 0–5 0
0–10	Silt loam	ML or CL	A–4 or A–6	0. 2 – 0. 8	0. 22	4. 0–5. 0
10–45+	Silty clay loam	CL	A–6 or A–7	0. 2 – 0. 8	0 19	4 0–5. 0
0–7	Silt loam	ML or CL	A–4 or A–6	0. 2 – 0. 8	0. 22	4 0–5 0
7–42+	Silt loam	CL	A–6	0. 2 – 0. 8	0 22	4 0–5 0
0–6	Silty clay	MH–CH	A–7	0. 05– 0 2	0 16	4 0–5. 0
6–18	Silty clay or clay	MH–CH	A–7	0. 05– 0 2	0. 14–0. 16	4 0–5. 0
18–45+	Clay	CH	A–7	0 05– 0. 2	0 14	4. 0–5 0
0–4	Silt loam	ML or CL	A–6	0. 8 – 2 0	0. 22	4 0–5. 0
4–34+	Silty clay loam	CL	A–6	0 8 – 2 0	0. 19	4. 0–5. 0

TABLE 19.—*Brief descriptions of the soils and*

Soil series	Occurs in soil associations—[1]	Occurs in counties—	Description of soil and site	Depth to rock
				Feet
Whitwell	Db, Jm, and Ps	All	Loam over silt loam, underlain by silty clay loam over silty clay or fine sandy loam, occurs on low, poorly drained to moderately well drained stream terraces, 0 to 4 percent slopes.	6 to 12+
Zaleski	Db, Dg, Jm, and Ps	Floyd, Johnson, Lawrence, Letcher, and Pike.	Silt loam over silty clay loam; underlain by silty clay loam or silty clay, occurs on moderately well drained toe slopes and colluvial fans, 2 to 6 percent slopes	5+

[1] See tables 4 to 11, beginning on page 4, for acreages in each soil association.

TABLE 20.—*Interpretation of*

["None" in a column means that the soil has no features that adversely affect the practice shown in column heading.

Soil series	Suitability of soils for—				
	Topsoil	Construction material (workability)	Compaction	Road fill	Sewage disposal area
Allegheny	Good	Good to fair	Good to poor	Fair to poor	Suitable
Atkins	Fair	Good to fair	Good to poor	Fair to poor	Unsuitable
Barbourville	Poor	Good to fair	Good to poor	Fair to poor	Suitable
Berks	Poor to fair	Good	Good	Good	Unsuitable
Bruno	Poor	Good to fair	Good to fair	Good to poor	Unsuitable
Cotaco	Fair	Good to fair	Good to poor	Fair to poor	Unsuitable
Dekalb	Poor to fair	Good	Good	Good	Unsuitable
Enders	Fair	Good to poor	Fair to poor	Fair to poor	Questionable
Gilpin	Fair	Good to fair	Good to poor	Good to poor	Unsuitable
Hayter	Fair	Fair to poor	Fair to poor	Fair to poor	Suitable
Holston	Fair	Good to fair	Good to fair	Fair to poor	Suitable on slopes of less than 12 percent.
Huntington	Good	Good to fair	Good to poor	Fair to poor	Unsuitable because of overflow.

their estimated physical and chemical properties—Continued

Depth from surface	Classification			Permeability	Available water capacity	Reaction
	USDA texture	Unified	AASHO			
Inches				*Inches per hour*	*Inches per inch of soil*	*pH*
0–7	Loam	ML or CL	A–4	0.8 – 2.0	0.18	4.0–5.0
7–21	Silt loam	ML or CL	A–4 or A–6	0.8 – 2.0	0.22	4.0–5.0
21–30	Silty clay loam	CL or CH	A–6 or A–7	0.8 – 2.0	0.19	4.0–5.0
30–36+	Silty clay or fine sandy loam	SC, ML, or CL	A–4 or A–6	0.8 – 2.0	0.13–0.16	4.0–5.0
0–5	Silt loam	ML–CL	A–4 or A–6	0.8 – 2.0	0.22	4.0–5.0
5–25	Silty clay loam	CL or CH	A–6 or A–7	0.8 – 2.0	0.19	4.0–5.0
25–43+	Silty clay loam or silty clay	CL or CH	A–6 or A–7	0.8 – 2.0	0.16–0.19	4.0–5.0

engineering properties of the soils

Dashed lines mean that the practice is not needed on the named soils]

Soil features affecting—					Remarks
Construction of farm ponds		Agricultural drainage	Use of terraces and diversions	Waterways	
Impounding area	Embankment				
Permeability of substratum is variable, seepage may be a problem.	None		None	None	
Excess seepage may be a hazard	Hazard of piping	None		Subject to overflow	Subject to overflow and seasonal high water table; some wetness after installation of drainage may limit suitable crops
Excess seepage may be a hazard	None		None	Generally gravelly	
High permeability may cause seepage	None		Gravelly soil	Gravelly soil	
Seepage may be a problem	Hazard of erosion and piping		Hazard of erosion and of channel filling.	Difficult to establish vegetation because of erosion.	Possible source of sand. Subject to overflow.
Seepage may be a problem.	None	None	None	Generally gravelly	
Steepness limits size	Limited amount of fill material.		Steep topography	Steep topography	
None	None		None	None	
Storage area may be limited.	Limited amount of fill material.		Shallow to bedrock in places	Shallow to bedrock in places	
Seepage may be a problem	None		None	None	
Seepage in substratum may be a problem.	None		None	None	
Excess seepage may be a hazard.	Hazard of piping			None	Subject to overflow

TABLE 20.—*Interpretation of*

["None" in a column means that the soil has no features that adversely affect the practice shown in column heading.

Soil series	Suitability of soils for—				
	Topsoil	Construction material (workability)	Compaction	Road fill	Sewage disposal area
Jefferson	Fair	Good to fair	Good to poor	Fair to poor	Suitable on slopes of less than 12 percent, questionable on slopes of 12 to 20 percent; unsuitable on slopes of more than 20 percent
Monongahela	Good	Good to fair	Good to poor	Fair to poor	Unsuitable
Muse	Good	Fair to poor	Fair to poor	Fair to poor	Questionable
Muskingum	Poor	Fair	Good to poor	Fair to poor	Unsuitable
Newark	Good	Good to fair	Good to poor	Fair to poor	Unsuitable
Philo	Fair	Good to fair	Good to poor	Fair to poor	Unsuitable
Pope	Fair	Good to fair	Good to fair	Good to poor	Unsuitable
Purdy	Poor	Good to fair	Good to poor	Fair to poor	Unsuitable
Rarden	Poor	Fair to poor	Fair to poor	Fair to poor	Unsuitable, slow permeability
Sequatchie	Fair	Good to fair	Good to poor	Good to poor	Questionable
Stendal	Fair	Good to fair	Good to poor	Fair to poor	Unsuitable
Tilsit	Fair	Good to fair	Good to poor	Fair to poor	Unsuitable
Tyler	Fair	Good to fair	Good to fair	Fair to poor	Unsuitable
Upshur	Poor	Fair to poor	Fair to poor	Fair to poor	Unsuitable
Wellston	Fair	Good to fair	Good to fair	Fair to poor	Suitable on slopes of less than 12 percent, questionable on slopes of more than 12 percent.
Whitwell	Fair	Good to poor	Good to poor	Fair to poor	Questionable
Zaleski	Fair	Fair to poor	Fair to poor	Fair to poor	Questionable

engineering properties of the soils—Continued

Dashed lines mean that the practice is not needed on the named soils]

Soil features affecting—					
Construction of farm ponds		Agricultural drainage	Use of terraces and diversions	Waterways	Remarks
Impounding area	Embankment				
None	Workability poor because of stones.		Gravelly or stony; steep in some places.	Gravelly or stony	
Hazard of excess seepage.	None		None	Fragipan	
None	None		None	None	
Steep in many places.	Limited amount of fill material.		Steep in many places.	Steep in many places.	
Subject to seepage	Some hazard of piping.	None		None	Subject to overflow.
Hazard of seepage	Hazard of piping	None; tile drainage not necessary for crop production, but its use lengthens time fieldwork can be performed.	Subject to overflow	Subject to overflow	Subject to overflow.
High permeability in subsoil.	Hazard of piping		Subject to overflow; terraces not needed.	Subject to overflow	
None	Fragipan	Shallow to fragipan; surface drainage needed.	Wet soil	Fragipan	Fragipan at a depth of 10 to 24 inches.
None	Poor stability		None where slopes permit row crops.	Low fertility	
Excess seepage in some areas.	None		None	None	Subject to infrequent overflow.
High permeability in subsoil	Some hazard of piping.	None	Seasonally high water table.	Seasonally high water table.	Subject to overflow.
None	Some hazard of piping.		None	Fragipan	Fragipan at a depth of 18 to 24 inches.
None	None	Shallow to fragipan; surface drainage needed.	Wet soil	Seepage from side slopes; fragipan.	Fragipan at a depth of 14 to 20 inches.
None	Fair to poor stability.		None where slopes permit row crops.	None	
None	None		None where slopes permit row crops.	None	
None	None	None	None	None	Drainage ranges from somewhat poor to moderately good.
None	None		None	Seepage from side slopes.	

The highly organic soils are usually very compressible and have undesirable construction characteristics. They are identified by the symbol Pt.

The American Association of State Highway Officials (*1*, *3*) classifies soils according to how they perform in highways. In this classification soils of about the same general capacity for load carrying and for service are placed together in seven basic groups. These groups range from A–1 for the best soils for road subgrade to A–7 for the poorest.

The textural soil fractions used in identification are gravel, coarse sand, fine sand, and combined silt and clay. The soil classifications are divided into two major groups, granular materials containing 35 percent or less material passing the number 200 sieve, and the silt-clay materials containing more than 35 percent material passing the number 200 sieve. If the plasticity index of a soil has a value of 10 or less, the fine material is silty, and if the plasticity index is more than 10, the material is clayey.

The granular soil groups are classed A–1, A–2, and A–3. Soils in the A–1 group are well-graded mixtures of coarse to fine material that have a nonplastic or slightly plastic soil binder, and soils in the A–2 group may be poorly graded and contain inferior binder material. A–3 soils consist of sands that are deficient in soil binder and coarse material.

The silt-clay soil groups are classed A–4, A–5, A–6, A–7–5, and A–7–6. Generally, soils in the A–4 group are predominantly silt and contain only moderate to small amounts of coarse material and small amounts of sticky colloidal clay. When dry, these soils provide a finer riding surface, and there is little rebound after loading. When water is absorbed rapidly, A–4 soils expand, lose stability, and are subject to frost-heave. The A–5 soils are similar to the A–4 soils, except that they include very poorly graded soils that are elastic and very low in stability. The A–6 soils generally consist predominantly of clay and contain moderate to small amounts of coarse material. They have good bearing capacity when compacted to maximum practical density, but they lose this capacity when moisture is absorbed. The A–7 soils consist predominantly of clay, but they are elastic because they contain one-sized silt particles, organic matter, mica flakes, or lime carbonate. At certain moisture contents, A–7 soils deform quickly under load and rebound when the load is removed.

Interpretations of soils for engineering

Table 20, beginning on page 66, rates the soils according to their suitability for use in the construction of highways and for general engineering purposes. It also gives features of the soils that affect their use for sewage disposal areas, farm ponds, and structures that are effective in controlling erosion and runoff. Other parts of the report contain additional information about the topography of the area, the association of specific soils with other soils, the parent materials, and the underlying rock strata.

In table 20, topsoil is rated according to its suitability as material that promotes the growth of vegetation on slopes, shoulders, and ditchbanks, and on other earth structures that require a protective cover.

The suitability of the soils for construction material, or their workability, is a qualitative rating. This rating indicates the relative suitability of the different soils for engineering construction.

In estimating the suitability of the soils for compaction, average field conditions and proper moisture control are assumed, as well as control over placement of the material in layers of suitable thickness, which are passed over an adequate number of times with proper equipment.

Suitability for road fill is an estimate of the suitability of the soils for subgrade material, provided the material is not subject to frost action. The suitability depends largely on the texture of the soil material and its natural content of water. Highly plastic soil material is poor to fair for road fill, depending on its natural content of water and on how easy or difficult the material handles, dries, or compacts.

The suitability of soils for sewage disposal areas depends mainly on how absorptive the soils are and, consequently, how well they dispose of sewage from septic tanks. In the last half of table 20, soil features are listed that affect engineering practices and the installation of structures used to conserve soil and water on farmland. Statements concerning soil features that may affect the structures are made for each soil under the listed practice. The miscellaneous land types in the survey area are not listed in table 20, because their characteristics are too variable.

Literature Cited

(1) American Association of State Highway Officials.
1961. standard specifications for highway materials and methods of sampling and testing Ed. 8, 2 v., 401 and 617 pp., illus.

(2) Coile, T. S. and Schumacher, F. X.
1953. site index of young stands of loblolly and shortleaf pines in the piedmont plateau region. Jour. of Forestry, v. 51 : 432–35.

(3) Portland Cement Association.
1956. pca soil primer. 86 pp , illus., Chicago.

(4) Slocum, G. K. and Miller, W. D
1953. virginia pine. N. C Agr. Exp. Sta., Tech. Bul. 100, 52 pp., illus.

(5) University of Kentucky.
1960. appalachian resource development project. (Submitted to the Kellogg Foundation by the College of Agr. and Home Ec.), 24 pp., illus.

(6) United States Department of Agriculture.
1929. volume, yield, and stand tables for second-growth southern pines. U.S. Dept. Agr. Misc. Pub 50, 202 pp. [Out of print]

(7) ———
1933. yellow-poplar—characteristics, growth, and management. Forest Serv. Tech. Bul. 356, 58 pp., illus.

(8) ———
1937. yield, stand, and volume tables for even-aged upland oak forests. Forest Serv. Tech. Bul. 560, 88 pp., illus.

(9) ———
1941. climate and man. U.S. Dept. Agr. Ybk., 1248 pp., illus.

(10) ———
1951. soil survey manual. U.S. Dept. Agr. Handb. 18, 503 pp., illus.

(11) ———
1959. guide for evaluating sweetgum sites. Forest Serv. Occas. Paper 176, 8 pp., illus.

(12) ———
1960. field guide for evaluating cottonwood sites. Forest Serv. Occas. Paper 178, 6 pp , illus.

(13) Waterways Experiment Station, Corps of Engineers.
1953. the unified soil classification system. Tech. Memo. 3–357, 2 v., and appendix, 48 pp. and charts, illus.

Glossary

Acidity. See Reaction.

Alluvium. Fine material, such as sand, silt, or clay, that has been deposited on land by streams

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small, individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map

Cover crop. A close-growing crop grown primarily to improve the soil and to protect it between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Diversion terrace or diversion. A ridge of earth that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage, soil. The rapidity and extent of the removal of water from the soil, in relation to additions, especially by runoff, by flow through the soil to underground spaces, or by a combination of both processes.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

Miscellaneous land type. A mapping unit for areas of land that have little or no natural soil; or that are too nearly inaccessible for orderly examination; or that occur where, for other reasons, it is not feasible to classify the soil.

Moisture-supplying capacity. The capacity of a soil to hold moisture that plants can withdraw. Relative terms are *very high*, *high*, *medium*, *medium low*, or *very low*.

Mottled. Irregularly marked with spots of different colors that vary in number and size Mottling in soils usually indicates poor aeration and lack of sufficient drainage. Descriptive terms are as follows: Abundance—*few*, *common*, and *many;* size—*fine*, *medium*, and *coarse;* and contrast—*faint*, *distinct*, and *prominent*. The size measurements are these: *fine*, less than 5 millimeters (about 0 2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

Phase, soil. A subdivision of a soil type, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects management.

Piping (engineering). Drainage channels, or "pipes," that are formed underground when water washes away soil material If piping occurs in a fill, the fill is weakened and material above the piping may sink and cause a rough surface.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5 6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 millimeter to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Shale. A sedimentary rock formed by the hardening of clay deposits.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0 002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Site index. A numerical means of expressing the quality of a forest site that is based on the height of the dominant stand at an arbitrarily chosen age; for example, the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. In many soils, the B horizon; roughly, the part of the profile below plow depth.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, usually about 5 to 8 inches in thickness. The plow layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Well-graded soil. A soil or soil material consisting of particles that are well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Workability, soil. See Tilth, soil.

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