SOIL SURVEY OF

Greenbrier County, West Virginia

United States Department of Agriculture
Soil Conservation Service
In cooperation with
West Virginia Agricultural Experiment Station

Issued April 1972

Major fieldwork for this soil survey was done in the period 1942–65. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1965. This survey was made cooperatively by the Soil Conservation Service and the West Virginia Agricultural Experiment Station. It is part of the technical assistance furnished to the Greenbrier Valley Soil Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Greenbrier County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the capability unit and woodland group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes, other than cultivated crops and woodland, can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of capability units and woodland groups.

Foresters and others can refer to the section "Use of the Soils for Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Recreational and Nonfarm Uses of the Soils."

Engineers and builders can find, under "Use of the Soils in Engineering," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Greenbrier County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication and in the section "General Nature of the County."

Cover: View from Muddy Creek Mountain. Frederick and Frankstown soils are in the limestone valley. Dekalb soils are on wooded Brushy Ridge in the background.

U.S. GOVERNMENT PRINTING OFFICE: 1972

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Contents

Issued April 1972

SOIL SURVEY OF GREENBRIER COUNTY, WEST VIRGINIA

BY JOHN L. GORMAN, LEONARD S. NEWMAN, WOODROW W. BEVERAGE, AND WILLIAM F. HATFIELD, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION

GREENBRIER COUNTY is in the southeastern part of West Virginia (fig. 1). It is the second largest county in the State and has a total of about 1,026 square miles, or 656,640 acres. The Virginia State line forms its eastern boundary. In 1960 the population of the county was 34,446 and that of Lewisburg, the county seat, was 2,259.

A series of steep, parallel ridges and narrow valleys makes up the eastern part of the county. This area has moderately deep to shallow soils that formed in material weathered from shale. These soils are generally better suited to woodland and recreational use than to other uses.

A rolling limestone valley crosses the central part of the county from southwest to northeast at an elevation of about 2,000 feet. This area has deep, moderately fertile to fertile soils. These soils are especially well suited to farming.

A moderately steep, dissected plateau area is in the western part. This area has deep, easily eroded soils that formed in material weathered from shale. These soils are suited to woodland and general farming.

A cool, rugged mountainous area that has elevations up to nearly 4,400 feet makes up the northwestern part. This area has mostly very steep, stony soils. These soils are well suited to woodland and recreation.

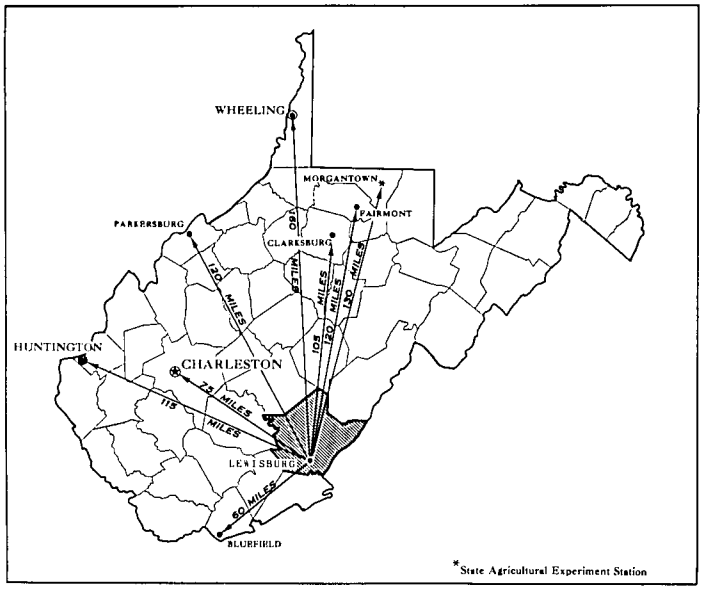

Figure 1.—Location of Greenbrier County in West Virginia.

The mountainous area in the northwestern part of the county has about 50 to 55 inches of annual precipitation and a short growing season. The rest of the county has about 38 inches of precipitation and a favorable growing season.

Greenbrier County is an important farming area, even though about three-quarters of the total acreage is wooded. About a third of the acreage is farmed, and of this acreage, about 40 percent is in pasture. The principal farm enterprises are the raising of beef cattle, sheep, and poultry, and dairying. Among the principal crops are corn, oats, wheat, and hay. These crops are used mainly for feeding livestock. Most of the cash income comes from the sale of livestock and livestock products.

An extensive acreage of hardwood forest is in the eastern and northwestern parts of the county, and more than a third is in the Monongahela National Forest. The sale of woodland products is an important source of income, and several sawmills are in operation.

Among the industries are the mining of soft coal, important in the western part of the county, and the extensive quarrying of limestone.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Greenbrier County, where they are located, and how they can be used. The soil scientists went into the county knowing they were likely to find many soils they had already seen and perhaps some they had not. As they worked in the county, they observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform

procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey. (*18*)[1]

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Atkins and Dekalb, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Atkins silt loam is one of two phases within the Atkins series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

A comparison of the detailed soil map of this county with that of adjoining areas of Monroe County will show places where soil boundaries that overlap county lines do not match perfectly. These differences arise, in part, for the following reasons. The patterns of occurrence of soils in some complexes and in some soil associations are different. The symbols differ in a few places because continuing refinement of the soil classification system has resulted in some changes in classification by soil series and in changes in conventions for naming soil associations and miscellaneous land types. For example, the Ernest series is the same as the Leadvale series of the Monroe County soil survey.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Greenbrier County: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Dekalb-Gilpin very stony complex, 5 to 20 percent slopes, is an example.

[1] Italic numbers in parentheses refer to Literature Cited, p. 93.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Calvin and Gilpin very stony soils, 10 to 25 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Alluvial land is a land type in Greenbrier County.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for some of the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Greenbrier County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and several minor soils, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Greenbrier County are discussed in the following pages.

1. Dekalb-Gilpin-Laidig association

Moderately deep and deep, well-drained, dominantly very steep and very stony soils of the high mountains

This association occupies the cool, rugged, mountainous area in the northern tip of the county. It is underlain by sandstone and shale that contain some mineable coal seams. The slopes are mostly very steep or steep, and the gentle ridges are relatively narrow. Elevations range from about 3,000 to more than 4,400 feet. The annual precipitation ranges from 50 to 55 inches.

The association makes up almost 12 percent of the county. It is about 40 percent Dekalb soils, 25 percent Gilpin soils, and 25 percent Laidig soils. Other soils make up the remaining 10 percent.

Dekalb and Gilpin soils are moderately deep. They occur in mixed patterns on side slopes and ridges. Dekalb soils are loamy and slightly droughty; Gilpin soils are more silty and hold water well. Stones and boulders on the surface severely to moderately limit farming and use of logging equipment.

Laidig soils are deep and strongly sloping to moderately steep. They occur on foot slopes and in concave areas of colluvium in the middle of long mountain slopes. They hold water well. Many large stones and boulders are on the surface.

Among the minor soils of this association are Cookport and Nolo soils on uplands, Pope soils and Alluvial land on stream bottoms, and Ernest and Andover soils on foot slopes.

This association is almost entirely woodland; much of the acreage is in the Monongahela National Forest. It is better suited to woodland and recreational uses than to other purposes because of the short growing season, the stones on the surface, and the slope. High-value northern hardwoods, such as hard maple, black cherry, birch, and red oak, grow especially well. The association provides hunting and stream fishing. Several recreational areas are maintained in the Monongahela National Forest. Little Clear Creek and the Cherry River drain much of the area.

A few small areas on the ridges are used for general farms. A few strip mines are worked. One all-weather road crosses this association in a north-south direction and West Virginia Route 39 crosses the northeastern tip, but roads are not numerous. There are no towns.

2. Dekalb-Gilpin-Laidig-Cookport association

Moderately deep and deep, well drained and moderately well drained, very steep to gently sloping, very stony soils of the high mountains

This association occupies the cool, mountainous area in the extreme northwestern part of the county. It is underlain by gray sandstone and shale that contain extensive mineable coal seams. The slopes are mostly steep or very steep, and the numerous ridges are gently sloping and fairly broad. Elevations are mostly 2,800 to 3,600 feet. The annual precipitation ranges from 50 to 55 inches.

The association makes up about 12 percent of the county. It is about 35 percent Dekalb soils, 25 percent Gilpin soils, 15 percent Laidig soils, and 10 percent Cookport soils. Other soils make up the remaining 15 percent.

Dekalb and Gilpin soils are moderately deep and well drained. They occur in mixed patterns on side slopes and ridges. Dekalb soils are loamy and slightly droughty; Gilpin soils are more silty and hold water well. Stones and boulders on the surface generally cause moderate to severe limitations on the use of logging equipment.

Laidig soils are deep, well-drained, and strongly sloping to moderately steep. They occur on foot slopes and below Dekalb and Gilpin soils. The numerous stones and boulders on the surface limit the use of these soils largely to woodland.

Cookport soils are gently sloping to strongly sloping, and about half of them are very stony. They occur on ridges, generally in mixed patterns with Dekalb soils. They are slightly wet and have a slowly permeable layer in the subsoil.

Among the minor soils of this association are Nolo, Andover, and Calvin soils on uplands, and Pope, Philo, and Ernest soils on bottom lands and foot slopes.

This association is nearly 90 percent woodland. It is well suited to outdoor recreational development. It is better suited to woodland and recreational uses than to other purposes because of the short growing season, the stones on the surface, and the slope. Such high-value northern hardwoods as hard maple, black cherry, birch, and red oak grow well. There is a large sawmill and lumber operation at Rainelle, near the southwestern edge of this association. Large amounts of timber products are used in local mining operations.

Scattered small areas, mostly on the ridges, are used for general farms, but much of the acreage is in large tracts held by coal and lumber companies. There are many small mining communities, mostly along the streams. All-weather roads serve these towns. Big Clear Creek and the Meadow River drain much of the area.

3. Teas-Calvin-Gilpin-Litz association

Moderately deep, well-drained, strongly sloping to steep soils underlain by shale and siltstone; in areas of a dissected plateau

This association occupies areas of a thoroughly dissected plateau, mostly in the west-central part of the county. It is characterized by many small streams, narrow ridges, and valleys, and by a few fairly wide flats. It is underlain by bedrock of interbedded red and gray siltstone, shale, and some sandstone, and there are some limy strata. The slopes are irregular, benchy, and generally moderately steep to steep.

This association makes up about 18 percent of the county. It is about 20 percent Teas soils, 20 percent Calvin soils, 20 percent Gilpin soils, and 10 percent Litz soils. Other soils make up the remaining 30 percent.

The reddish-brown Teas soils and the dark-brown Litz soils commonly occur together in mixed patterns on strongly sloping to steep side slopes. These soils formed in material weathered from siltstone and shale, some strata of which contain lime. Soils of both series contain many small fragments of stone. They erode easily.

The brown Gilpin soils and reddish-brown Calvin soils occur together as small patches throughout the association and extensively at the base of mountains in the northwestern part of the county. These are steep, stony soils that formed in material weathered from acid siltstone, shale, and sandstone.

Among the minor soils in this association are Cookport, Dekalb, and Clymer soils on ridges and flats, Albrights soils on colluvial foot slopes, Monongahela soils on stream

terraces, and Pope, Philo, and Atkins soils on bottom lands.

The soils in this association are used for general farming, for raising livestock, and for woodland. The less steep areas are fairly well suited to general crops and pasture. The steep and very stony areas are better suited to woodland and outdoor recreation than to other purposes. About half the acreage remains wooded. Erosion is generally a severe hazard and has been active in cropped fields.

Gravel roads and improved roads serve the association. Among the several towns in the area are Ronceverte, Smoot, Leonard, and Vago. Some coal is strip mined along the base of mountains in the northern part of this association.

4. Atkins-Teas-Monongahela association

Deep and moderately deep, poorly drained to well-drained, nearly level to steep soils on bottom lands and stream terraces and similar soils underlain by shale on adjoining uplands

This association occupies a long strip of bottom lands and adjoining uplands along the Meadow River and its tributaries in the western part of the county. This area is a nearly level hanging valley underlain by massive sandstone ledges, across the river and downstream from Rupert. In this area the river has a very low rate of fall and overflows at least once a year, usually in winter or early in spring.

This association makes up about 4 percent of the county. It is about 45 percent Atkins soils, 20 percent Teas soils, and 5 percent Monongahela soils. Other soils make up the remaining 30 percent.

Atkins soils occur on bottom lands. They are nearly level and poorly drained, and their subsoil is grayish, mottled, and slowly permeable. Most of these soils have a high water table, are flooded at least once a year, and are difficult to drain.

Teas soils are on uplands on rounded slopes near streams. These are moderately deep, well-drained, moderately steep, reddish-brown soils that contain many fragments of shale. They erode easily.

Monongahela soils occur on stream terraces above the flooded areas. These are gently sloping, infertile soils that have a slowly permeable layer in the lower part of the subsoil. The water table is high in winter and in spring.

Among the minor soils of this association are Pope and Philo soils on bottom lands, Albrights soil on colluvial foot slopes, and Litz soils along the edges of the surrounding uplands.

About half the association is in woodland, and half is in general farms or livestock farms that produce mostly pasture or hay crops. Drained areas of bottom land are suitable for pasture, hay, and general crops. The effectiveness of drainage is limited by the high water table and the slow permeability. The terrace and upland areas are suitable for general crops and for pasture. The use of this association is severely limited by the flooding, a high water table, and poor drainage.

This association appears to have good potential for recreational development, and bottom-land areas are generally suitable for impoundments.

There is a large hardwood lumber mill at Rainelle, a principal lumber center in the county.

5. Frederick-Frankstown association

Deep, well-drained, gently sloping to steep soils underlain by limestone; on broad valley uplands

This association occupies a large valley that extends through the center of the county, from the Monroe County line south of Fort Spring to the Pocahontas County line east of Renick. The large valley area is underlain by limestone as are scattered small areas. The slope ranges mostly from gentle to steep, but there are small, very steep areas. The surface is irregular because of the many, shallow, saucer-shaped sinkholes. Because this association is underlain by cavernous limestone, surface drainage is largely through sinkholes into underground solution channels in the limestone. Surface streams are not numerous.

This association makes up about 12 percent of the county. It is 70 percent Frederick soils and 15 percent Frankstown soils. Other soils make up the remaining 15 percent.

Frederick soils occur on slopes throughout the association. These soils have a surface layer of cherty silt loam and a fine-textured, moderately permeable subsoil. They release moisture readily for plant use. On more than half the acreage, enough limestone bedrock crops out to severely limit the use of farm machinery.

Frankstown soils occur as small areas scattered throughout the association. They generally occur on less steep, smoother slopes than do the Frederick soils. Frankstown soils formed in material weathered from strata of silty limestone. They have a surface layer of silt loam and a moderately fine textured subsoil that contains some fragments of soft siltstone. They release moisture readily for plant use.

Among the minor soils of this association are Pickaway and Sees soils on gently sloping uplands and Huntington and Lindside soils on bottoms along small drainageways and in sinkholes.

Because this association has soils that are deep and well drained and that have favorable slopes, it is well suited to the raising of livestock and to general farming. It is mostly in farms, and less than 10 percent is in farm woodlots. This association is in the heart of the livestock-raising area of the county. The raising of beef cattle and sheep, and dairying are the principal farm enterprises. This area is known for its bluegrass pasture and hay crops. This association is also well suited to housing developments and to recreational development, partly because of the favorable climate.

Improved roads traverse the area. U.S. Highway 219 crosses this association in a north-south direction, and Interstate Highway 64 and U.S. Highway 60 cross the association in an east-west direction. There is a modern airport near Maxwelton. Among the towns in this area are Lewisburg, Frankford, Organ Cave, and Fort Spring.

6. Dekalb-Clymer association

Moderately deep and deep, well-drained, gently sloping to very steep soils underlain by sandstone and shale; on broad ridges and adjoining side slopes

This association consists of broad, smooth, gently sloping to strongly sloping ridges and the adjoining steep to very steep side slopes. In general, it adjoins the limestone valley area. It includes Muddy Creek Mountains, Brushy Ridge, and a long narrow area just west of the Greenbrier

River. It is underlain by bedrock that is mostly sandstone but that has some shale.

This association makes up about 9 percent of the county. It is about 70 percent Dekalb soils and 10 percent Clymer soils. Other soils make up the remaining 20 percent.

Dekalb soils occur on smooth, gentle slopes and on steep to very steep slopes. They are moderately deep, loamy soils that are slightly droughty.

Clymer soils occur on gently sloping to strongly sloping ridges. These are deep soils that have a loamy surface layer and a subsoil of clay loam that holds moisture well. They are underlain by sandstone.

Among the minor soils in this association are Cookport soils on ridges and Teas, Litz, and Calvin soils on side slopes.

The smoother areas of this association are used for general farms and for raising livestock. The soils on the smooth ridges are suitable for general crops and pasture, and in most of these areas they are used for pasture and hay crops. They are also well suited to recreational use, housing developments, and other nonfarm uses. The soils on the steep side slopes have remained mostly in woods, and they are generally better suited to trees than to other uses. Although sparsely populated, this area is served by all-weather roads.

7. Westmoreland-Litz-Clarksburg association

Moderately deep and deep, well drained and moderately well drained, steep to gently sloping soils underlain by shale and limestone; in areas of a dissected plateau

This association occupies areas of a dissected plateau. It is just west of the limestone valley in the central part of the county. The association is underlain by shale, sandstone, and limestone. Many small streams have cut far back into the hilly areas underlain by shale and have caused the formation of many moderately sloping, rounded knobs and ridgetops. Narrow ledges of limestone crop out on the moderately steep to steep side slopes. There are small, severely eroded spots on the side slopes.

This association makes up about 6 percent of the county. It is about 65 percent Westmoreland soils, 10 percent Litz soils, and 2 percent Clarksburg soils. Other soils make up the remaining 23 percent.

Westmoreland soils occur on side slopes throughout the area. These are moderately deep, gently sloping to steep, well-drained, medium-textured soils that formed in material weathered from interbedded shale, sandstone, and limestone. They are moderately fertile and release moisture readily for plant use. They are easily eroded.

Litz soils occur on the side slopes with Westmoreland soils, but they are somewhat shallower than those soils and contain more rock fragments.

Clarksburg soils occur as numerous small areas at the foot of slopes. They are gently sloping, moderately well drained soils that formed in colluvial material accumulated through water action and soil creep from Westmoreland soils. These soils have moderate to high fertility.

Among the minor soils of this association are Frederick and Frankstown soils on limestone uplands, Teas, Litz, and Dekalb soils on shale and sandstone uplands, and Pope and Atkins soils on bottom lands.

This association is used for general farms and for the raising of livestock. Overall, it is suited to livestock farming and to woodland. Pasture is extensive, and woodland, mostly on the steeper slopes, is fairly extensive. The gently sloping to sloping areas are suitable for crops and hay, and the favorable slope is especially well suited to bluegrass pasture. Erosion has been especially active in many of the steeper cropped fields and pastures. Some of the fields are growing up to Virginia pine and hardwoods.

This association is well supplied with improved and all-weather roads. Homesteads are fairly well distributed. Among the communities are Alderson, Unus, and Friars Hill. Culberson Creek and Muddy Creek flow through this association.

8. Dekalb-Berks-Laidig association

Moderately deep and deep, well-drained, very steep to strongly sloping, very stony soils underlain by sandstone and shale; on mountain side slopes and foot slopes

This association occupies a band of mountain slopes in the eastern part of the county extending from the Monroe County line south of Caldwell to the Pocahontas County line in a southwest-northeast direction. It is underlain by acid sandstone and shale. The slopes are mostly very steep or steep.

This association makes up about 5 percent of the county. It is about 40 percent Dekalb soils, 35 percent Berks soils, and 5 percent Laidig soils. Other soils make up the remaining 20 percent.

Dekalb and Berks soils occur in mixed patterns on side slopes and narrow ridges. Dekalb soils are loamy and slightly droughty; Berks soils are more silty and contain many small fragments of stone. Dekalb soils formed in material weathered from sandstone, and Berks soils in material weathered from shale. Commonly, large stones are on the surface of both these soils.

Laidig soils occur on gently sloping to strongly sloping foot slopes below Dekalb and Berks soils, where they formed in colluvium from those soils. They are well-drained, medium-textured soils that have high available moisture capacity.

Among the minor soils of this association are Ernest and Monongahela soils on foot slopes and terraces and Chavies, Pope, Philo, and Atkins soils on bottom lands.

This association is nearly all wooded and is well suited to trees. The northern half is in the Monongahela National Forest. The soils of this association are used extensively for forest products, especially pulpwood, as well as for recreation. There are several summer camps, youth camps, and recreational developments in this area. Along the Greenbrier River and Anthony Creek are sites that have favorable slope for recreational use.

This association is well suited to future recreational development because of its location, its scenic value, its streams, and its extensive wooded areas. It is well served by roads, including U.S. Highway 60.

9. Weikert-Berks-Ernest association

Shallow to deep, excessively drained, well drained, and moderately well drained, very steep to strongly sloping soils underlain by shale and siltstone; on mountain side slopes and foot slopes

This association occupies much of the mountain slopes that are drained by Anthony and Howard Creeks at the eastern edge of the county. It is underlain by acid shale, siltstone, and thin-bedded sandstone. Numerous small

streams have cut far back into the slopes and have caused the formation of many narrow ridges and narrow, steep-sided, V-shaped valleys.

This association makes up about 14 percent of the county. It is about 40 percent Weikert soils, 30 percent Berks soils, and 5 percent Ernest soils. Other soils make up the remaining 25 percent.

Weikert and Berks soils are silty, and they contain many small fragments of rock. They occur mostly in mixed patterns. Weikert soils are most common on southern and western exposures. They are extensive on the lower part of foothills along the upper part of Anthony Creek and its main tributaries. These soils are mainly shallow to bedrock, but they range from shallow to very shallow and are very droughty. Berks soils are moderately deep to bedrock and are somewhat less droughty than Weikert soils.

Ernest soils are deep, moderately well drained, and yellowish brown. They occur as narrow bands on foot slopes. They formed in colluvium from upland areas underlain by shale and siltstone. Permeability in the fragipan, which is at a depth of about 2 feet, is slow. The water table is seasonally high.

Among the minor soils of this association are Dekalb soils on and near the top of steep slopes, Laidig soils on foot slopes, and Pope, Philo, and Atkins soils on bottom lands.

This association is mostly woodland, and about half the acreage is in the Monongahela National Forest. Greenbrier State Forest is also within this association. Mixed hardwoods occupy a large acreage, and stands of Virginia pine occupy the drier sites. These stands produce a large amount of wood for pulp. The steep, droughty soils are generally only fairly well suited to poorly suited to wood crops, but they need the protection from excessive loss of water and soil material afforded by trees.

This association also has good potential for fishing, hunting, and other recreational developments.

10. Dekalb-Elliber association

Moderately deep and deep, well-drained, very steep to moderately steep, cherty and very stony soils underlain by sandstone or limestone; on mountain ridges and side slopes

This association occupies a narrow strip of mountain ridges and side slopes in the eastern part of the county, extending from just north of White Sulphur Springs northeast to Alvon and on to the Pocahontas County line. The ridges are mostly narrow. The side slopes are steep or very steep. The upper part of the slopes is underlain by sandstone, the middle part by limestone, and the lower part by acid shale.

This association makes up about 3 percent of the county. It is about 45 percent Dekalb soils and 30 percent Elliber soils. Other soils make up the remaining 25 percent.

Dekalb soils occur on the upper part of the slopes and narrow ridges underlain by sandstone. They are moderately deep, slightly droughty, very stony, and loamy.

Elliber soils formed in material weathered from cherty limestone, mostly in the middle of very steep slopes. They are deep, well drained, very stony or very cherty, and rapidly permeable. Their subsoil is medium textured and contains a large amount of angular chert fragments. In most areas large stones are on the surface.

Among the minor soils of this association are Frederick soils in areas underlain by limestone, Weikert soils in areas underlain by shale, Laidig and Ernest soils on foot slopes, and Pope, Philo, and Atkins soils in narrow strips on bottom lands.

This association is mostly in forest; about two-thirds of the acreage is within the Monongahela National Forest. It is better suited to woodland than to other purposes because the soils are generally steep and stony. A small acreage is in pasture, and there are a few part-time farms, mainly between White Sulphur Springs and Alvon. The less steep soils are fairly well suited to pasture.

Howard Creek and Anthony Creek cut through this association, and there is an improved road along each of these creeks. There are also numerous strongly flowing springs, some of which are mineral springs. Although small, this association is scenic and has potential for recreational development.

11. Alluvial land-Monongahela-Pope association

Variable alluvial material and deep, moderately well drained and well drained, level to strongly sloping soils; on stream terraces and bottom lands

This association consists of level to gently sloping bottom lands and stream terraces in the eastern part of the county, along the upper part of Anthony Creek and along Howard Creek from Harts Run to White Sulphur Springs. The alluvium in these areas was washed from upland areas underlain by acid sandstone and shale.

The association makes up about 2 percent of the county. It is about 30 percent Alluvial land, 20 percent Monongahela soils, and 20 percent Pope soils. Other soils make up the remaining 30 percent.

Alluvial land consists of nearly level and gently sloping material that varies in texture and in drainage within short distances. It is frequently flooded and is subject to deposition or removal of soil material. Most areas are gravelly and droughty, but small wet areas are common.

Monongahela soils are on stream terraces above the areas flooded. These are gently sloping to strongly sloping, medium-textured, moderately well drained, yellowish-brown soils. The lower part of the subsoil has a slowly permeable layer. The water table is seasonally high.

Pope soils are generally along the edges of streams, on bottoms that are subject to flooding. These are well-drained, slightly droughty, loamy soils.

Among the minor soils of this association are Atkins soils on bottoms, Ernest and Laidig soils on colluvial foot slopes, and Weikert and Berks soils along the edges of surrounding uplands.

This association is fairly well suited to nonfarm uses, and much of the acreage has been urbanized. The urban area includes White Sulphur Springs, the buildings and grounds of the Greenbrier Hotel, an airport, and the Federal fish hatchery. The soils of this association are used for general farms and livestock farms. They are generally suited to row crops, forage crops, and pasture. Pasture and hay are the most common crops, but there is also a small acreage of cultivated crops. The chief hazards are the high water table and the flooding, which is accompanied by streambank cutting and the deposition of coarse material.

This association has potential for further urban expansion and for recreational development. It is served by

U.S. Highway 60 and, near the southern end, by Interstate Highway 64.

12. Dekalb-Berks association

Moderately deep, well-drained, very steep to strongly sloping soils underlain by sandstone and shale; on mountain side slopes and benches

This association occupies benchy mountain slopes and narrow bottom lands that are drained by Meadow Creek and Laurel Creek, along the eastern edge of the county. It is underlain by acid sandstone and shale.

The association makes up about 3 percent of the county. It is about 65 percent Dekalb soils and 15 percent Berks soils. Other soils make up the remaining 20 percent.

Dekalb and Berks soils are moderately deep. They occur in mixed patterns on the steep to very steep upper parts of slopes. Large stones are common on the surface of both soils, but there are few or no stones on the surface of areas of Dekalb soils that occur on the many strongly sloping benches on the middle and lower parts of the slopes. Dekalb soils formed in material weathered from sandstone, and Berks soils formed in material weathered from shale. Dekalb soils are loamy and slightly droughty; Berks soils are siltier and contain many small stone fragments.

Among the minor soils of this association are Buchanan and Laidig soils on colluvial foot slopes, Atkins soils and Alluvial land on bottoms along streams, and Teas soils on shale uplands. These soils are important because they are sites for potential recreational development.

Essentially, all of this association is woodland and is within the Monongahela National Forest. It is well suited to woodland and to recreational use. Sherwood Lake, which is on Meadow Creek and which covers about 164 acres, has been developed for recreational use. A hard-surfaced road serves this area.

Descriptions of the Soils

In this section the soils of Greenbrier County are described in detail. The procedure is to describe first the soil series and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which the unit belongs.

Each series description contains a short description of a soil profile considered typical of the series and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations. Many of the terms used in describing soil series and mapping units are defined in the Glossary, and some are defined in the section "How This Survey Was Made."

The approximate acreage and proportionate extent of the soils are shown in table 1. The "Guide to Mapping Units" lists the mapping units of the county and shows the capability units and woodland groups each mapping unit is in and the page where each of these is described.

Albrights Series

The Albrights series consists of deep, gently sloping, moderately well drained soils. These soils occur on foot slopes, mostly in the western part of Greenbrier County. They formed in colluvium accumulated through water action and soil creep. This soil material was derived from upland soils that are underlain by red and gray shale and siltstone, some strata of which are calcareous. Slope ranges from 3 to 8 percent.

In a typical profile, the surface layer is reddish-brown silt loam about 10 inches thick. The subsoil extends to a depth of 38 inches. The upper part is reddish-brown and dark reddish-brown silty clay loam, and the lower part is dark reddish-brown, firm, compact, very shaly silty clay loam. Below the subsoil is dark reddish-brown very shaly silt loam that extends to a depth of 50 inches or more.

The available moisture capacity and natural fertility are moderate. Reaction in the subsoil ranges from strongly acid in the upper part to medium acid in the lower part. The water table is high in winter and early in spring.

These soils are used mainly for pasture and general crops.

Typical profile of Albrights silt loam, 3 to 8 percent slopes, in a meadow near Smoot.

Ap—0 to 6 inches, reddish-brown (5YR 4/3) silt loam; moderate, fine, granular structure; friable; medium acid; 5 percent small shale chips; clear, smooth boundary.

B1—6 to 10 inches, reddish-brown (5YR 4/3) silt loam; weak, medium, subangular blocky structure; friable; strongly acid; 5 percent small shale chips; gradual, wavy boundary.

B21t—10 to 16 inches, reddish-brown (2.5YR 4/4) silty clay loam; moderate, medium and coarse, subangular blocky structure; firm; thin, discontinuous clay films; strongly acid; 10 percent small shale chips; clear, wavy boundary.

B22t—16 to 26 inches, dark reddish-brown (2.5YR 3/4) silty clay loam; common, fine, distinct mottles of reddish gray (5YR 5/2); moderate, medium and coarse, subangular blocky structure; firm; thin, discontinuous clay films; few manganese concretions; strongly acid; 10 percent shale chips; clear, wavy boundary.

Bx—26 to 38 inches, dark reddish-brown (2.5YR 3/4) shaly silty clay loam; many, fine, distinct mottles of reddish gray (5YR 5/2); moderate, thin and medium, platy structure breaking to weak, medium, subangular blocky; very firm; thin patchy clay films; 20 percent shale fragments; medium acid; clear, wavy boundary.

C—38 to 50 inches +, dark reddish-brown (2.5YR 3/4) very shaly silt loam; massive; firm; common fine manganese concretions; 60 percent shale fragments; medium acid; gradual, wavy boundary.

The dominant texture of the B horizon is silty clay loam, but texture ranges to heavy silt loam and clay loam. The base saturation in the lower part of this horizon is presumed to be 35 percent. Coarse fragments generally make up about 10 to 30 percent of the solum, increasing to as much as 65 percent of the C horizon. The depth to mottling ranges from about 16 to 22 inches, and the depth to the fragipan ranges from 24 to 30 inches. In most areas the depth to bedrock is more than 5 feet.

Albrights soils commonly occur in areas below upland slopes occupied by the moderately deep Teas, Calvin, and Litz soils and above the bottom lands occupied by the poorly drained Atkins soils. They are redder than Clarksburg and Ernest soils, which occur in similar positions.

Albrights silt loam, 3 to 8 percent slopes (AbB).—Seep spots are common on this soil. Included in mapping were small areas of soil that is browner than the one described as typical, a few areas that are slightly better drained, and a few areas where the slope is more than 8 percent.

407-696—72——2

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Albrights silt loam, 3 to 8 percent slopes	1,080	0.2
Alluvial land	10,050	1.5
Andover-Nolo extremely stony loams, 0 to 8 percent slopes	540	.1
Atkins silt loam	9,280	1.4
Atkins silty clay loam	4,230	.6
Calvin and Gilpin very stony soils, 10 to 25 percent slopes	1,230	.2
Calvin and Gilpin very stony soils, 25 to 40 percent slopes	18,760	2.9
Calvin and Gilpin very stony soils, 40 to 65 percent slopes	31,410	4.8
Chavies fine sandy loam	1,940	.3
Clarksburg silt loam, 3 to 10 percent slopes	590	.1
Clymer fine sandy loam, 3 to 10 percent slopes	5,580	.8
Clymer fine sandy loam, 10 to 20 percent slopes	1,790	.3
Cookport loam, 3 to 8 percent slopes	1,770	.3
Dekalb fine sandy loam, 5 to 12 percent slopes	3,880	.6
Dekalb fine sandy loam, 12 to 25 percent slopes	6,600	1.0
Dekalb channery loam, 5 to 12 percent slopes	1,320	.2
Dekalb channery loam, 12 to 25 percent slopes	2,760	.4
Dekalb channery loam, 25 to 35 percent slopes	3,800	.6
Dekalb very stony loam, 5 to 25 percent slopes	4,280	.6
Dekalb extremely stony loam, 5 to 25 percent slopes	1,170	.2
Dekalb-Berks very stony complex, 25 to 40 percent slopes	9,080	1.4
Dekalb-Berks very stony complex, 40 to 65 percent slopes	76,200	11.6
Dekalb-Buchanan loams, 5 to 20 percent slopes	1,550	.2
Dekalb-Cookport loams, 3 to 12 percent slopes	5,640	.9
Dekalb-Cookport very stony loams, 5 to 20 percent slopes	14,670	2.2
Dekalb-Gilpin very stony complex, 5 to 20 percent slopes	3,490	.5
Dekalb-Gilpin very stony complex, 20 to 40 percent slopes	11,680	1.8
Dekalb-Gilpin very stony complex, 40 to 65 percent slopes	76,500	11.6
Elliber very stony loam, 10 to 35 percent slopes	410	.1
Elliber very stony loam, 35 to 60 percent slopes	6,690	1.0
Elliber very cherty silt loam, 10 to 25 percent slopes	490	.1
Ernest silt loam, 3 to 8 percent slopes	1,060	.2
Ernest silt loam, 8 to 15 percent slopes	630	.1
Frankstown silt loam, 3 to 10 percent slopes	4,310	.7
Frankstown silt loam, 10 to 20 percent slopes	2,480	.4
Frankstown silt loam, 20 to 30 percent slopes	1,020	.1
Frankstown silt loam, karst, 10 to 20 percent slopes	2,040	.3
Frankstown rocky silt loam, 10 to 20 percent slopes	780	.1
Frankstown rocky silt loam, 20 to 30 percent slopes	840	.1
Frederick cherty silt loam, 3 to 8 percent slopes	5,120	.8
Frederick cherty silt loam, 8 to 15 percent slopes	2,530	.4
Frederick cherty silt loam, 15 to 25 percent slopes	5,520	.8
Frederick cherty silt loam, 25 to 45 percent slopes	1,120	.2
Frederick cherty silt loam, karst, 3 to 8 percent slopes	1,030	.2
Frederick cherty silt loam, karst, 8 to 15 percent slopes	5,370	.8
Frederick very rocky soils, 3 to 15 percent slopes	5,500	.8
Frederick very rocky soils, 15 to 25 percent slopes	11,710	1.8
Frederick very rocky soils, 25 to 45 percent slopes	16,270	2.5
Frederick very rocky soils, 25 to 45 percent slopes, severely eroded	470	.1
Frederick very rocky soils, 45 to 60 percent slopes	3,840	.6
Huntington silt loam, local alluvium	200	(1)
Laidig channery loam, 3 to 8 percent slopes	1,170	.2
Laidig channery loam, 8 to 15 percent slopes	770	.1
Laidig very stony loam, 5 to 15 percent slopes	5,560	.8
Laidig very stony loam, 15 to 30 percent slopes	8,350	1.3
Laidig-Ernest extremely stony complex, 3 to 15 percent slopes	7,780	1.2
Laidig-Ernest extremely stony complex, 15 to 30 percent slopes	30,180	4.6
Lindside silt loam, local alluvium	210	(1)
Mine dump	150	(1)
Monongahela silt loam, 2 to 8 percent slopes	3,550	.5
Monongahela silt loam, 8 to 15 percent slopes	370	.1
Murrill channery loam, 8 to 15 percent slopes	480	.1
Murrill channery loam, 15 to 25 percent slopes	470	.1
Murrill very stony loam, 10 to 25 percent slopes	1,090	.2
Murrill very stony loam, 25 to 45 percent slopes	590	.1
Philo silt loam	1,320	.2
Pickaway silt loam, 3 to 8 percent slopes	630	.1
Pope fine sandy loam	3,350	.5
Purdy silt loam	260	(1)
Rock land, steep	1,580	.1
Sees silty clay loam	770	.2
Steep eroded land, shale materials	470	.1
Stony rock land	520	.1
Strip mine spoil	6,500	1.1
Summers channery loam, 5 to 15 percent slopes	490	.0
Summers very stony loam, 5 to 25 percent slopes	1,110	.2
Teas and Litz silt loams, 3 to 8 percent slopes	4,240	.6
Teas and Litz silt loams, 8 to 15 percent slopes	5,790	.9
Teas and Litz silt loams, 8 to 15 percent slopes, severely eroded	1,350	.2
Teas and Litz silt loams, 15 to 25 percent slopes	6,150	.9
Teas and Litz silt loams, 15 to 25 percent slopes, severely eroded	4,340	.7
Teas and Litz silt loams, 25 to 40 percent slopes	10,230	1.5
Teas and Litz silt loams, 25 to 40 percent slopes, severely eroded	10,110	1.5
Teas and Litz silt loams, 40 to 65 percent slopes	2,580	.4
Teas and Litz silt loams, 40 to 65 percent slopes, severely eroded	800	.1
Weikert shaly silt loam, 10 to 20 percent slopes	270	(1)
Weikert shaly silt loam, 20 to 30 percent slopes	420	.1
Weikert shaly silt loam, 30 to 45 percent slopes	6,340	1.0
Weikert shaly silt loam, 45 to 65 percent slopes	4,910	.7
Weikert-Berks complex, 20 to 30 percent slopes	320	(1)
Weikert-Berks complex, 30 to 45 percent slopes	18,520	2.8
Weikert-Berks complex, 45 to 65 percent slopes	69,120	10.5
Westmoreland silt loam, 3 to 10 percent slopes	590	.1
Westmoreland silt loam, 10 to 20 percent slopes	2,740	.4
Westmoreland silt loam, 20 to 30 percent slopes	1,880	.3
Westmoreland silt loam, 20 to 30 percent slopes, severely eroded	1,030	.2
Westmoreland silt loam, 30 to 45 percent slopes	12,290	1.9
Westmoreland silt loam, 30 to 45 percent slopes, severely eroded	2,050	.3
Westmoreland silt loam, 45 to 65 percent slopes	6,350	1.0
Urban and built-up areas	9,600	1.5
Roads and railroads	4,900	.7
Water	1,700	.3
Total	656,640	100.0

[1] Less than 0.05 percent.

The soil is suited to most crops commonly grown in the county. Alfalfa grows fairly well, but in winter it is subject to damage caused by the seasonal high water table. If tilled crops are grown, contour cultivation is needed to help control erosion. Natural waterways should remain in sod. Drainage of the seep spots makes cultivation easier and helps to increase productivity. Diversion terraces can be used to keep water from the hills from spreading onto the soil. (Capability unit IIe–14; woodland group 3)

Alluvial Land

Alluvial land (Ad) occurs along many small- and medium-size streams throughout the county. In some places it occupies the entire bottom along small streams; in others it occurs only along the edge of streams, where it is next to Atkins or Philo soils. It consists of droughty, sandy and gravelly material and, in strips and patches, of moderately well drained to poorly drained silt loam. These materials vary from year to year because of the frequent flooding and the deposition of new material. They also vary from place to place. In places small boulders are on the surface. Generally, gravel and boulders are less common along streams that drain the limestone uplands than along streams that drain the sandstone and shale uplands. In most areas the coarse-textured material that covers 15 to 30 percent of the surface is of sufficient depth to seriously affect plant growth. Slope ranges from 0 to 5 percent.

Natural fertility is moderate. Reaction is strongly acid to slightly acid.

Because of the flooding and the deposition or removal of material, this land type is better suited to pasture or to trees than to other uses. (Capability unit VIw–1; not in a woodland group)

Andover Series

The Andover series consists of deep, poorly drained, extremely stony soils. These soils occur around the head of streams, as concave areas on ridges, and on the lower slopes in the high mountainous areas in the northwestern part of Greenbrier County. They formed in colluvium that accumulated through water action and soil creep. The soil material was derived from sandstone and shale, and large stones cover as much as a quarter of the surface. Slope ranges from 0 to 8 percent.

In a typical profile in a wooded area, a thin mat of moss and spruce needles covers the surface. The surface layer, below this mat, is black loam in the uppermost 4 inches and gray channery loam in the next 2 inches. The subsoil extends to a depth of 38 inches. It is yellowish-brown clay loam in the upper part, gray clay loam in the middle, and gray, very firm, compact sandy clay loam in the lower part. Gray and strong-brown mottling begins at a depth of about 6 inches. Below the subsoil is gray, plastic and sticky silty clay that extends to a depth of 50 inches or more.

Permeability is slow, the available moisture capacity is moderate, and natural fertility is moderate to low. Reaction is very strongly acid. The erosion hazard is slight to moderate. The water table is at or near the surface during much of the winter and spring. Seeps are common.

In Greenbrier County, Andover soils are mapped only in a complex with Nolo soils.

Typical profile of Andover extremely stony loam, 0 to 8 percent slopes, in woodland near Summit Lake.

O1—2 inches to ½ inch, moss and spruce needles.
O2—½ inch to 0, partly decomposed needles.
A1—0 to 4 inches, black (10YR 2/1) loam; weak, fine, granular structure; very friable; 20 percent sandstone fragments; very strongly acid; clear, irregular boundary.
A2—4 to 6 inches, gray (10YR 6/1) channery loam; many medium mottles of dark brown (7.5YR 4/4); massive and coherent; somewhat firm; 20 percent sandstone fragments; few streaks of dark reddish brown (5YR 3/4); very strongly acid; clear, wavy boundary.
B1—6 to 10 inches, yellowish-brown (10YR 5/4) light clay loam; common medium mottles of gray (10YR 6/1) and strong brown (7.5YR 5/6); few organic stains of dark reddish brown (5YR 3/4); weak, fine and medium, subangular blocky structure; firm; 15 percent rock fragments; very strongly acid; clear, wavy boundary.
B21t—10 to 20 inches; yellowish-brown (10YR 5/4) clay loam; many coarse mottles of gray (10YR 6/1) and strong brown (7.5YR 5/8); weak, coarse, prismatic structure breaking to moderate, coarse, subangular blocky; firm; common pale-brown (10YR 6/3) clay films on peds and prism faces; 10 percent rock fragments; very strongly acid; clear, wavy boundary.
B22tg—20 to 27 inches, gray (10YR 6/1) clay loam; common medium mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8); weak, coarse, prismatic structure breaking to weak, medium, platy and weak, medium, subangular blocky; firm; many pale-brown (10YR 6/3) clay films on prisms; 10 percent rock fragments; very strongly acid; clear, wavy boundary.
Bxg—27 to 38 inches, gray (10YR 6/1) sandy clay loam; many coarse mottles of yellowish brown (10YR 5/6) and few mottles of strong brown (7.5YR 5/8); weak, thick, platy structure and weak, coarse, subangular blocky; very firm; many brown (10YR 5/3) clay films; few manganese concretions; 10 percent sandstone fragments; very strongly acid; clear, wavy boundary.
IICg—38 to 50 inches +, gray (N 6/0) silty clay; massive; firm, plastic and slightly sticky; few streaks and mottles of strong brown (7.5YR 5/8); common manganese concretions; few sandstone fragments; very strongly acid.

The A horizon is mainly loam but ranges from loam to sandy loam. The A1 horizon is black or very dark gray. The B horizon ranges from dark grayish brown to yellowish brown in color. The C horizon ranges from silty clay to channery clay loam in texture. The depth to the fragipan (Bx horizon) ranges from about 20 to 28 inches, and the depth to bedrock is more than 5 feet. Stones cover about 5 to 25 percent of the surface.

Andover soils commonly occur downslope from the moderately deep Dekalb and Gilpin soils. They are closely associated with Nolo soils, but they are deeper to a fragipan and to bedrock than those soils. Andover soils are deeper and more poorly drained than Cookport soils. In places they occur near the well-drained Laidig soils and the more silty, moderately well drained Ernest soils.

Andover-Nolo extremely stony loams, 0 to 8 percent slopes (AnB).—This complex occurs as concave areas on smooth ridges and benches and on colluvial toe slopes around the heads of streams. The Andover soil, which most commonly occurs on toe slopes, makes up about 60 percent of the complex. Nolo soil about 25 percent, and other soils make up the rest.

These soils have the profile described as typical of their respective series. Stones cover about 5 to 25 percent of their surface. The water table is at or near the surface for long periods.

Included in mapping were narrow, more stony strips along drainageways and small areas of Dekalb and Cookport soils.

The use of this complex is severely limited by the high water table and the stones. The areas are used for woodland, recreation, and wildlife habitat. Almost all the acreage is in red spruce, but there are a few areas of hardwoods, such as beech and red maple. (Capability unit VIIs–5; woodland group 15)

Atkins Series

The Atkins series consists of deep, poorly drained, nearly level soils. These soils are on bottom lands, generally near the base of hills, but in places they occupy entire bottoms. They are commonly along streams that drain the uplands and are extensive along the Meadow River and Anthony Creek. They are subject to flooding. These soils formed in alluvium derived from upland soils that are underlain by acid sandstone and shale. Slope ranges from 0 to 3 percent.

In a typical profile, the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil extends to a depth of about 36 inches. The upper part is gray heavy silt loam, and the lower part is gray light silty clay loam. Strong-brown mottling begins at a depth of about 8 inches. Below the subsoil is gray silty clay loam that contains thin lenses of sandy and silty material. This layer extends to a depth of 50 inches or more.

Permeability is moderately slow to slow, the available moisture capacity is moderate, and fertility is low to moderate. The water table is high.

The use of these soils for most purposes is severely to very severely limited by the high water table and the hazard of flooding. Much of the wetter acreage remains in woods. The cleared acreage is used for pasture and, where drained, for general crops. These soils are generally well suited to impoundments where flooding is not too severe a hazard, and in some places, they are important in recreational development.

Typical profile of Atkins silt loam, in a pasture near Dawson.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; few fine mottles of strong brown (7.5YR 5/6); weak, fine, granular structure; friable; slightly acid; abrupt, wavy boundary.

B1g—8 to 16 inches, gray (10YR 5/1) heavy silt loam; common medium mottles of strong brown (7.5YR 5/8); few silt coatings; very weak, medium, subangular blocky structure; friable to firm; strongly acid; clear, wavy boundary.

B2g—16 to 36 inches, gray (10YR 5/1) light silty clay loam; many coarse mottles of strong brown (7.5YR 5/8); weak, medium, subangular blocky structure; firm; common silt coatings; many fine manganese concretions; few roots; strongly acid; gradual, wavy boundary.

Cg—36 to 50 inches +, gray (10YR 5/1) light silty clay loam stratified with thin lenses of sand and silt; common coarse mottles of strong brown (7.5YR 5/6); massive; few roots; few manganese concretions; very strongly acid.

In places the A horizon is silty clay loam instead of silt loam. The B horizon is faintly expressed. It is mostly gray and ranges from silt loam to silty clay loam in texture. It has strong-brown or yellowish-brown mottles. In places the C horizon has weakly stratified layers of silt and fine sand and scattered pebbles. Reaction is strongly acid or very strongly acid in the B and C horizons.

Atkins soils are on bottom lands with the well-drained Pope and Chavies soils and the moderately well drained Philo soils. They are commonly in lower areas than the moderately well drained Monongahela, Albrights, Buchanan, and Ernest soils, all of which are commonly on terraces or foot slopes. Atkins soils are also associated with the poorly drained Purdy soils.

Atkins silt loam (At).—This soil has the profile described as typical of the series. Included in mapping were small areas of very poorly drained soils and small areas of soils that have a surface layer of fine sandy loam. Also included were small, slightly more sloping areas on hillsides.

If adequately drained, this soil is suitable for crops. Hay or pasture crops that consist of mixtures of water-tolerant grass and legumes are better suited than other crops. Surface drainage generally is poor. The subsoil drains moderately well into tile and into open ditches if the permanent water table is not too high. (Capability unit IIIw–1; not in a woodland group)

Atkins silty clay loam (Ay).—Most of this soil occurs on bottom lands along the Meadow River. Most areas are level, but some have slopes of as much as 2 percent. The profile of this soil is similar to the one described as typical of the series, but the surface layer and the subsoil are finer textured. Permeability is slower than in the soil described as typical.

This soil is poorly suited to tilled crops because of the frequent flooding. It is better suited to pasture, woodland, wildlife, and recreational use than to other purposes. Tile drainage is more difficult than in Atkins silt loam because of the slower permeability in the subsoil, and outlets are not available in some areas because of the low gradient of the streams. (Capability unit VIw–2; not in a woodland group)

Berks Series

The Berks series consists of moderately deep, well-drained, moderately steep to very steep soils. These soils are on mountain slopes in the eastern part of the county. They formed in residuum weathered from gray, acid siltstone, shale, and thin-bedded sandstone. Slope ranges from 20 to 65 percent, but it is 40 to 65 percent in most places.

In a typical profile in a wooded area, a thin mat of black organic matter covers the surface. The surface layer, below this mat, is very dark grayish-brown and brown, very friable channery silt loam about 8 inches thick. The subsoil is light olive-brown and yellowish-brown very channery silt loam that extends to a depth of about 23 inches. Sandstone fragments make up 50 to 60 percent of the volume. Below the subsoil is weathered shale, that is 10 to 20 percent light olive-brown silt loam. At a depth of 26 inches is firm shale and siltstone.

The available moisture capacity is low to moderate, and natural fertility is low. The reaction is strongly acid to very strongly acid.

The use of these soils is limited mainly to woodland because of the slope and the droughtiness. Almost all the acreage is in mixed hardwoods, but some is in Virginia pine.

In Greenbrier County, Berks soils are mapped only in complexes with Dekalb soils and with Weikert soils.

Typical profile of Berks channery silt loam in an area of Weikert-Berks complex, 30 to 45 percent slopes, in woodland near White Sulphur Springs:

O1—2 inches to ½ inch, hardwood leaf litter.
O2—½ inch to 0, black felty mat of partly weathered leaf litter; many fine roots.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) channery silt loam; moderate, medium, granular structure; loose; 25 percent sandstone fragments; many roots; very strongly acid; clear, irregular boundary.
A2—2 to 8 inches, brown (10YR 5/3) channery silt loam; weak, fine, subangular blocky structure and weak, fine, granular; very friable; 30 percent sandstone fragments; very strongly acid; many roots; clear, wavy boundary.
B1—8 to 14 inches, light olive-brown (2.5YR 3/4) very channery silt loam; weak, fine and medium, subangular blocky structure; friable; 50 percent sandstone fragments up to 3 inches in diameter; many roots; strongly acid; clear, wavy boundary.
B2—14 to 23 inches, yellowish-brown (10YR 5/6) very channery silt loam; weak, fine and medium, subangular blocky structure; friable; 60 percent sandstone fragments up to 3 inches in diameter; common roots; strongly acid; gradual, wavy boundary.
C—23 to 26 inches, 80 to 90 percent weathered shale; light olive-brown (2.5YR 5/4) silt loam in cracks; friable; massive; few roots; very strongly acid; diffuse boundary.
R—26 inches +, shale and siltstone bedrock; tilted and somewhat shattered; a little silty material in cracks.

Coarse fragments make up 50 to 90 percent of the B and C horizons. The horizons are weakly expressed. The depth to bedrock ranges from 20 to 30 inches.

Berks soils occur with the sandier Dekalb soils and the shallower, more droughty Weikert soils. They occur to a lesser extent with the deep, cherty Elliber soils. They are upslope from the deep Laidig, Buchanan, and Ernest soils, which occur on foot slopes. Berks soils show less profile development than Litz and Gilpin soils, which have a finer textured subsoil and contain fewer rock fragments.

Buchanan Series

The Buchanan series consists of deep, moderately well drained, mainly strongly sloping, loamy soils. These soils are on foot slopes in the extreme eastern part of the county. They formed in colluvium accumulated through water action and soil creep. This soil material was derived from upland areas that are underlain by gray acid sandstone and shale. Slope ranges from 5 to 20 percent.

In a typical profile in a wooded area, a thin mat of dark-colored organic matter covers the surface. The surface layer, below this mat, consists of very dark grayish-brown loam in the uppermost 2 inches and brown fine sandy loam in the next 6 inches. The subsoil extends to a depth of 38 inches. The upper part is yellowish-brown fine sandy loam, the middle part is yellowish-brown clay loam and sandy clay loam, and the lower part is yellowish-brown, very firm and compact sandy clay loam. Below the subsoil is yellowish-brown channery sandy clay loam. Sandstone bedrock is at a depth of about 54 inches.

Permeability is moderately slow in the fragipan. The available moisture capacity is moderate, and fertility is low to moderate. The water table is high in winter and spring. Seeps are common.

The entire acreage is in woodland that consists of mixed hardwoods.

In Greenbrier County, Buchanan soils are mapped only in a complex with Dekalb soils.

Typical profile of Buchanan loam in an area of Dekalb-Buchanan loams, 5 to 20 percent slopes, in woodland near Sherwood Lake:

O1—2 inches to ½ inch, ground cover of hardwood leaf litter.
O2—½ inch to 0, compacted, black, partly decomposed leaf litter.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; loose; many roots; very strongly acid; abrupt, smooth boundary.
A2—2 to 8 inches, brown (10YR 5/3) fine sandy loam; weak, fine, granular structure; friable; roots are common; very strongly acid; clear, wavy boundary.
B1—8 to 13 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, medium, subangular blocky structure; friable; common roots; very strongly acid; clear, wavy boundary.
B21t—13 to 18 inches, yellowish-brown (10YR 5/4) clay loam; moderate, medium, subangular blocky structure; firm; common roots; few thin clay films; 10 percent sandstone fragments; strongly acid; clear, wavy boundary.
B22t—18 to 25 inches, yellowish-brown (10YR 5/4) sandy clay loam; few fine mottles of light brownish gray (10YR 6/2); weak, medium, subangular blocky structure; firm; few clay films; common roots; 10 percent sandstone fragments; very strongly acid; gradual, wavy boundary.
Bx—25 to 38 inches, yellowish-brown (10YR 5/6) sandy clay loam; common medium mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; very firm; thin, discontinuous clay films; 15 percent sandstone fragments; very strongly acid; gradual, irregular boundary.
C—38 to 54 inches, yellowish-brown (10YR 5/6) channery sandy clay loam; fine, distinct mottles of strong brown (7.5YR 5/6) and light gray (10YR 7/1); very weak, coarse, subangular blocky structure; firm; 30 percent sandstone fragments; very strongly acid; gradual, irregular boundary.
R—54 inches +, hard sandstone.

The A horizon is mainly loam, but it ranges from loam to fine sandy loam in texture. The B2 and Bx horizons are yellowish-brown clay loam, sandy clay loam, or heavy loam. Low-chroma mottles occur 15 to 20 inches from the surface. The depth to the fragipan ranges from 22 to 28 inches. The development of the fragipan ranges from weak to evident. Coarse fragments make up 10 to 30 percent of the solum, and they increase in quantity with increasing depth. The depth to bedrock is more than 4 feet. Natural reaction is strongly acid or very strongly acid throughout the profile.

Buchanan soils occur downslope from the well-drained Dekalb and Berks soils. In places they adjoin the well-drained Laidig soils and the poorly drained Atkins soils. They are sandier than Ernest soils, which occur in similar positions.

Calvin Series

The Calvin series consists of moderately deep, well-drained, reddish-brown, stony soils. These soils are on dissected uplands in the west-central part of the county. They formed in material weathered from reddish, acid siltstone and shale. Slope ranges from 10 to 65 percent, but is 40 to 65 percent in more than half the acreage.

In a typical profile in a wooded area, a thin mat of dark-colored organic matter covers the surface. The surface layer, below this mat, is dark reddish-brown silt loam in the uppermost 2 inches and reddish-brown silt loam in the next 5 inches. The subsoil extends to a depth of about 23 inches. The upper part is dark reddish-brown heavy silt loam, and the lower part is dark reddish-brown very channery silt loam. Siltstone fragments make up 60 to 70 percent of the lower part. Red siltstone bedrock begins at a depth of 23 inches.

Air and water move through these soils at a moderate rate. The available moisture capacity and natural fertility are low to moderate. Reaction is strongly acid. These soils erode easily.

Stoniness has limited the use of these soils largely to woodland, but a large acreage has been kept in pasture, even though the soils are poorly suited. Many small eroded areas have grown up to Virginia pine or brushy hardwoods.

Typical profile of Calvin very stony silt loam in an area of Calvin and Gilpin very stony soils, 10 to 25 percent slopes, in woodland, 3 miles southeast of Smoot.

O1—3 inches to ½ inch, hardwood leaf litter.
O2—½ inch to 0, compacted hardwood leaf mull.
A1—0 to 2 inches, dark reddish-brown (5YR 3/3) silt loam; moderate, fine, granular structure; very friable; 5 percent sandstone fragments; strongly acid; clear, wavy boundary.
A2—2 to 7 inches, reddish-brown (5YR 5/3) silt loam; weak, fine, granular structure and very weak, thin, platy; very friable; 10 percent sandstone fragments; very strongly acid; clear, wavy boundary.
B2—7 to 13 inches, dark reddish-brown (5YR 3/4) heavy silt loam; moderate, fine and medium, subangular blocky structure; friable; few thin silt coatings; 15 percent siltstone fragments; very strongly acid; clear, wavy boundary.
B3—13 to 23 inches, dark reddish-brown (5YR 3/4) very channery silt loam; weak, fine and medium, subangular blocky structure; friable; 60 to 70 percent siltstone fragments; very strongly acid; gradual, wavy boundary.
R—23 inches +, red siltstone.

In places the A horizon is silt loam marginal to loam. Coarse fragments make up 15 to 40 percent of the B2 horizon and as much as 70 percent of the B3 horizon. The depth to bedrock ranges from 20 to 30 inches.

Calvin soils occur with Gilpin and Litz soils. Their subsoil is slightly less clayey than that of those soils and is dark reddish brown rather than yellowish brown. They also occur with Teas soils, but they formed in more acid material. Calvin soils commonly occur next to the sandier Dekalb soils and above the moderately well drained Albrights soils.

Calvin and Gilpin very stony soils, 10 to 25 percent slopes (CgD).—Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of their respective series. They have moderate fertility. Many large stones and boulders are on the surface. Included in mapping were small areas of Dekalb and Litz soils and small severely eroded areas.

Generally, these soils are better suited to trees than to other uses. They are difficult to manage because of the large stones. The small included areas are fairly well suited to bluegrass pasture; they can be mowed, limed, and fertilized. (Capability unit VIIs–2; woodland group 9)

Calvin and Gilpin very stony soils, 25 to 40 percent slopes (CgE).—Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of their respective series. Many large sandstone rocks and boulders are scattered over the surface. Included in mapping were severely eroded areas that have shallow gullies and small areas of Dekalb and Litz soils.

These soils are better suited to forest than to other uses because of the slope, the stoniness, and the erosion hazard. The slope and the stones moderately to severely limit the use of woodland equipment. (Capability unit VIIs–2; woodland group 9)

Calvin and Gilpin very stony soils, 40 to 65 percent slopes (CgF).—These soils have mostly very steep, short slopes. Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of their respective series, except that they contain more rock fragments. There are many large sandstone boulders on the surface and some outcrops of sandstone. Included in mapping were small areas of Dekalb soils and small severely eroded areas.

These soils are better suited to woodland, wildlife habitat, and recreation than to other purposes, because of the slope and the stoniness. The slope and the stones severely to very severely limit the use of woodland equipment. (Capability unit VIIs–2; woodland group 9)

Chavies Series

The Chavies series consists of deep, nearly level, well-drained soils. These soils are on high bottoms, mainly along the Greenbrier River and Anthony Creek. They are infrequently flooded. These soils formed in alluvium washed chiefly from upland areas underlain by acid sandstone and shale. Slope ranges from 0 to 3 percent.

In a typical profile, the surface layer is dark-brown fine sandy loam about 8 inches thick. The subsoil is dark-brown and brown, friable fine sandy loam to a depth of 33 inches. Below the subsoil is brown, very friable fine sandy loam that extends to a depth of 60 inches or more. This layer contains a few small pebbles.

These soils tend to be slightly droughty. They are friable and easily tilled. Permeability is moderately rapid, and the available moisture capacity is moderate. Fertility is moderate.

Most of the acreage is suited to all crops grown in the county, including truck crops. These soils are attractive as sites for summer homes as well as for recreational areas. The infrequent flooding and the possibility of contaminating the water in the sandy substratum are hazards to be considered if these soils are used for homesites.

Typical profile of Chavies fine sandy loam, near Caldwell.

Ap—0 to 8 inches, dark-brown (10YR 4/3) fine sandy loam; very weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.
B1—8 to 16 inches, dark-brown (7.5YR 4/4) fine sandy loam; weak, medium subangular blocky structure; friable; common silt coatings of material from the Ap horizon; medium acid; clear, wavy boundary.
B2t—16 to 33 inches, brown (7.5YR 5/4) fine sandy loam; moderate, medium, subangular blocky structure; friable; common, thin, discontinuous clay films; strongly acid; gradual, wavy boundary.
C—33 to 60 inches +, brown (7.5YR 5/4) fine sandy loam; structureless; very friable; few pebbles; few fine manganese concretions; strongly acid.

The A horizon is principally fine sandy loam, but it ranges from fine sandy loam to loam. The B horizon extends to depths ranging from about 30 to 36 inches. It is brown, dark-brown, yellowish-brown, or strong-brown fine sandy loam or loam, and it is slightly finer textured than the A horizon. In places the C horizon is stratified with sand and small pebbles. The natural reaction is strongly acid.

Chavies soils are adjacent to but higher above the stream and less frequently flooded than the well drained Pope soils, the moderately well drained Philo soils, and the poorly drained Atkins soils. They have a brighter colored, more strongly developed B horizon than Pope soils. In places they occur near the moderately well drained Monongahela soils, which are on terraces higher than areas that are flooded.

Chavies fine sandy loam (Ch).—Included in mapping with this soil were a few small areas of soils that are gravelly throughout and some areas of soil that is sandier than is typical.

This soil is suited to all crops commonly grown in the county. Careful management is needed if good tilth is to be maintained and the soil kept productive. Incorporation of crop residue helps to maintain the organic-matter content and to improve moisture relationships. (Capability unit I–6; not in a woodland group)

Clarksburg Series

The Clarksburg series consists of deep, gently sloping to strongly sloping, moderately well drained soils. These soils occur on foot slopes along the western edge of the limestone valley in the central part of the county. They formed in colluvium accumulated through water action and soil creep. The soil material was derived from upland soils that are underlain by interbedded gray shale, limestone, and some sandstone. Slope ranges from 3 to 10 percent.

In a typical profile, the surface layer consists of dark grayish-brown silt loam in the uppermost 7 inches and brown silt loam in the next 2 inches. The subsoil extends to a depth of about 55 inches. The upper part is yellowish-brown, friable silty clay loam; the middle part is yellowish-brown, firm shaly silty clay loam; and the lower part is yellowish-brown, very firm and compact shaly silty clay loam. This very firm layer begins at a depth of about 25 inches. Gray shale bedrock begins at a depth of 55 inches.

The available moisture capacity and natural fertility are moderate to high. Water stands on the slowly permeable fragipan. The water table is high in winter and early in spring. Seeps are common.

These soils are used mainly for crops and pasture.

Typical profile of Clarksburg silt loam, 3 to 10 percent slopes, in a pasture near Alderson.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; many fine roots; medium acid; abrupt, smooth boundary.

A2—7 to 9 inches, brown (10YR 5/3) silt loam; weak, fine, subangular blocky structure; friable; medium acid; clear, wavy boundary.

B21t—9 to 18 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, subangular blocky structure; friable; few thin clay films; few fine manganese concretions; 10 percent shale fragments; medium acid; clear, wavy boundary.

B22t—18 to 25 inches, yellowish-brown (10YR 5/4) shaly silty clay loam; common medium mottles of strong brown (7.5YR 5/8) and light brownish gray (2.5YR 6/2); moderate, medium and coarse, subangular blocky structure; firm; 15 percent shale fragments; a few fine manganese concretions; common thin clay films; strongly acid; gradual, wavy boundary.

Bx—25 to 55 inches, yellowish-brown (10YR 5/4) shaly silty clay loam; weak, medium, platy structure and moderate, medium, subangular blocky; very firm; many medium mottles of strong brown (7.5YR 5/8) and light brownish gray (2.5YR 6/2); 25 percent small shale chips; few clay films; few fine manganese concretions; medium acid; clear, wavy boundary.

R—55 inches +, gray shale.

In most places the B horizon is silty clay loam, but in some places it is heavy silt loam. In places it is brown instead of yellowish brown. The depth to mottling ranges from 16 to 22 inches, and that to the fragipan ranges from 24 to 28 inches. The content of coarse fragments in the lower part of the B horizon is as much as 40 percent. Reaction in the subsoil ranges from strongly acid in the upper part to medium acid in the lower part. The depth to bedrock is more than 4 feet.

Clarksburg soils are below uplands occupied by the well-drained Westmoreland soils. They are less red than Albrights soils. The lower part of their subsoil is less acid than that of Ernest soils, which occur on foot slopes.

Clarksburg silt loam, 3 to 10 percent slopes (ClB).—Included in mapping were small areas of soils that are slightly better drained than this soil and small, more strongly sloping areas. Stones are on the surface in places.

This soil is suited to most crops commonly grown in the county. Alfalfa is subject to winter damage because of the seasonal high water table. If tilled crops are grown, contour cultivation or contour stripcropping is needed to help control erosion. Drainage of small seep spots is beneficial. (Capability unit IIe–14; woodland group 3)

Clymer Series

The Clymer series consists of deep, well-drained, mostly gently sloping and strongly sloping soils. These soils occur on low mountain ridges and upland flats in the central part of the county. They formed in material weathered from acid sandstone and some interbedded shale. Slope is not more than 10 percent in most places, but it ranges from 3 to 20 percent.

In a typical profile, the surface layer consists of very dark grayish-brown fine sandy loam in the uppermost 2 inches and light yellowish-brown fine sandy loam in the next 8 inches. The subsoil extends to a depth of 40 inches. The upper part is yellowish-brown, friable heavy fine sandy loam; the middle part is strong-brown, friable to firm clay loam; and the lower part is strong-brown, firm channery clay loam. Below the subsoil is yellowish-brown soft, weathered sandstone. Massive sandstone bedrock begins at a depth of 44 inches.

These soils are easily tilled, and they warm up early in spring. Permeability to air and water is moderate, the available moisture capacity is high, and fertility is moderate.

Most areas of this soil are used for general crops, hay, and pasture. These soils are desirable as sites for recreational and housing developments.

Typical profile of Clymer fine sandy loam, 3 to 10 percent slopes, in woodland on Muddy Creek Mountain.

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine, granular structure; loose; many fine roots; strongly acid; clear, wavy boundary.

A2—2 to 10 inches, light yellowish-brown (10YR 6/4) fine sandy loam; weak, fine, granular structure and very weak, thin, platy; friable; many fine roots; strongly acid; clear, wavy boundary.

B1—10 to 17 inches, yellowish-brown (10YR 5/4) heavy fine sandy loam; weak to moderate, medium, subangular blocky structure; friable; roots are common; common fine pores; strongly acid; clear, wavy boundary.

B21t—17 to 25 inches, strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; friable; few clay films; few rock fragments; common fine pores and root channels; strongly acid; clear, wavy boundary.

B22t—25 to 32 inches, strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; friable to firm; few dark-brown (7.5YR 4/4) clay films; few spots of yellowish red (5YR 5/6); 10 percent sandstone fragments; very strongly acid; clear, wavy boundary.

B3t—32 to 40 inches, strong-brown (7.5YR 5/6) channery clay loam; weak, medium, subangular blocky structure; firm; few clay films; 20 percent partly weathered sandstone fragments; very strongly acid; gradual boundary.

C—40 to 44 inches, yellowish-brown (10YR 5/4-5/6), soft, weathered sandstone; few spots of strong brown (7.5YR 5/6) and yellowish red (5YR 5/6); very strongly acid; gradual boundary.

R—44 inches +, massive sandstone.

The A horizon is mainly fine sandy loam, but it ranges from fine sandy loam to loam. The B2 and B3 horizons are yellowish-brown or strong-brown heavy loam, clay loam, or sandy clay loam. The solum ranges from about 30 to 40 inches in thickness. Coarse fragments make up about 10 to 35 percent of the profile. The depth to sandstone bedrock ranges from about 42 to 50 inches.

Clymer soils ordinarily occur with the moderately well drained Cookport soils and the shallower Dekalb soils. They have a finer textured subsoil than Dekalb soils.

Clymer fine sandy loam, 3 to 10 percent slopes (CmB).—This soil has the profile described as typical of the series. Included in mapping were small areas where the soil has a slightly redder subsoil than is typical and where the sandstone strata contain reddish layers.

This soil is easy to cultivate. It can be used for all the crops commonly grown in the county. Simple measures, such as contour cultivation or contour stripcropping, are needed to control erosion. The natural drainageways should be maintained. (Capability unit IIe–4; woodland group 14)

Clymer fine sandy loam, 10 to 20 percent slopes (CmC).—Included with this soil in mapping were a few small areas of the shallower Dekalb soils and small areas where there are a few large boulders on the surface.

This soil is easy to till. It can be used for all the crops commonly grown in the county. The erosion hazard is moderately severe, and such measures as contour stripcropping are needed to control losses of soil and water. The natural drainageways should be maintained. (Capability unit IIIe–4; woodland group 14)

Cookport Series

The Cookport series consists of deep, moderately well drained, mainly gently sloping and strongly sloping soils. These soils are on mountain ridges and flats throughout the county. They formed in residuum weathered from gray, acid sandstone and some interbedded shale. Slope ranges from 3 to 20 percent.

In a typical profile, the surface layer consists of very dark grayish-brown loam in the uppermost 2 inches and brown loam in the next 7 inches. The subsoil extends to a depth of 36 inches. The upper part is yellowish-brown, friable loam; the middle part is yellowish-brown, friable to firm clay loam; and the lower part is yellowish-brown, firm, slowly permeable light clay loam. Below the subsoil is gray and yellowish-brown, soft, weathered sandstone. Massive sandstone bedrock begins at a depth of 40 inches.

Permeability is slow in the fragipan, the available moisture capacity is moderate, and natural fertility is generally low. The seasonal water table is moderately high in winter and spring. Seeps are common.

Much of the nonstony acreage has been cleared and is used for general crops, but the extensive stony areas are mostly in trees. These important woodland soils are well suited to black cherry and the associated high-value hardwoods.

Typical profile of Cookport loam, 3 to 8 percent slopes, in woodland near Cold Knob.

A1—0 to 2 inches, very dark grayish-brown (2.5YR 3/2) loam; moderate, fine, granular structure; very friable; many fine roots; very strongly acid; clear, irregular boundary.

A2—2 to 9 inches, brown (10YR 5/3) loam; weak, fine, granular structure and weak, fine, subangular blocky; very friable; many roots; material from the A1 horizon fills root channels; very strongly acid; clear, wavy boundary.

B1—9 to 14 inches, yellowish-brown (10YR 5/6) loam; weak, fine, subangular blocky structure; friable; roots are common; few sandstone fragments; very strongly acid; clear, wavy boundary.

B21t—14 to 19 inches, yellowish-brown (10YR 5/6) clay loam; weak to moderate, medium, subangular blocky structure; friable; thin, discontinuous clay films; few sandstone fragments; very strongly acid; clear, wavy boundary.

B22t—19 to 25 inches, yellowish-brown (10YR 5/6) clay loam; common medium mottles of strong brown (7.5YR 5/8) and grayish brown (2.5YR 5/2); moderate, medium, subangular blocky structure; friable to firm; common discontinuous clay films; 10 percent sandstone fragments; very strongly acid; gradual, wavy boundary.

Bx—25 to 36 inches, yellowish-brown (10YR 5/4) light clay loam; many medium mottles of strong brown (7.5YR 5/6) and grayish brown (2.5YR 5/2); weak, medium and coarse, subangular blocky structure; firm; few clay films; common fine pores; 10 percent sandstone fragments; very strongly acid; gradual, wavy boundary.

C—36 to 40 inches, soft, weathered, grayish and yellowish-brown sandstone; very strongly acid; gradual, wavy boundary.

R—40 inches +, hard massive sandstone.

In places the A horizon is fine sandy loam instead of loam, and in much of the acreage, it is very stony. The B2 and Bx horizons are yellowish-brown or strong-brown clay loam, fine sandy clay loam, or sandy clay loam. In places coarse fragments make up as much as 30 percent of the material in the lower part of the solum. The depth to low-chroma mottling ranges from 16 to 20 inches, and that to the fragipan from 22 to 26 inches. The depth to bedrock ranges from 40 to 48 inches. Natural reaction is strongly acid or very strongly acid.

Cookport soils occur on flats in mixed patterns with the well-drained Dekalb and Clymer soils. In places they are next to the poorly drained Nolo and Andover soils. They occur with the well-drained Dekalb soils and the more silty Gilpin soils, which are commonly on adjacent hillsides.

Cookport loam, 3 to 8 percent slopes (CpB).—This soil is extensive in such areas as Muddy Creek Mountain. Included in mapping were small, nearly level areas, small areas of soils that are slightly shallower than is typical, and a few small areas of soils that are more poorly drained than is typical. Also included were small areas of Dekalb soils.

This soil is suited to all the crops commonly grown in the county, and most of the acreage has been cleared. Such deep-rooted plants as alfalfa may be short lived because of the seasonal high water table. The content of organic matter is low, and incorporation of crop residue is desira-

ble. Contour stripcropping is needed on long slopes to help control runoff and erosion. (Capability unit IIe–13; woodland group 5)

Dekalb Series

This series consists of moderately deep, gently sloping to very steep, well-drained soils that contain many small rock fragments. These soils are widely distributed on uplands and mountain slopes throughout the county. They are extensive in the high-rainfall areas in the western part of the county. They formed in residuum weathered from gray, acid sandstone and some interbedded shale. In most of the acreage the slope is very steep, but it ranges from 5 to 65 percent. Stones are on the surface in most places.

In a typical profile in a wooded area, a thin mat of black organic matter covers the surface. The surface layer, below this mat, consists of very dark grayish-brown loam in the uppermost 2 inches and brown channery loam in the next 8 inches. The subsoil extends to a depth of 27 inches. It is yellowish-brown, friable channery and very channery fine sandy loam. Sandstone fragments are numerous and increase in number and size with increasing depth. Below the subsoil is yellowish-brown very channery sandy loam. This layer is nearly 75 percent sandstone fragments. Sandstone bedrock begins at a depth of 33 inches.

Permeability is moderately rapid, and the available moisture capacity and natural fertility are low to moderate.

The less steep areas of nonstony Dekalb soils are suited to general crops. Many smooth areas have been cleared. The steeper and the stony soils have remained largely in woodland and are important producers of trees. In the western part of the county, black cherry, birch, sugar maple, and other high-quality northern hardwoods are grown on these soils.

Typical profile of Dekalb very stony loam, 25 to 40 percent slopes, in woodland, near a school.

O1—3 inches to ½ inch, good ground cover of hardwood leaf litter.

O2—½ inch to 0, partly decomposed, compacted leaf litter and a few sand grains.

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; friable; 20 percent sandstone fragments and stones; many roots; very strongly acid; clear, irregular boundary.

A2—2 to 10 inches, brown (10YR 5/3) channery loam; weak, fine, subangular blocky structure and very weak, thin, platy; friable; 20 percent sandstone fragments; many roots; very strongly acid; clear, wavy boundary.

B2—10 to 19 inches, yellowish-brown (10YR 5/6) channery fine sandy loam; weak, fine and medium, subangular blocky structure; friable; 20 percent sandstone fragments; common roots; very strongly acid; clear, irregular boundary.

B3—19 to 27 inches, yellowish-brown (10YR 5/4) very channery fine sandy loam; weak, fine, subangular blocky structure; friable; 40 percent sandstone fragments and stones up to 10 inches in diameter; common roots; very strongly acid; clear, irregular boundary.

The A horizon is loam, fine sandy loam, or channery loam and is stony in much of the acreage. The B horizon consists of yellowish-brown or strong-brown loam, fine sandy loam, and sandy loam. Sandstone fragments make up 20 to 50 percent of the solum. The depth to bedrock ranges from about 2 to 3½ feet. Natural reaction ranges from strongly acid to very strongly acid.

Dekalb soils occur in mixed patterns with the more silty Gilpin, Calvin, and Berks soils. On ridges and flats they occur with the moderately well drained Cookport soils and are next to the deeper Clymer, Elliber, and Murrill soils. Dekalb soils are upslope from the deep Laidig, Buchanan, Andover, and Ernest soils, which occur on colluvial foot slopes.

Dekalb fine sandy loam, 5 to 12 percent slopes (DbB).—This soil occurs on smooth flats and ridges. It has a profile similar to the one described as typical of the series, except that it is somewhat sandier, shallower, and relatively free of sandstone fragments. The surface is not stony. Most areas are steep enough that the erosion hazard is moderately severe.

This soil is fairly well suited to most crops, but it is not good for pasture. Rather frequent applications of fertilizer are needed. (Capability unit IIIe–12; woodland group 10)

Dekalb fine sandy loam, 12 to 25 percent slopes (DbC).—The profile of this soil is similar to the one described as typical of the series, except that it is somewhat sandier, shallower, and generally not stony. In some small areas there are sandstone fragments throughout the profile. The erosion hazard is severe.

This soil is suited to tilled crops grown in long rotations. Rather frequent applications of fertilizer are needed. (Capability unit IVe–5; woodland group 10)

Dekalb channery loam, 5 to 12 percent slopes (DcB).—The profile of this soil is similar to the one described as typical of the series, except that it is slightly shallower. There are no large stones or boulders on the surface, but there are many small fragments of sandstone on the surface and throughout the profile. A few small areas are stony. Most areas are steep enough that the erosion hazard is moderately severe. Included in mapping were small areas of soils that have a slightly redder subsoil than is typical.

This soil is suited to most crops commonly grown in the county. Applications of lime and fertilizer are needed at relatively short intervals. If tilled crops are grown, contour strips help to control losses of soil and water. (Capability unit IIIe–12; woodland group 10)

Dekalb channery loam, 12 to 25 percent slopes (DcC).—The profile of this soil is similar to the one described as typical of the series, except that it is slightly shallower. There are no large stones on the surface, but there are a few large sandstone boulders. Small fragments of rock, mainly sandstone, occur on the surface. The erosion hazard is severe. Included in mapping were small stony areas.

This soil is suited to most crops commonly grown in the county. The intervals between applications of lime and fertilizer should be shorter than is usual. If tilled crops are grown, contour strips and other practices are needed to help control loss of soil and water. (Capability unit IVe–5; woodland group 10)

Dekalb channery loam, 25 to 35 percent slopes (DcD).—Only a few large stones and boulders occur on the surface of this soil.

Because of the slope, this soil is better suited to permanent pasture and to trees than to other purposes, but it is only fairly well suited to poorly suited to pasture. Applications of lime and fertilizer are needed to maintain a good cover of grass. (Capability unit VIe–4; woodland group 11)

Dekalb very stony loam, 5 to 25 percent slopes (DeC).—This soil is mostly on mountain ridges and the upper part

of slopes in the central and eastern parts of the county. It has a profile similar to the one described as typical of the series, except that it is generally shallower to bedrock. This soil is more droughty than is typical. Stones cover about 1 to 5 percent of the surface.

Because of the stoniness and the droughtiness, this soil is better suited to woodland than to other purposes, and most of the acreage is in forest. Generally, the stones moderately limit the use of woodland equipment. Only a few areas can be used for pasture, and their use for this purpose is very severely limited. (Capability unit VIIs–2; woodland group 10)

Dekalb extremely stony loam, 5 to 25 percent slopes (DgC).—This soil is on narrow ridges and the margins of broad ridges in the high mountainous areas of the northwestern part of the county. It has a profile that is generally similar to the one described as typical of the series, but it is shallower and somewhat coarser textured and has a slightly thicker, dark-colored surface layer. Large stones and boulders cover about 5 to 25 percent of the surface. Included in mapping were areas where 90 percent of the surface is covered with stones and boulders, small areas of nearly level, somewhat poorly drained soils, and narrow strips of steep soils.

This soil is well suited to woodland and recreation. The large stones and boulders are a severe limitation. (Capability unit VIIs–5; woodland group 15)

Dekalb-Berks very stony complex, 25 to 40 percent slopes (DlE).—This complex occurs in rough mountainous areas in the eastern part of the county. These areas are mapped at a lower intensity—that is, the delineations are broader and the inclusions larger and more numerous—than are the smoother, less rugged areas of the county. The Dekalb soil makes up about 50 percent of the acreage, the Berks soil about 25 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of their respective series. In some areas the soils are redder than is typical. Small outcrops of sandstone and shale ledge occur.

Included in mapping were areas of moderately steep soil and areas of very steep soils. Also included were areas of deep, well-drained, colluvial soils along small, steep drainageways and in coves.

The stones, the slope, and the moderate to low natural fertility limit the use of these soils to woodland, wildlife, and recreational purposes. The limitations on the use of woodland equipment are moderate to severe. (Capability unit VIIs–2; woodland group 11)

Dekalb-Berks very stony complex, 40 to 65 percent slopes (DlF).—This complex occurs in rough mountainous areas in the eastern part of the county. These areas are mapped at lower intensity—that is, the delineations are broader and the inclusions larger and more numerous—than are the smoother, less rugged areas of the county. The Dekalb soil makes up about 40 percent of the acreage, the Berks soil about 20 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of their respective series, except that they generally contain more stones. In places the soils are redder than is typical. The slopes are long and continuous in some places and broken by less strongly sloping benches in others. Outcrops of sandstone ledge are common in some areas.

Included in mapping were narrow areas of well-drained, colluvial soils along small drainageways and in coves. Also included were areas of gently sloping soils.

The combination of stones and slope limits the use of these soils to woodland, wildlife, and recreational purposes. The limitations on the use of woodland equipment are severe to very severe. (Capability unit VIIs–2; woodland group 11)

Dekalb-Buchanan loams, 5 to 20 percent slopes (DnC).—This complex occurs mostly on the lower part of slopes along Meadow Creek on the eastern margin of the county, in areas cut by many small intermittent drainageways. The slightly wet Buchanan soils are interfingered with, and downslope from, the well-drained Dekalb soils. The Dekalb soil makes up about 60 percent of the acreage, the Buchanan soil about 25 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of their respective series. There are few, if any, stones on the surface.

Included in mapping were small areas of poorly drained soils near drainageways and a few small areas of nearly level soils that have a layer of gray clay in the subsoil. Also included were a few areas of soils that formed in material weathered from red shale. Where the soils are near this red shale, they are redder and more clayey than is typical of either Dekalb or Buchanan soil.

These soils are suitable for general crops and pasture, but nearly all the acreage is wooded. Their value for woodland, wildlife, and recreational use is enhanced because they are part of a national forest. Less than 100 acres was ever cleared, and most of this has reverted to trees. (Capability unit IIIe–13; woodland group 10)

Dekalb-Cookport loams, 3 to 12 percent slopes (DoB).—This complex is mostly on broad ridgetops, but it also occurs on benches. It occurs in the high mountainous area in the northwestern part of the county. The Dekalb soil makes up about 50 percent of the acreage, the Cookport soil about 30 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of their respective series, except that the profile of Dekalb soils is slightly shallower. There are only a few stones on the surface.

Included in mapping were areas of nearly level soils and areas of strongly sloping soils. Some of the included nearly level soils are more poorly drained and shallower to bedrock than is typical of Dekalb or Cookport soils. Also included were a few areas where there are stones on the surface.

Most of the acreage is forested, but some areas have been cleared and are used for hay and pasture. These soils are not well suited to row crops, because of the cool climate and short growing season in these high areas. (Capability unit IIIe–13; woodland group 8)

Dekalb-Cookport very stony loams, 5 to 20 percent slopes (DpC).—This complex is on broad ridgetops and benches in the high mountainous northwestern part of the county. The Dekalb soil makes up 50 percent of the acreage, the Cookport soil about 25 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of their respective series, except that the profile of Dekalb soil is slightly shallower. There are stones on the surface.

Included in mapping were a few areas of soils that are deeper than Cookport or Dekalb soils. These areas are in drainageways that dissect the benches and in areas where material, by gravity and creep, has worked onto the benches from upslope areas. Also included were a few areas of nearly level soils, a few small areas of stone-free soils, and a few small areas of extremely stony soils. Some areas of the included nearly level soils are more poorly drained and shallower to bedrock than is typical of Dekalb or Cookport soils.

Most of the acreage is forested, and only small isolated areas have been cleared. Plowing these soils is not practical, because of the stones on the surface. These soils are better suited to woodland and wildlife habitat than to other purposes, because of the stoniness. (Capability unit VIIs–2; woodland group 8)

Dekalb-Gilpin very stony complex, 5 to 20 percent slopes (DsC).—This complex occurs mainly on rolling exposed ridgetops in the rough mountainous area in the northwestern part of the county. This mountainous area has more rainfall and a shorter growing season than the rest of the county. It is mapped at a lower intensity—that is, the delineations are broader and the inclusions larger and more numerous—than the smoother, less rugged areas of the county. The Dekalb soil makes up about 55 percent of the acreage, the Gilpin soil about 25 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of the series, except that they are generally shallower. These soils are slightly more droughty than is typical. There are stones on the surface.

Included in mapping were areas of steep soils, a few areas of nearly level soils, and, within areas of the included nearly level soils, small areas of moderately well drained to somewhat poorly drained soils. Also included were soils that have characteristics intermediate between Dekalb and Gilpin soils.

These soils are better suited to woodland and wildlife habitat than to other purposes because of the stones on the surface, and most of the acreage is forested. The stones slightly to moderately limit the use of woodland equipment. A few areas have been used for pasture. (Capability unit VIIs–2; woodland group 8)

Dekalb-Gilpin very stony complex, 20 to 40 percent slopes (DsE).—This complex occurs generally on the upper part of slopes and in benchy areas that have long, very steep slopes, in the rough mountainous area in the northwestern part of the county. This mountainous area has more rainfall and a shorter growing season than the rest of the county. It is mapped at lower intensity—that is, the delineations are broader and the inclusions larger and more numerous—than the smoother, less rugged areas of the county. The Dekalb soil makes up about 50 percent of the acreage, the Gilpin soil about 25 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of the series. In most areas, many large stones and boulders are on the surface.

Included in mapping were areas of less strongly sloping soils, areas of moderately well drained soils, and areas of Laidig and other deep soils. Also included were small areas of Stony rock land.

These soils are well suited to hard maple, black cherry, and other hardwoods because they are in an area of high rainfall and a short growing season. Nearly all the acreage is woodland. The slope and the stones moderately to severely limit the use of woodland equipment. These soils are well suited to wildlife habitat and recreational uses. (Capability unit VIIs–2; woodland group 9)

Dekalb-Gilpin very stony complex, 40 to 65 percent slopes (DsF).—This complex occurs on the main mountain slopes in the northwestern part of the county. It is in a rough mountainous area that is cooler and has more rainfall than the rest of the county. This mountainous area is mapped at a lower intensity—that is, the delineations are broader and the inclusions larger and more numerous—than the smoother, less rugged areas of the county. The Dekalb soil makes up about 40 percent of the acreage, the Gilpin soil about 25 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of the series, except that they are somewhat deeper to bedrock and contain more stones. Many large stones and boulders are scattered on the surface.

Included in mapping were areas of less steep soils, areas of moderately well drained soils, and areas of Laidig and other deep soils. Also included were areas of Rock land, steep.

The combination of stones and slope limits the use of these soils largely to woodland and recreation. The slope and the stones severely to very severely limit the use of woodland equipment. These soils are well suited to hard maple, black cherry, and other quality northern hardwood trees because they are in a cool area that receives a large amount of rainfall. (Capability unit VIIs–2; woodland group 9)

Elliber Series

The Elliber series consists of deep, well-drained, strongly sloping to very steep, very cherty or very stony soils. These soils occur as rather narrow belts on limestone uplands in the eastern part of the county. They formed in residuum weathered from limestone that contained a large amount of angular chert. Slope ranges from 10 to 60 percent.

In a typical profile in a wooded area, a thin mat of black organic matter covers the surface. The surface layer, below this mat, is very dark gray very cherty silt loam in the uppermost 2 inches and grayish-brown very cherty silt loam in the next 6 inches. The subsoil extends to a depth of about 38 inches. It is mainly yellowish-brown, friable very cherty silt loam, but the lower part ranges from yellowish-brown to pale brown. The subsoil is about 50 percent angular chert fragments in the uppermost layer and 70 to 75 percent chert fragments in the rest. Below the subsoil is brown extremely cherty loam that is 90 percent chert fragments and that extends to a depth of 50 inches or more.

Permeability is moderately rapid, the available moisture capacity is moderate, and natural fertility is low to moderate.

Because of the stones and the slope, most of the acreage is better suited to woodland than to other purposes. Some

of the nonstony areas have been cleared and are fairly well suited to pasture and general crops. The use of Elliber soils in Greenbrier County for orchard fruits may be limited by frost damage, even though such use of these soils has been successful in other parts of West Virginia. The chert fragments interfere with tillage and mowing.

Typical profile of Elliber very cherty silt loam, 10 to 25 percent slopes, in woodland near White Sulphur Springs:

O1—3 inches to 1 inch, hardwood leaf litter.
O2—1 inch to 0, black, compacted leaf litter and considerable soil material.
A1—0 to 2 inches, very dark gray (10YR 3/1) very cherty silt loam; weak, fine, granular structure; loose; 60 percent chert fragments; many roots; very strongly acid; clear, irregular boundary.
A2—2 to 8 inches, grayish-brown (2.5YR 5/2) very cherty silt loam; weak, fine, subangular blocky structure and weak, medium, granular; very friable; 55 percent chert fragments; many roots; very strongly acid; clear, wavy boundary.
B1—8 to 15 inches, yellowish-brown (10YR 5/4) very cherty silt loam, but slightly finer textured than the A2 horizon; weak, fine, subangular blocky structure; friable; 50 percent chert fragments; common roots; very strongly acid; clear, irregular boundary.
B2—15 to 24 inches, yellowish-brown (10YR 5/4) very cherty heavy silt loam; weak, fine and medium, subangular blocky structure; friable; 70 percent chert fragments and small stones; few roots; very strongly acid; gradual, irregular boundary.
B3—24 to 38 inches, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) very cherty silt loam grading to loam; weak, fine and medium, subangular blocky structure; friable; 75 percent chert fragments and small stones; very strongly acid; gradual, irregular boundary.
C—38 to 50 inches +, brown (10YR 5/3) extremely cherty loam; massive; friable to firm; 90 percent chert fragments; very strongly acid.

In places the A horizon is very stony loam instead of very cherty silt loam. The B horizon is yellowish-brown, pale-brown, or strong-brown very cherty silt loam, very cherty loam, or very cherty light clay loam. Chert fragments make up 50 to 75 percent of the solum. The depth to hard limestone is more than 4 feet.

In many places Elliber soils are downslope from the sandier, shallower Dekalb soils and upslope from the shallow Weikert soils and the moderately deep Berks soils, which are underlain by shale. They occur next to Frederick soils, which have a redder, more clayey subsoil.

Elliber very stony loam, 10 to 35 percent slopes (EbD).—The profile of this soil is similar to the one described as typical of the series, except that it is slightly coarser textured. This soil is more permeable and slightly more droughty than is typical. Large blocks of chert and sandstone are on the surface and throughout the profile. Included in mapping were small areas, near limestone outcrops, of soil that has a finer textured subsoil than is typical of this soil.

This soil is better suited to woodland than other purposes. Because of the large stones and the numerous pieces of chert, cultivation is not practical and mowing is difficult. (Capability unit VIIs–1; woodland group 1)

Elliber very stony loam, 35 to 60 percent slopes (EbF).—The profile of this soil is similar to the one described as typical of the series, except that it is coarser textured. This soil is slightly more droughty than is typical. Large blocks of sandstone and chert are on the surface. Included in mapping were small areas of Frederick very stony loams and Dekalb very stony soils.

This soil is better suited to woodland than to other purposes. (Capability unit VIIs–1; woodland group 1)

Elliber very cherty silt loam, 10 to 25 percent slopes (ElD).—This soil has the profile described as typical of the series. A few large fragments of sandstone are scattered over the surface. Included in mapping were a few small areas of Dekalb very stony soils.

This soil is better suited to pasture or woodland than to other purposes. It is somewhat droughty for bluegrass and other shallow-rooted grasses. The deeper rooted grasses and legumes respond well to lime and fertilizer. Large chert fragments and stones are sufficiently numerous that cultivation is not practical on a large acreage and mowing operations are somewhat difficult. (Capability unit VIs–1; woodland group 1)

Ernest Series

The Ernest series consists of deep, moderately well drained, gently sloping to moderately steep soils. These soils are on the lower part of slopes, mainly in the mountainous areas in the eastern and northwestern parts of the county. They formed in colluvium that accumulated through water action and soil creep. This soil material was derived from upland slopes where the underlying material is gray, acid shale, siltstone, and sandstone. Slope ranges from 3 to 30 percent.

In a typical profile in a wooded area, a thin mat of brown organic matter covers the surface. The surface layer, below this mat, is very dark gray silt loam in the uppermost 2 inches and brown silt loam in the next 6 inches. The subsoil extends to a depth of about 42 inches. The upper part is yellowish-brown, friable heavy silt loam. The middle part is yellowish-brown, friable to firm channery silty clay loam. The lower part is light brownish-gray and strong-brown, firm, compact channery silt loam. Below the subsoil, to a depth of 50 inches or more, is light brownish-gray and strong-brown, very firm channery silt loam that is about 25 percent rock fragments.

Permeability is moderately slow in the fragipan. The available moisture capacity is moderate to high, and fertility is moderate. The water table is high in winter and spring. Seeps are common.

The nonstony areas are used for pasture, trees, and general crops. The extensive extremely stony areas that occur with Laidig soils in the high mountain area of the northwestern part of the county are used for woodland. These areas are important producers of woodland. The high water table, the seeps, and the hazard of soil slippage limit the usefulness of these soils for building sites.

Typical profile of Ernest silt loam, 3 to 8 percent slopes, in woodland near White Sulphur Springs.

O1—2 inches to ¼ inch, hardwood leaf litter.
O2—¼ inch to 0, brown, partly decomposed leaf mull.
A1—0 to 2 inches, very dark gray (10YR 3/1) silt loam; weak, fine, granular structure; very friable; 10 percent sandstone fragments; many roots; strongly acid; clear, wavy boundary.
A2—2 to 8 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure and weak, fine, subangular blocky; friable; 10 percent sandstone fragments; common roots; very strongly acid; clear, wavy boundary.
B1—8 to 14 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine, subangular blocky structure; friable; 15 percent sandstone fragments; common roots, strongly acid; clear, wavy boundary.

B21t—14 to 21 inches, yellowish-brown (10YR 5/6) channery silty clay loam; moderate, medium, subangular blocky structure; friable; 15 percent sandstone fragments; few roots; common thin clay films; strongly acid; gradual, wavy boundary.

B22t—21 to 26 inches, yellowish-brown (10YR 5/4) channery light silty clay loam; common medium mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8); moderate, medium and coarse, subangular blocky structure; friable to firm; 20 percent rock fragments; a few roots; common thin clay films; strongly acid; gradual, wavy boundary.

Bx—26 to 42 inches, variegated light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/8) channery heavy silt loam; weak, medium, subangular blocky structure and weak, medium, platy; firm; 20 percent rock fragments; few clay films; a few roots; strongly acid; gradual, wavy boundary.

Cx—42 to 50 inches +, variegated light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/8) channery heavy silt loam; massive; very firm; 25 percent rock fragments; strongly acid.

In places the A horizon is silt loam marginal to loam. It is stony in much of the acreage. The B2t horizon is yellowish-brown or strong-brown silty clay loam or heavy silt loam. Coarse fragments ordinarily make up about 10 to 30 percent of the solum. The depth to low-chroma mottling ranges from 18 to 26 inches, that to an evident fragipan from about 20 to 28 inches, and that to bedrock from more than 4 feet to many feet.

Ernest soils occur downslope from the moderately deep Berks and Litz soils and the shallow Weikert soils. They also occur extensively downslope from the moderately deep Dekalb and Gilpin complexes. In many places Ernest soils are immediately upslope from Pope, Philo, or Atkins soils, which are on bottom lands, and Monongahela soils, which are on stream terraces. They contain more rock fragments than Monongahela soils. They are less sandy than Buchanan soils and are better drained than Andover soils, both of which occur in similar positions downslope from upland areas underlain by sandstone and shale. Ernest soils are less red than Albrights soils. They have a more acid reaction in the lower part of the subsoil than Clarksburg soils.

Ernest silt loam, 3 to 8 percent slopes (ErB).—This soil occurs as small, narrow areas. It has the profile described as typical of the series. Small seep spots are common.

Included in mapping were small, well-drained areas that contain numerous fragments of sandstone and shale. Also included were a few small areas that contain fragments of chert, as well as a few small, very stony areas.

This soil is suited to most crops commonly grown in the county, but it is only fairly well suited to deep-rooted legumes. In fields where tilled crops are grown, contour cultivation or contour stripcropping is needed to control erosion. Diversion ditches are needed in some places to intercept water received from the hills. Drainage of the seep spots is beneficial (Capability unit IIe–13; woodland group 3)

Ernest silt loam, 8 to 15 percent slopes (ErC).—This soil is similar to the one described as typical, but it has better surface drainage and fewer seeps. Included in mapping were small, well-drained areas, small areas that contain chert fragments, and small, stony areas.

This soil is suited to most crops commonly grown in the county, but it is only fairly well suited to deep-rooted legumes. If tilled crops are grown, contour stripcropping is needed to control erosion. Diversion terraces are needed in some places to intercept runoff from higher slopes. (Capability unit IIIe–13; woodland group 3)

Frankstown Series

The Frankstown series consists of deep, well-drained, mainly gently sloping to strongly sloping soils. These soils occur on uplands in limestone valleys in the central part of the county. They are fairly extensive near Frankford and Maxwelton. These soils formed in residuum weathered from limestone that contained a large amount of silty impurities. Shallow sinkholes are common, and many areas have short, irregular slopes. Slope ranges from 3 to 30 percent.

In a typical profile, the surface layer is dark-brown and yellowish-brown silt loam about 11 inches thick. The subsoil extends to a depth of 28 inches. The upper part is brown, slightly sticky silty clay loam; the lower part is strong-brown, firm, plastic and sticky silty clay loam. Below the subsoil are layers and lenses of strong-brown and yellowish-brown light silty clay loam and red sticky clay that contain enough soft siltstone fragments to make up 25 to 30 percent of the volume. Massive limestone begins at a depth of 47 inches.

These soils are easily worked. Permeability is moderate, the available moisture capacity is high, and natural fertility is moderate.

These soils are well suited to pasture and other crops grown in the county. Woodland is limited to small scattered farm woodlots. These soils generally lie well for building sites, but their use for this purpose is somewhat limited because limestone is near the surface.

Typical profile of Frankstown silt loam, 3 to 10 percent slopes, in a meadow near Frankford.

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; slightly acid; clear, wavy boundary.

A2—8 to 11 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine and medium, subangular blocky structure; friable; slightly acid; clear, wavy boundary.

B21t—11 to 16 inches, brown (7.5YR 5/4) silty clay loam; a few clay films of yellowish red (5YR 5/6); moderate, medium, subangular blocky structure; firm, plastic and slightly sticky; medium acid; clear, wavy boundary.

B22t—16 to 25 inches, strong-brown (7.5YR 5/6) silty clay loam; strong-brown (7.5YR 5/8) and yellowish-red (5YR 5/8) ped faces; strong, medium, subangular blocky structure; firm, plastic and sticky; prominent clay films; strongly acid; clear, wavy boundary.

B23t—25 to 28 inches, strong-brown (7.5YR 5/6) silty clay loam; yellowish-red (5YR 5/8) ped faces; moderate, medium and coarse, subangular blocky structure; firm, slightly plastic and sticky; common thin clay films; 10 percent soft siltstone fragments; strongly acid; gradual, wavy boundary.

B&C—28 to 47 inches, interstratified masses of yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) light silty clay loam and layers and lenses of red (2.5YR 5/8) clay; firm; 25 to 30 percent soft siltstone fragments in pockets and lenses, content of siltstone increases with increasing depth; few manganese concretions; strongly acid; gradual, wavy boundary.

R—47 inches +, massive silty limestone.

Some areas of Frankstown soils are rocky. The B horizon ranges from heavy silt loam to heavy silty clay loam in texture. Siltstone fragments make up 25 to 40 percent of the B&C horizon. Natural reaction, which is dominantly strongly acid in this horizon, ranges from strongly acid to medium acid. The depth to hard limestone ranges from 3½ to more than 6 feet.

Frankstown soils are generally near Frederick soils, which have a redder, more clayey subsoil. In some places they are next to the moderately well drained Pickaway soils and the somewhat poorly drained Sees soils. They occur with the

slightly more silty Huntington soils and the moderately well drained Lindside soils, both of which are in associated drainageways.

Frankstown silt loam, 3 to 10 percent slopes (FaB).—This soil occurs as large areas that have fairly smooth slopes. It has the profile described as typical of the series. Surface runoff is medium, and the erosion hazard is moderate. Included in mapping were small areas that have a cherty surface layer, small areas of limestone outcrops, and small areas of Frederick and Pickaway soils.

This soil is well suited to all locally grown crops. If limed and adequately fertilized, it is well suited to corn, small grain, and legume hay. Most of the acreage has been cultivated for many years. Contour farming, sod waterways, suitable crop rotations, and other soil-conserving measures help to control loss of soil and water. (Capability unit IIe–1; woodland group 1)

Frankstown silt loam, 10 to 20 percent slopes (FaC).—This soil has a profile similar to the one described as typical of the series, except that it is slightly shallower to bedrock and in places contains more siltstone fragments. It has short, irregular slopes. Surface runoff is medium, and the erosion hazard is moderate to severe. Included in mapping were small rocky and cherty areas, small gently sloping areas, severely eroded areas, and areas of Frederick soils.

This soil is well suited to all crops commonly grown in the county. Intensive soil-conserving measures are needed because of the slope, the runoff, and the erosion hazard. Crop rotations should be of moderate length, but if stripcropping is not practical, longer rotations that include more years of hay are desirable. Natural drainageways should be kept in sod to provide safe removal of excess water. (Capability unit IIIe–1; woodland group 1)

Frankstown silt loam, 20 to 30 percent slopes (FaD).—This soil has a profile similar to the one described as typical of the series, except that it is not so deep to bedrock. If not protected, this moderately steep soil is subject to severe erosion. Included in mapping were some areas where there are a few limestone outcrops, as well as some small steep or very steep areas.

Contour stripcropping where practical, long crop rotations, and other erosion control measures are needed. (Capability unit IVe–1; woodland group 1)

Frankstown silt loam, karst, 10 to 20 percent slopes (FbC).—This soil has a profile similar to the one described as typical of the series, except that it is slightly less deep to bedrock. It has karst topography. Slopes are irregular, and there are many shallow, saucer-shaped sinkholes. There are some limestone outcrops and small steep and very steep areas.

Because contour stripcropping is not practical on karst topography, the erosion hazard is severe where this soil is used for row crops. A long crop rotation helps to control loss of soil and water. Natural drainageways should be maintained in sod. (Capability unit IVe–1; woodland group 1)

Frankstown rocky silt loam, 10 to 20 percent slopes (FeC).—This soil has a profile similar to the one described as typical of the series, except that it is generally a little more shallow. Limestone crops out in places.

This soil is well suited to pasture or woodland. The outcrops of limestone effectively prevent tillage, but in nearly all the acreage, machinery can be used for mowing and treating the soil. (Capability unit VIs–1; woodland group 1)

Frankstown rocky silt loam, 20 to 30 percent slopes (FeD).—This soil has a profile similar to the one described as typical of the series, except that it is slightly less deep to bedrock. There are more rock outcrops than is typical. If not protected, this soil is subject to severe erosion. Included in mapping were small areas of Frederick soils.

This soil is suitable for permanent pasture or woodland. If used for pasture, it has to be properly managed to control erosion. On most of the acreage, machinery can be used for mowing and treating the soil. (Capability unit VIs–1; woodland group 1)

Frederick Series

The Frederick series consists of deep, well-drained, gently sloping to steep, cherty soils. These soils are on upland slopes in the limestone valley in the central part of the county. They are extensive and by far the most common soils in this valley, which extends across the county from Fort Spring to Renick. These soils formed in residuum weathered from limestone that contained some chert. They have short, irregular slopes, and shallow sinkholes are common. Slope ranges from 3 to 60 percent.

In a typical profile, the surface layer is dark grayish-brown and yellowish-brown cherty silt loam 10 inches thick. The subsoil extends to a depth of 62 inches or more. The upper part is reddish-brown, friable silty clay loam; the middle part is red, slightly plastic and sticky silty clay and clay; and the lower part is dark-red, plastic and slightly sticky clay that has small pockets and streaks of yellowish-red and yellowish-brown material.

Permeability is moderate, the available moisture capacity is high, and natural fertility is moderate to high. The erosion hazard is moderate to severe.

These are important cropland and pasture soils. Most of the rocky areas are used for pasture. Woodland is limited to small farm woodlots. In more than half the acreage, there are enough limestone outcrops to severely limit the use of farm machinery.

Typical profile of Frederick cherty silt loam, 3 to 8 percent slopes, near Fairlea.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) cherty silt loam; weak, fine, granular structure; very friable; 20 percent chert; medium acid; abrupt, smooth boundary.

A2—7 to 10 inches, yellowish-brown (10YR 5/4) cherty silt loam; weak, thin, platy structure and weak, fine, subangular blocky; friable; 20 percent chert; medium acid; clear, wavy boundary.

B21t—10 to 21 inches, reddish-brown (2.5YR 4/4) silty clay loam; yellowish-brown (10YR 5/4) ped faces; moderate, fine, subangular blocky structure; friable; 15 percent chert; medium acid; clear, wavy boundary.

B22t—21 to 28 inches, red (2.5YR 5/6) silty clay; reddish-brown (5YR 5/4) ped faces and common yellowish-brown (10YR 5/4) flecks and streaks; strong, medium and fine, blocky structure; firm; 15 percent chert; continuous clay films; slightly plastic and slightly sticky; strongly acid; gradual, wavy boundary.

B23t—28 to 42 inches, red (2.5YR 5/6) clay; films of yellowish red (5YR 5/6) and common flecks and narrow streaks of yellowish brown (10YR 5/4); strong, medium, blocky structure; firm, plastic and sticky; prominent clay films; 15 percent chert; strongly acid; gradual, wavy boundary.

B3t—42 to 62 inches +, dark-red (2.5YR 3/6) clay; many pockets, streaks, and flecks of yellowish-red (5YR 5/6) and yellowish-brown (10YR 5/4) clay limestone remnant material make up about 20 percent of this horizon; massive but breaks to weak, medium, subangular blocky structure; plastic and slightly sticky; medium acid.

The B horizon ranges from reddish brown to red and dark red in color and from silt loam to clay in texture. Chert makes up 10 to 25 percent of the solum. The natural reaction is dominantly strongly acid, but it is medium acid in the lower part of the B horizon and in the C horizon. The depth to hard limestone is more than 5 feet.

Frederick soils occur with Frankstown soils, which contain little chert and have a less reddish, less clayey subsoil. They occur with the more cherty Elliber soils and the moderately well drained Pickaway soils. Huntington soils, which have a less reddish, less clayey subsoil, and the moderately well drained Lindside soils occur in drainageways associated with Frederick soils. On the western edge of the valley, Frederick soils are next to the moderately deep Westmoreland soils, which have a less reddish, less clayey subsoil. They also occur next to Dekalb, Teas, and Litz soils, which are underlain by sandstone or shale.

Frederick cherty silt loam, 3 to 8 percent slopes (FhB).—This soil occurs as small areas that generally have short, irregular slopes. It has the profile described as typical of the series. Runoff is medium, and the erosion hazard is moderate.

Included in mapping were small areas that have a surface layer of silt loam, areas where there are a few outcrops of limestone, and small severely eroded spots, especially around sinkhole rims. Also included were small areas of Frankstown and Pickaway soils.

This soil is well suited to all locally grown crops and is especially well suited to bluegrass pasture. Such soil-conserving measures as contour farming, sod waterways, and crop rotations of at least 3 years duration help to check excessive loss of soil and water. (Capability unit IIe–1; woodland group 1)

Frederick cherty silt loam, 8 to 15 percent slopes (FhC).—On this soil, runoff is medium and the erosion hazard is moderate to severe. Included in mapping were small gently sloping, severely eroded areas, areas of Frankstown soils, and a few limestone outcrops.

This soil is well suited to all crops commonly grown in the county and to bluegrass pasture. Because of the slope, intensive soil-conserving measures are needed to help control erosion. Crop rotations of moderate length can be used, but where contour stripcropping is not practical, longer crops rotations that include more years of hay are needed. Natural drainageways should be kept in sod to provide safe removal of excess water. (Capability unit IIIe–1; woodland group 1)

Frederick cherty silt loam, 15 to 25 percent slopes (FhD).—Ordinarily, this soil has fairly uniform, but not long, slopes. Some limestone ledges crop out. Included in mapping were small, severely eroded areas on the rims of sinkholes.

This soil is suited to all crops commonly grown in the county and is well suited to bluegrass pasture. Because of the slope and the erosion hazard, intensive soil-conserving measures are needed. Long crop rotations that include only an occasional row crop are needed. Contour stripcropping is needed where the sod has been broken for reseeding. Waterways should be maintained in sod. (Capability unit IVe–1; woodland group 1)

Frederick cherty silt loam, 25 to 45 percent slopes (FhE).—On this soil there are more outcrops of limestone than is typical of Frederick soils. In most places the slope ranges from 25 to 35 percent. The erosion hazard is very severe. Included in mapping were small areas of severely eroded soils.

The erosion hazard and the slope limit suitability of this soil to pasture and woodland. The soil is well suited to permanent pasture, but proper management practices are needed to maintain good stands of grass. (Capability unit VIe–1; woodland group 1)

Frederick cherty silt loam, karst, 3 to 8 percent slopes (FkB).—This soil has short, irregular slopes formed by many shallow sinkholes. In places the sinkholes have open, visible outlets.

This fertile soil is well suited to all crops commonly grown in the county and is especially well suited to bluegrass pasture. Contour stripcropping is not practical, because of the slope. Field stripcropping helps to control loss of soil and water. This cropping system consists of growing alternate strips of close-growing and clean-tilled crops across the general slope and as nearly on the contour as possible. (Capability unit IIIe–1; woodland group 1)

Frederick cherty silt loam, karst, 8 to 15 percent slopes (FkC).—This soil has very irregular slopes because of the sinkholes. Some limestone crops out on the shoulders and rims of the sinkholes. Small areas are severely eroded. In these eroded areas, plowing has mixed some of the subsoil with the remaining surface layer, and consequently, the plow layer is reddish brown and clayey.

This soil is only fairly well suited to row crops because of the irregular slope, but it can be cropped if long crop rotations are used. It is well suited to long-term hay or pasture. Keeping tillage to a minimum, incorporating crop residue into the soil, and cultivating across the slope are essential practices in controlling erosion. (Capability unit IVe–1; woodland group 1)

Frederick very rocky soils, 3 to 15 percent slopes (FrC).—These soils commonly occur as a broad expanse in pasture that surrounds smaller areas of Frederick cherty silt loam in cropped fields. There are outcrops of limestone ledge and large limestone rocks on the surface. In places the rocks occur in a line, but more commonly they occur in irregularly spaced groups. The slopes are irregular. Sinkholes are common and provide most of the drainage.

These soils have profiles that are generally similar to the one described as typical of the series, but they tend to be somewhat redder and more clayey. In most places the surface layer is silt loam, but in some places it is silty clay loam. In most areas these soils are deep. Included in mapping were shallower areas near outcrops, which are caused by the shelving of the limestone outcrops.

These soils are fairly good for pasture, and if adequately managed, they are of average or better suitability. They are slightly too droughty for bluegrass. The limestone ledge and the loose rocks severely limit plowing, but in most areas, machinery can be used for mowing and reseeding between the rocks. Obtaining water for livestock is a problem in many places, and suitable sites for water impoundments are generally scarce. (Capability unit VIs–1; woodland group 2)

Frederick very rocky soils, 15 to 25 percent slopes (FrD).—These soils have profiles that are similar to the one

described as typical of the series, except that they are more variable and tend to be slightly redder and more clayey. They have a surface layer of silt loam and silty clay loam. There are more outcrops of limestone on the surface than on the surface of Frederick very rocky soils, 3 to 15 percent slopes. Included in mapping were small areas of severely eroded soils.

These soils are well suited to woodland. They can be used for pasture, but they are only moderately well suited. The outcrops and the slope limit the use of farm machinery for mowing and fertilizing. Limitations are more severe on these soils than on Frederick very rocky soils, 3 to 15 percent slopes. (Capability unit VIs–1; woodland group 2)

Frederick very rocky soils, 25 to 45 percent slopes (FrE).—These soils have profiles that are similar to the one described as typical of the series, except that they are more variable and tend to be slightly redder and more clayey. They have a surface layer of silt loam and silty clay loam. These soils have slopes that are more irregular than those of Frederick very rocky soils, 3 to 15 percent slopes, and there are more outcrops of rock. The rock outcrops tend to be concentrated in irregularly spaced patches that in many places are 20 to 30 feet across. The erosion hazard is severe. Included in mapping were areas of the more silty, somewhat less rocky Frankstown soils as well as small, severely eroded areas.

These soils are well suited to woodland. They are fairly well suited to bluegrass pasture if adequate stocking and other needed management practices are used. Their use is severely limited because they are steep, rocky, and erodible. (Capability classification VIIs–1, woodland group 2)

Frederick very rocky soils, 25 to 45 percent slopes, severely eroded (FrE3).—These soils are shallower and more droughty than Frederick very rocky soils, 3 to 15 percent slopes, and there are more outcrops of rock on the surface. The erosion hazard is very severe. Much of the original surface layer has been removed by erosion, and there are shallow gullies and some spots of bare limestone.

These soils have profiles that are similar to the one described as typical of the series, except that they are more variable and tend to be slightly redder and more clayey. They have a surface layer of silt loam and silty clay loam.

These soils are not well suited to bluegrass pasture, because of the outcrops and the slope and because they are eroded. In most areas they are better suited to trees than to pasture, but in many places, a grass cover is needed to limit the loss of soil and water until trees are established. Measures that control water are needed in many places. (Capability unit VIIs–1; woodland group 2)

Frederick very rocky soils, 45 to 60 percent slopes (FrF).—These soils have short, irregular slopes. They are much steeper and are shallow in more areas than are Frederick very rocky soils, 3 to 15 percent slopes, and there are more rock outcrops. There are many narrow limestone ledges. Rock outcrops cover as much as half the surface in small, narrow bands and spots.

These soils have profiles that are similar to the ones described as typical of the series, except that they are more variable and tend to be slightly redder and more clayey. They have a surface layer of silt loam and silty clay loam. Included in mapping were areas of shallow, clayey soils.

These soils are better suited to woodland than to other purposes. They are poorly suited to bluegrass pasture. The use of farm machinery on the very steep, rocky slopes is generally not practical. (Capability unit VIIs–1; woodland group 2)

Gilpin Series

The Gilpin series consists of moderately deep, well-drained, strongly sloping to very steep soils. These soils are on dissected uplands in the western part of the county. They formed in residuum weathered from gray acid siltstone and shale and some interbedded sandstone. Slope ranges from 5 to 65 percent.

In a typical profile in a wooded area, a thin mat of organic matter covers the surface. The surface layer, below this mat, is very dark grayish-brown silt loam in the uppermost 2 inches and brown silt loam in the next 6 inches. The subsoil extends to a depth of 22 inches. The upper part is yellowish-brown, friable, shaly silty clay loam, and the lower part is yellowish-brown, shaly heavy silt loam. Shale fragments are common in the subsoil and increase in volume with increasing depth. Below the subsoil is yellowish-brown very shaly silt loam that is about 75 percent shale fragments. Gray shale bedrock begins at a depth of 28 inches.

Permeability and the available moisture capacity are moderate, and fertility is low to moderate.

These soils are better suited to woodland and wildlife than to other purposes. The stoniness and the slope limit the use of these soils largely to woodland. Pasture is poorly suited, but some areas are maintained in pasture.

In Greenbrier County, Gilpin soils are mapped only in undifferentiated groups with Calvin soils and in complexes with Dekalb soils.

Typical profile of Gilpin very stony silt loam in an area of Calvin and Gilpin very stony soils, 25 to 40 percent slopes, in woodland near Quinwood.

O1—8 inches to ½ inch, hardwood leaf litter.
O2—½ inch to 0, partly decomposed leaf litter.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable; 15 percent stone fragments; many fine roots; very strongly acid; clear, wavy boundary.
A2—2 to 8 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure and weak, fine, subangular blocky; friable; many roots; 10 percent shale fragments; very strongly acid; clear, wavy boundary.
B2t—8 to 16 inches, yellowish-brown (10YR 5/6) shaly silty clay loam; moderate, fine and medium, subangular blocky structure; friable; common clay films in pores and on some ped faces; common roots; 20 percent shale fragments; very strongly acid; gradual, wavy boundary.
B3t—16 to 22 inches, yellowish-brown (10YR 5/6) shaly heavy silt loam; weak, fine and medium, subangular blocky structure; friable; 35 percent shale fragments; few clay films; few roots; very strongly acid; gradual, wavy boundary.
C—22 to 28 inches, yellowish-brown (10YR 5/4) very shaly silt loam; massive; 75 percent partly weathered shale; a few clay films; few roots; very strongly acid; gradual, wavy boundary.
R—28 inches +, gray, acid shale.

In places, the A horizon is silt loam marginal to loam. In places the B horizon is strong brown instead of yellowish brown. It ranges from 12 to 18 inches in thickness. Coarse fragments make up 10 to 40 percent of this horizon. The depth to bedrock ranges from 20 to 30 inches. Reaction ranges from strongly acid to very strongly acid.

Gilpin soils commonly occur with the reddish-brown Calvin soils and the sandier Dekalb soils. In places they are next to the reddish-brown Teas soils. They also occur with Litz soils, which have a thinner subsoil, and with Westmoreland soils, which are less acid in the lower part of the subsoil. In places they are next to the poorly drained Andover soils and are upslope from the moderately well drained Monongahela and Ernest soils and the well-drained, sandier Laidig soils.

Huntington Series

The Huntington series consists of deep, well-drained, silty soils. These soils occur as small areas along narrow drainageways and in shallow sinkholes in the limestone valley in the central part of the county. They formed in recent alluvium washed from limestone uplands occupied mainly by Frederick and Frankstown soils. Huntington soils are drained largely through openings into underground channels, rather than by surface streams. Slope ranges from 0 to 3 percent.

In a typical profile, the surface layer is very dark grayish-brown silt loam about 9 inches thick. The subsoil extends to a depth of 34 inches. It is dark-brown, friable silt loam and heavy silt loam. Below the subsoil is dark-brown, friable to loose, stratified silty, loamy, and sandy material to a depth of 50 inches or more.

These soils are easily worked. They may be ponded locally for a short period. Permeability is moderate, and the available moisture capacity and fertility are high.

These soils are well suited to crops and pasture.

Typical profile of Huntington silt loam, local alluvium, in meadow near Richland.

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; very friable; many fine roots; mildly alkaline; abrupt, smooth boundary.

B1—9 to 17 inches, dark-brown (10YR 4/3) silt loam; weak, fine, subangular blocky structure and weak, fine, granular; very friable; common silt coatings; many fine roots; neutral; clear, wavy boundary.

B2—17 to 34 inches, dark-brown (10YR 4/3) heavy silt loam; weak, fine, subangular blocky structure; common silt coatings; friable; few roots; slightly acid; clear, wavy boundary.

C—34 to 50 inches +, dark-brown (10YR 4/3 to 3/3) stratified silt, silty clay loam, and some very fine sand; friable to loose; slightly acid.

The dark-colored A horizon ranges from 8 to 12 inches in thickness. Other than color, the B horizon shows little development. In places it is dark yellowish brown instead of dark brown. These soils commonly have a few chert fragments. The natural reaction ranges from slightly acid to neutral. The depth to limestone is more than 4 feet.

Huntington soils are surrounded by Frederick, Frankstown, and Pickaway soils, which are on uplands and which have a finer textured, brighter colored subsoil. In places they are next to the moderately well drained Lindside soils.

Huntington silt loam, local alluvium (Hu).—This soil is well suited to crops commonly grown in the county. Areas of this soil are used along with surrounding areas of Frederick and Frankstown soils because they are too small to be used separately. Most areas are used for pasture. Erosion is a slight hazard. (Capability unit I–6; not in a woodland group)

Laidig Series

The Laidig series consists of deep, well-drained, gently sloping to moderately steep, channery or stony soils. These soils are on foot slopes, mainly in the eastern and northwestern parts of the county. They are extensive, especially in the northwestern part. They formed in deep colluvium accumulated through water action and soil creep at the base of mountain slopes underlain by gray acid sandstone and shale. They receive a large amount of surface and subsurface water from upslope areas. Slope ranges from 3 to 30 percent.

In a typical profile in a wooded area, a thin mat of dark-colored organic matter covers the surface. The surface layer, below this mat, is very dark grayish-brown channery loam in the uppermost 6 inches and brown channery loam in the next 7 inches. The subsoil extends to a depth of 39 inches. It is strong-brown, friable channery sandy clay loam. Partly rounded sandstone fragments make up 30 to 35 percent of the subsoil. Below this is strong-brown, firm channery sandy clay loam to a depth of 60 inches or more.

Permeability is moderate above the fragipan and moderately slow within it. The available moisture capacity is moderate, and natural fertility is moderate to low.

The nonstony areas are used mostly for pasture or general crops, and the stony areas for trees. These soils are well suited to woodland. They are also desirable for building sites.

Typical profile of Laidig very stony loam, 5 to 15 percent slopes, in woodland near Caldwell.

O1—3 inches to ½ inch, hardwood leaf litter.

O2—½ inch to 0, partly decomposed hardwood leaf mull; many fine roots.

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) channery loam; moderate, fine, granular structure; very friable; contains 30 percent channery-size fragments and a few large stones; medium acid; clear, irregular boundary.

A2—6 to 13 inches, brown (10YR 5/3) channery loam; very weak, thin, platy structure; 20 percent sandstone fragments; friable; strongly acid; clear, irregular boundary.

B21t—13 to 24 inches, strong-brown (7.5YR 5/6) channery sandy clay loam; some yellowish brown (10YR 5/4) ped faces; weak, fine and medium, subangular blocky structure; friable; 30 percent sandstone fragments; few clay films; strongly acid; gradual, irregular boundary.

B22t—24 to 39 inches, strong-brown (7.5YR 5/6) channery sandy clay loam; common clay films of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; friable; 35 percent sandstone fragments; strongly acid; gradual, irregular boundary.

Cx—39 to 60 inches +, strong-brown (7.5YR 5/6) channery sandy clay loam; many medium mottles of brown (10YR 5/3) and yellowish red (5YR 4/6); massive; firm; common thin clay films; 40 percent sandstone fragments and stones that have a silty accumulation on the top and are clean on the bottom; strongly acid.

The A horizon ranges from loam to very fine sandy loam in texture. It is stony in much of the acreage. In places the B horizon is yellowish brown instead of strong brown in color, and clay loam or heavy loam instead of sandy clay loam in texture. Coarse fragments make up 20 to 35 percent of the solum. The fragipan ranges from weak to evident in development, and it is at depths ranging from 35 to 45 inches. In a few places there is mottling above the fragipan. The depth of these soils ranges from more than 5 feet to many feet. The natural reaction ranges from strongly acid to very strongly acid.

Laidig soils are commonly downslope from the moderately deep Dekalb soils and, to a lesser extent, downslope from the siltier Gilpin and Berks soils. They occur extensively in mixed patterns with the moderately well drained, siltier Ernest soils. In places Laidig soils are next to the moderately well drained Buchanan soils and the poorly drained Andover soils,

which formed in similar material. Murrill soils, which also formed in colluvium from sandstone, are underlain at a moderate depth by material weathered from limestone.

Laidig channery loam, 3 to 8 percent slopes (LaB).—This soil is similar to the one described as typical of the series, except that it lacks stones on the surface. It occurs mostly on smooth slopes, some distance from the mountains. Channery-size fragments, up to about 6 inches across, occur throughout the profile, and generally, large sandstone boulders are scattered on the surface.

This soil can be used for all crops commonly grown in the county. In places diversion terraces are useful for controlling the runoff received from higher lying areas. The response to lime and fertilizer is good. (Capability unit IIe–4; woodland group 3)

Laidig channery loam, 8 to 15 percent slopes (LaC).—This soil is fairly well suited to bluegrass pasture. It can be used for all crops commonly grown in the county, but it requires intensive conservation measures. There are fewer stones on the surface than is typical. (Capability unit IIIe–4; woodland group 3)

Laidig very stony loam, 5 to 15 percent slopes (LbC).—This soil has the profile described as typical of the series. It is too stony for most uses, but it is excellent for trees and commonly is fairly well suited to pasture. The use of woodland harvesting equipment is only slightly limited by the stones, but use of farm machinery is generally difficult in the areas used for pasture. (Capability unit VIIs–2; woodland group 3)

Laidig very stony loam, 15 to 30 percent slopes (LbD).—This soil is near the mountain slopes. Included in mapping were some narrow, extremely stony strips, mostly on bottoms along drainageways, and small slightly steeper areas.

This soil is well suited to trees, and in places it can be used for pasture. The use of woodland equipment is moderately limited, and in most places, the use of machinery for mowing and fertilizing is severely limited by the stones. (Capability unit VIIs–2; woodland group 3)

Laidig-Ernest extremely stony complex, 3 to 15 percent slopes (LeC).—This complex occurs on colluvial foot slopes near the larger streams in the northwestern part of the county. It occurs in an area that has cooler temperatures, higher elevations, and more rainfall than the rest of the county. The Laidig soil makes up 50 percent of the acreage, Ernest soil about 25 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of the series, except that they contain more stones. In most areas large stones and boulders cover 5 to 20 percent of the surface, but in narrow areas, generally in drainageways, the stones and boulders cover half or more than half the surface. In small spots the surface is free of stones. Seepy spots are fairly common.

These soils are better suited to woodland than to other purposes because of the extreme stoniness, and essentially the entire acreage is woodland. These soils are well suited to black cherry, hard maple, birch, and other northern hardwoods. The stoniness moderately to severely limits the use of woodland equipment. These soils are also suitable for recreational uses. (Capability unit VIIs–4; woodland group 4)

Laidig-Ernest extremely stony complex, 15 to 30 percent slopes (LeD).—This complex is in concave positions on the middle or lower parts of very long mountain slopes in the northwestern part of the county. It occurs in an area that has cooler temperatures, higher elevations, and more rainfall than the rest of the county. The Laidig soil makes up 60 percent of the acreage, the Ernest soil about 20 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of their respective series, but they contain more stones. In most places stones and boulders cover 10 to 30 percent of the surface, but in some narrow areas, generally in drainageways, stones cover half or more than half the surface. Included in mapping were scattered areas of Dekalb soils and Buchanan soils and scattered areas of seepy spots.

These soils are well suited to black cherry, red oak, hard maple, birch, and other high-quality northern hardwood trees, and essentially the entire acreage is woodland. The stones moderately to severely limit the use of logging equipment. (Capability unit VIIs–4; woodland group 4)

Lindside Series

The Lindside series consists of deep, moderately well drained, silty soils. These soils occur along small drainageways without channels and in shallow sinkholes throughout the limestone valley in the central part of the county. They formed in recent alluvium washed from upland areas underlain by limestone. Slope ranges from 0 to 3 percent.

In a typical profile, the surface layer is dark grayish-brown silt loam about 10 inches thick. The subsoil extends to a depth of 36 inches. The upper part is dark-brown, friable silt loam; the lower part is yellowish-brown, friable to firm light silty clay loam that is mottled with light gray and yellowish red. The mottling begins at a depth of about 17 inches. Below the subsoil is yellowish-brown, light-gray, and yellowish-red, stratified silty, loamy, and sandy material that extends to a depth of 50 inches or more.

Permeability is moderate. The available moisture capacity and natural fertility are moderate to high. The water table is high in winter and spring, and short periods of local ponding are common.

Typical profile of Lindside silt loam, local alluvium, in a meadow near Frankford.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; many roots; neutral; clear, smooth boundary.

B1—10 to 17 inches, dark-brown (10YR 4/3) silt loam; weak, fine and medium, subangular blocky structure; friable; common roots; neutral; clear, wavy boundary.

B2—17 to 36 inches, yellowish-brown (10YR 5/4) light silty clay loam; common medium mottles of light gray (10YR 7/2) and yellowish red (5YR 4/6); weak, fine and medium, subangular blocky structure; friable to firm; few chert fragments; common fine manganese concretions; slightly acid; gradual, wavy boundary.

C—36 to 50 inches +, variegated yellowish-brown (10YR 5/4), light-gray (10YR 7/2), and yellowish-red (5YR 4/6) stratified heavy silt loam to silty clay loam; thin sandy lenses and some chert fragments; slightly acid.

The B horizon ranges from silt loam to silty clay loam in texture. The depth to low-chroma mottling ranges from about 16 to 26 inches. The depth to bedrock is more than 4 feet. The natural reaction ranges from medium acid to neutral.

Lindside soils are surrounded by Frederick and Frankstown soils, which have a redder, finer textured subsoil. In places they are adjacent to the well-drained Huntington soils. They are less acid than Philo soils.

Lindside silt loam, local alluvium (Ln).—This soil is well suited to the crops commonly grown, except such deep-rooted plants as alfalfa, which may be short lived. Seasonal wetness and the hazards of flooding and ponding should be considered in planning the use of this soil. (Capability unit IIw–7; not in a woodland group)

Litz Series

The Litz series consists of moderately deep, well-drained, gently sloping to very steep soils. These soils are on dissected uplands in the west-central part of the county. They formed in residuum weathered from gray shale and siltstone, some of which is weakly calcareous. Slope ranges from 3 to 65 percent.

In a typical profile, the surface layer consists of dark-brown silt loam in the uppermost 8 inches and yellowish-brown silt loam in the next 2 inches. The subsoil extends to a depth of 16 inches. It is yellowish-brown, friable heavy silt loam that contains small fragments of shale. Below the subsoil is yellowish-brown, friable, very shaly heavy silt loam that is nearly 75 percent shale fragments. Bedrock of siltstone and shale begins at a depth of 22 inches.

Permeability, the available moisture capacity, and natural fertility are moderate.

In many areas these soils are used for pasture and general crops. The steeper areas are used for pasture or woodland, and most of the stony areas are wooded. Erosion has been active in many areas.

In Greenbrier County, Litz soils are mapped only in undifferentiated groups with Teas soils.

Typical profile of Litz silt loam, in an area of Teas and Litz silt loams, 8 to 15 percent slopes, in a pasture near Vale.

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; few shale chips; strongly acid; abrupt, smooth boundary.

A2—8 to 10 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; friable; 10 percent small shale chips; strongly acid; clear, wavy boundary.

B2—10 to 16 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine and medium, subangular blocky structure; friable; 15 percent shale fragments; contains discontinuous areas of silty clay loam that has moderate, fine and medium, subangular blocky structure and a few clay films; strongly acid; clear, wavy boundary.

C—16 to 22 inches, yellowish-brown (10YR 5/6) very shaly heavy silt loam; very weak, fine, subangular blocky structure; friable; 75 percent small shale chips; strongly acid; gradual, wavy boundary.

R—22 inches +, gray blocky siltstone and shale. Calcareous seams occur at a depth of 10 to 12 feet.

In places the B horizon is strong brown instead of yellowish brown in color. It ranges from silt loam to silty clay loam in texture, but it is mainly silt loam or shaly silt loam. Its development is dominantly weak, although in about a third of the acreage, enough clay has accumulated and there are enough clay films that it can be considered a B2t horizon. Shale fragments make up 10 to 50 percent of the solum. The depth to firm shale ranges from about 20 to 26 percent.

Litz soils occur mainly with the redder Teas soils. In places they are next to the sandier Dekalb soils and the redder Calvin soils. They are associated with Gilpin soils, which have a thicker subsoil and are slightly deeper to bedrock. Litz soils are also associated with the deeper Frederick and Westmoreland soils. The moderately well drained Albrights soils and, to a small extent, Ernest soils occupy colluvial slopes below Litz soils.

Mine Dump

Mine dump (Md) consists of large piles of waste from deep coal mines. This waste consists of a mixture of coal, slate, sandstone, and shale. It is piled in steep-sided heaps near mine openings. Most of the material is extremely acid and ordinarily incapable of producing any worthwhile vegetation. Many of the dumps catch fire by spontaneous combustion and burn for long periods. Scattered trees, shrubs, and vines sometimes become established and furnish some cover on the mounds. Burned dumps are a common source of surfacing material, locally called "red dog," for roads and lanes. (Not in a capability unit or a woodland group)

Monongahela Series

The Monongahela series consists of deep, moderately well drained, gently sloping to strongly sloping, silty soils. These soils are on stream terraces high enough to be unaffected by overflow. They are common along Anthony Creek, the Greenbrier River, the Meadow River, and other streams. They formed in old alluvium washed from uplands that are underlain principally by acid sandstone and shale. Slope ranges from 2 to 15 percent.

In a typical profile, the surface layer is dark grayish-brown and pale-brown silt loam about 10 inches thick. The subsoil extends to a depth of 57 inches. The upper part is light olive-brown, firm silty clay loam. The middle part is yellowish-brown, firm heavy silt loam. The lower part is yellowish-brown, very firm and compact silt loam that is mottled with light gray and yellowish red. The very firm layer begins at a depth of about 27 inches. Below the subsoil is light yellowish-brown, yellowish-red, and gray, firm light silty clay loam that contains some sandstone fragments. This layer extends to a depth of 65 inches or more.

Permeability is moderate above the fragipan, but slow within it. The available moisture capacity is moderate, and natural fertility is low. The water table is high in winter and spring, and seepy spots are common.

Most of the acreage has been cleared and is used for pasture and various crops. The use of these soils is limited mainly by the seasonal high water table and the slowly permeable fragipan. The usefulness of these soils for building sites is also limited by the high water table.

Typical profile of Monongahela silt loam, 8 to 15 percent slopes, in a meadow near Fort Spring.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—7 to 10 inches, pale-brown (10YR 6/3) silt loam; very weak, thin, platy structure and weak, fine, subangular blocky; friable; very strongly acid; clear, wavy boundary.

B21t—10 to 22 inches, light olive-brown (2.5Y 5/4) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; few, thin, discontinuous clay films; very strongly acid; gradual, wavy boundary.

B22t—22 to 27 inches, yellowish-brown (10YR 5/4) heavy silt loam; many, medium, prominent mottles of gray (10YR 6/1) and dark brown (7.5YR 4/4); moderate to strong, medium, subangular blocky structure; firm; few patchy clay films; very strongly acid; gradual, wavy boundary.

Bx—27 to 57 inches, yellowish-brown (10YR 5/4) silt loam; many coarse mottles of light gray (10YR 7/1) and yellowish red (5YR 5/8); weak, coarse, prismatic

structure breaking to weak, coarse, blocky; very firm; thick, light-gray (10YR 7/1) clay films on prism faces; few manganese concretions; very strongly acid; gradual, wavy boundary.

C—57 to 65 inches +, variegated light yellowish-brown (10YR 6/4), yellowish-red (5YR 5/6), and gray (10YR 6/1) light silty clay loam; massive; firm; common small sandstone fragments in lower part; strongly acid.

The B horizon is silt loam, clay loam, or silty clay loam. Low-chroma mottling occurs at depths ranging from about 18 to 24 inches. The fragipan ranges from evident to distinct in development; it begins at depths ranging from about 25 to 30 inches. The solum is generally free of coarse fragments. In places gravel makes up 5 to 40 percent of the C horizon. The depth to bedrock is more than 4 feet. Natural reaction ranges from strongly acid to very strongly acid.

In places Monongahela soils occur next to the poorly drained Purdy soils on terraces and, in many places, are above the Atkins, Philo, Pope, and Chavies soils on bottons. They are ordinarily below Gilpin, Berks, Weikert, and other soils on uplands. Monongahela soils contain fewer rock fragments than Ernest soils, which are on foot slopes.

Monongahela silt loam, 2 to 8 percent slopes (MgB).—In some places rounded stones and pebbles occur at a depth of 3 feet or more. Included with this soil in mapping were a few areas of well-drained soils, small nearly level areas, and small spots that are wetter than is typical.

This soil is suited to all the crops commonly grown in the county, but alfalfa is likely to be short lived as a result of impeded drainage and the seasonal high water table. In places the stones and pebbles at a depth of 3 feet or more interfere to some extent with the use of mechanical ditchers. The supply of potash and the content of organic matter are especially low. (Capability unit IIe–13; woodland group 5)

Monongahela silt loam, 8 to 15 percent slopes (MgC).—This soil occurs as fairly large areas and as narrow bands or breaks between two terrace levels or between the terrace and the bottom land. It has the profile described as typical of the series. In places where this soil occurs downslope from Dekalb and Gilpin soils, there are a few large boulders on the surface. Surface drainage is generally good, but the hazard of erosion is greater than on Monongahela silt loam, 2 to 8 percent slopes.

This soil is suited to the crops commonly grown in the county, but it is not good for pasture. In places alfalfa and other deep-rooted crops are damaged as a result of the seasonal high water table. Such conservation measures as contour stripcropping and diversion ditches help to control runoff and to check the loss of soil. (Capability unit IIIe–13; woodland group 5)

Murrill Series

The Murrill series consists of deep, well-drained, strongly sloping to steep, loamy soils that contain a fairly large number of partly rounded sandstone fragments. The soils are on concave foot slopes, mainly along Muddy Creek Mountain at the edge of the limestone valley. They formed in colluvium accumulated through water action and soil creep. The soil material was derived from uplands that are underlain by acid sandstone and shale. These soils are underlain at a moderate depth by moderately fine textured material that weathered from the underlying limestone. They receive surface water and subsurface water from higher slopes. Slope ranges from 8 to 45 percent.

In a typical profile, the surface layer is dark-brown and brown channery loam about 11 inches thick. The subsoil extends to a depth of about 50 inches. The upper part is yellowish-brown and strong-brown, friable to firm, channery light silty clay loam. The lower part, beginning at a depth of 38 inches, is reddish-brown, firm heavy clay loam that is mottled with red and light brownish gray.

Permeability is moderate, the available moisture capacity is moderate to high, and natural fertility is moderate.

Most of the channery areas are used for crops and pasture. The stony areas are used for both pasture and trees, but the pasture is low in productivity. These are excellent soils for woodland, and they are especially well suited to black walnut, yellow-poplar, and other high-value species. They are also desirable for building sites.

Typical profile of Murrill very stony loam, 10 to 25 percent slopes, in a meadow near Blaker Mills.

Ap—0 to 8 inches, dark-brown (10YR 4/3) channery loam; weak, fine, granular structure; very friable; many fine roots; 30 percent partly rounded sandstone fragments; strongly acid; abrupt, irregular boundary.

A2—8 to 11 inches, brown (10YR 5/3) channery loam; weak, fine and medium, subangular blocky structure; friable; 30 percent sandstone fragments; strongly acid; clear, smooth boundary.

B21t—11 to 21 inches, yellowish-brown (10YR 5/4) channery light silty clay loam; moderate, fine and medium, subangular blocky structure; friable to somewhat firm; 30 percent sandstone fragments; few clay films; strongly acid; clear, wavy boundary.

B22t—21 to 38 inches, strong-brown (7.5YR 5/6) channery light silty clay loam; moderate, medium and coarse, subangular blocky structure; firm; 25 percent sandstone fragments; common thin clay films; strongly acid; gradual, wavy boundary.

IIB23tb—38 to 50 inches +, reddish-brown (5YR 4/4) heavy clay loam; common medium mottles of red (2.5YR 4/6) and light brownish gray (10YR 6/2); strong, medium and coarse, blocky structure; firm, plastic and slightly sticky; 5 percent standstone fragments; few clay films and manganese coatings; strongly acid.

In places the A horizon is loam instead of channery loam and, in much of the acreage, is very stony. The depth to the IIB23tb horizon ranges from about 35 to 60 inches. In places this horizon is yellowish red instead of reddish brown. The texture ranges from clay loam to clay. This horizon apparently formed in material weathered from limestone. Coarse fragments make up 10 to 30 percent of the solum. The depth to bedrock is more than 5 feet.

Murrill soils are downslope from the moderately deep Dekalb soils and, to a lesser extent, from the moderately deep Berks soils. They occur on foot slopes above and commonly adjacent to areas of Frederick soils, which formed in residuum weathered from limestone, have a reddish subsoil, and contain few or no sandstone fragments. Murrill soils occur with Laidig soils, which occupy similar positions, are underlain by acid sandstone and shale, and have a fragipan.

Murrill channery loam, 8 to 15 percent slopes (MuC).—There are few or no stones on the surface of this soil, but partly rounded sandstone fragments are common throughout the profile. Included in mapping were small gently sloping areas, a few spots where most of the original surface soil has been lost through erosion, and small areas that are deeper to limestone.

This soil can be used for all the crops commonly grown in the county. If tilled crops are grown, contour stripcropping and other erosion control measures are needed. In places diversion terraces are needed to intercept runoff received from higher areas. (Capability unit IIIe–1; woodland group 3)

Murrill channery loam, 15 to 25 percent slopes (MuD).—There are few, if any, stones on the surface of

this soil, but in some places, there are a few outcrops of limestone. The hazard of erosion is severe.

This soil can be used for all the crops commonly grown in the county. The crops should be grown in contour strips to control erosion. In places diversion terraces are needed to intercept runoff from higher areas. (Capability unit IVe–1; woodland group 3)

Murrill very stony loam, 10 to 25 percent slopes (MvD).—This soil has the profile described as typical of the series. There are enough large, partly rounded sandstone boulders on the surface and in the soil to make cultivation difficult.

This soil is fairly well suited to bluegrass pasture. Stoniness limits the use of farm machinery in places. Where practical, areas should be limed and fertilized to maintain productivity and mowed to control weeds and brush. The soil is well suited to trees, especially such species as yellow-poplar and black walnut. (Capability unit VIs–1; woodland group 3)

Murrill very stony loam, 25 to 45 percent slopes (MvE).—This soil is similar to the one described as typical of the series, except that it generally has more stones on the surface. It is only fairly well suited to bluegrass pasture. Where practical to use farm machinery, the soil should be limed and fertilized to maintain productivity and it should be mowed to control weeds and brush. In most areas it is better suited to trees than to other purposes. (Capability unit VIIs–1; woodland group 3)

Nolo Series

The Nolo series consists of moderately deep, poorly drained, nearly level to gently sloping, extremely stony soils. These soils occur in slightly depressed areas on high mountain ridges and benches in the northwestern part of the county. They formed in material weathered from gray sandstone and shale. Many large stones cover about 3 percent to nearly 25 percent of the surface. Slope ranges from 0 to 8 percent. Elevations range from 3,000 to 4,500 feet.

In a typical profile in a wooded area, a thin mat of black organic matter covers the surface. The surface layer, below this mat, consists of black loam in the uppermost 4 inches and dark-gray fine sandy loam in the next 7 inches. The subsoil extends to a depth of 26 inches. The upper part is gray and yellowish-brown, friable to firm clay loam. The lower part, beginning at a depth of 17 inches, is yellowish-brown, very firm and compact channery sandy loam that is mottled with gray and strong brown. Sandstone bedrock begins at a depth of 26 inches.

Permeability is slow in the fragipan. The available moisture capacity is moderate to low, and natural fertility is low in most places. The water table is at or near the surface in winter and spring. The erosion hazard is slight. Reaction is very strongly acid throughout the profile.

All the acreage is in woodland. The trees are red spruce, red maple, beech, and associated hardwoods.

In Greenbrier County, Nolo soils are mapped only in a complex with Andover soils.

Typical profile of Nolo extremely stony loam, in an area of Andover-Nolo extremely stony loams, 0 to 8 percent slopes, in woodland near Manning Knob.

O1—3 inches to 1 inch, hardwood leaf litter and spruce needle litter.

O2—1 inch to 0, black, partly decomposed litter.

A1—0 to 4 inches, black (5YR 2/1) loam; weak, fine, granular structure; friable; 20 percent rock fragments; very strongly acid; clear, irregular boundary.

A2—4 to 11 inches, dark-gray (5YR 4/1) fine sandy loam; common medium mottles of yellowish brown (10YR 5/8); weak, coarse, subangular blocky structure; firm; coherent; some black (5YR 2/1); ped faces; 15 percent rock fragments; very strongly acid; clear, wavy boundary.

B2tg—11 to 17 inches, variegated gray (10YR 5/1) and yellowish-brown (10YR 5/6) clay loam; weak, medium, subangular blocky structure; friable to firm; few clay films; few spots of dark reddish brown (2.5YR 3/4); 15 percent sandstone fragments; very strongly acid; clear, wavy boundary.

Bx—17 to 26 inches, yellowish-brown (10YR 5/4) channery sandy loam; many medium mottles of strong brown (7.5YR 5/8) and gray (10YR 5/1); few spots of dark reddish brown (2.5YR 3/4); weak, medium, platy structure; very firm; few clay films; few manganese concretions and faces; very strongly acid; 20 percent sandstone fragments; clear, wavy boundary.

R—26 inches +, acid sandstone.

The A horizon is mostly loam, but it ranges from loam to sandy loam in texture. In some places the A1 horizon is very dark gray in color. The B horizon is about equally mottled with yellowish brown and gray, but there are also some strong-brown mottles. In places the texture is sandy clay loam. The fragipan ranges from weak to evident in development. It is at a depth ranging from 16 to 20 inches. The depth to hard bedrock ranges from 20 to 36 inches. In this county these soils are shallower to bedrock than is typical of the Nolo series, but their use and behavior are not significantly different.

Nolo soils commonly occur next to the well-drained Dekalb soils and the moderately well drained Cookport soils. They also occur with the deeper Andover soils.

Philo Series

The Philo series consists of deep, moderately well drained, nearly level soils. These soils are on bottom lands and are extensive along Anthony Creek, the Meadow River, and other streams. They formed in alluvium washed from upland areas that are underlain by gray, acid sandstone and shale. Most areas are flooded about once in 2 to 4 years, but some small areas may be flooded each year. Slope ranges from 0 to 3 percent.

In a typical profile, the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 38 inches. The upper part is yellowish-brown, friable light silt loam; the lower part is dark yellowish-brown, friable to firm silt loam that is mottled with light brownish gray and strong brown. Below the subsoil, to a depth of 60 inches or more, is dark yellowish-brown to dark grayish-brown, stratified sandy and loamy material that contains small pebbles and shale fragments.

Permeability is moderate, and the available moisture capacity is moderate to high. Natural fertility is moderate. The water table is high in winter and spring.

Most of the acreage is used for general crops and pasture.

Typical profile of Philo silt loam, in a meadow near Neola.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; very friable; many fine roots; few pebbles on the surface; medium acid; abrupt, smooth boundary.

B1—8 to 19 inches, yellowish-brown (10YR 5/4) light silt loam; very weak, medium, subangular blocky structure; friable; strongly acid; gradual, wavy boundary.

B2—19 to 38 inches, dark yellowish-brown (10YR 4/4) silt loam to loam that is coarser textured with increasing depth; common medium mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8); weak, medium, subangular blocky structure; friable to firm; few small pebbles; very strongly acid; clear, wavy boundary.

IIC—38 to 60 inches +, dark yellowish-brown (10YR 4/4) to dark grayish-brown (10YR 4/2), stratified sandy loam, fine sand, and silt loam; few small pebbles and shale fragments; common, medium and coarse, light brownish-gray (10YR 6/2) mottles; very strongly acid.

The B horizon ranges from fine sandy loam to silt loam in texture. It is weakly expressed. The depth to low-chroma mottles ranges from 16 to 20 inches, and that to stratified material from about 36 to 60 inches. The depth to alluvial material is more than 5 feet. Natural reaction ranges from strongly acid to very strongly acid.

Philo soils occur on bottom lands with the poorly drained Atkins soils and the well-drained Pope and Chavies soils. In places Ernest and Monongahela soils occur on colluvial slopes or terraces above these soils. Philo soils are more acid than Lindside soils.

Philo silt loam (Ph).—Included with this soil in mapping were small areas of fine sandy loam and, along Muddy Creek, small areas of a redder soil.

This soil is easily worked. It is suited to all the crops commonly grown in the county, but in places impeded drainage shortens the life of alfalfa stands. Wetness and the flooding hazard should be considered in planning the use of this soil. Spot drainage of the small wetter areas may be desirable. (Capability unit IIw–7; not in a woodland group)

Pickaway Series

The Pickaway series consists of deep, moderately well drained, gently sloping soils. These soils occur as relatively large areas near Richland. They are generally on concave slopes of the limestone valley uplands. These soils formed in residuum weathered from silty limestone. Slope ranges from 3 to 8 percent.

In a typical profile, the surface layer is dark grayish-brown silt loam in the uppermost 8 inches and light yellowish-brown silt loam in the next 4 inches. The subsoil extends to a depth of 38 inches. The upper part is yellowish-brown, friable silt loam. The middle part is yellowish-brown, friable to firm heavy silt loam that is mottled with light gray and strong brown. The lower part, beginning at a depth of 25 inches, is yellowish-brown, firm to very firm and compact, heavy silt loam. Below the subsoil is light-gray and yellowish-brown, firm silty clay loam that extends to a depth of 61 inches or more.

Permeability is moderate above the fragipan, but moderately slow within it; in places water is perched above the pan during wet periods. The available moisture capacity is moderate to high, and fertility is moderate. The water table is high in winter and spring, and there are some small seeps.

These soils are used for general crops and for pasture. Their desirability for housing sites is limited by the seasonal high water table.

Typical profile of Pickaway silt loam, 3 to 8 percent slopes, in a meadow near Richland.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam, weak, fine, granular structure; very friable; medium acid; clear, smooth boundary.

A2—8 to 12 inches, light yellowish-brown (10YR 6/4) silt loam; weak, fine, subangular blocky structure and weak, thin, platy; friable; strongly acid; clear, wavy boundary.

B1—12 to 16 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine and medium, subangular blocky structure; friable; common medium pores; strongly acid; clear, wavy boundary.

B2t—16 to 25 inches, yellowish-brown (10YR 5/6) heavy silt loam; few medium mottles of light gray (10YR 7/2) and strong brown (7.5YR 5/8); moderate, fine and medium, subangular blocky structure; friable to firm; few clay films; few shot-size manganese concretions; strongly acid; clear, wavy boundary.

Bx—25 to 38 inches, yellowish-brown (10YR 5/6) heavy silt loam; common medium mottles of light gray (10YR 7/2) and a few mottles of yellowish red (5YR 5/6); weak, fine and medium, subangular blocky structure and moderate, medium, platy; firm to very firm; few clay films; few fine manganese concretions; strongly acid; clear, wavy boundary.

Cx—38 to 61 inches +, variegated light-gray (10YR 7/2) and yellowish-brown (10YR 5/4) silty clay loam; few red (2.5YR 5/8) mottles; weak subangular blocky structure and weak, medium, platy; firm; common manganese concretions; strongly acid; 20 percent soft siltstone fragments that increase in number with increasing depth.

In places the B horizon is strong brown instead of yellowish brown, and it ranges from silt loam to silty clay loam in texture. The depth to low-chroma mottles ranges from 16 to 27 inches. The fragipan ranges from weak to evident in development. It is at a depth ranging from 22 to 28 inches. The solum is essentially free of coarse fragments. The depth to bedrock is 4 feet or more. In the upper part of the solum natural reaction ranges from strongly acid to very strongly acid, but in the lower part of the B horizon, it ranges from very strongly acid to medium acid.

Pickaway soils occur with the well-drained Frederick and Frankstown soils, which have a redder and finer textured subsoil, and with the poorly drained Sees soils. They also occur with the well-drained Huntington soils in adjacent drainageways.

Pickaway silt loam, 3 to 8 percent slopes (PkB).—In this soil, the content of organic matter is generally low and the supplies of phosphorus and potassium are low in places. Included in mapping were a few small areas of Sees and Frankstown soils.

This soil is suited to all the crops commonly grown in the county, but alfalfa may be short lived. Much of the acreage has been cropped for a long time. Incorporating crop residue into the soil helps to maintain the content of organic matter. Drainage of seepy spots is needed. (Capability unit IIe–14; not in a woodland group)

Pope Series

The Pope series consists of deep, well-drained, moderately coarse textured soils. These soils are on bottom lands, generally near streambanks. They are common along Anthony Creek, Meadow Creek, the Greenbrier River, and other streams. They formed in recent alluvium washed from upland areas underlain by gray, acid sandstone and shale. These soils are flooded at intervals ranging from once a year to once in 3 or 4 years; the length of the intervals varies from place to place. Slope ranges from 0 to 3 percent.

In a typical profile, the surface layer is dark grayish-brown fine sandy loam about 10 inches thick. The subsoil extends to a depth of 40 inches. The upper part is dark yellowish-brown, friable fine sandy loam, and the lower

part is dark yellowish-brown, very friable sandy loam. Below the subsoil is loose, stratified silty, sandy, and gravelly material to a depth of 60 inches or more.

These soils are easily worked. Permeability is moderately rapid, and the available moisture capacity is moderate to moderately low. Natural fertility is moderate.

Most of the acreage is used for general crops and pasture. The use of these soils is limited by flooding and by their tendency to be droughty.

Typical profile of Pope fine sandy loam, in a meadow near Neola.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) fine sandy loam; very weak, medium, granular structure; very friable; many fine roots; medium acid; clear, wavy boundary.

B2—10 to 25 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, medium, granular structure and weak, fine, subangular blocky; friable; common fine roots; strongly acid; gradual, smooth boundary.

B3—25 to 40 inches, dark yellowish-brown (10YR 4/4) sandy loam; very weak, fine, subangular blocky structure; very friable; few small pebbles; strongly acid; gradual, wavy boundary.

IIC—40 to 60 inches +, stratified silt, sand, gravel, and some channery material; few, large, rounded stones; loose; strongly acid.

The A horizon is fine sandy loam, loam, or silt loam. The B horizon is dark yellowish-brown or yellowish-brown loam, fine sandy loam, or sandy loam. It is weakly expressed. The depth to the stratified C horizon that contains sand and gravel ranges from 3 to 4 feet. The thickness of the alluvium is more than 5 feet. Natural reaction ranges from strongly acid to very strongly acid.

Pope soils occur in many places on the same bottoms with the poorly drained Atkins soils and the moderately well drained Philo soils. They occur with the moderately well drained Ernest and Monongahela soils, which are on adjacent slopes. They have a slightly coarser textured, less bright-colored subsoil than Chavies soils, which are at higher levels on bottom lands.

Pope fine sandy loam (Po).—Included with this soil in mapping were areas of redder soils along Spring Creek and Muddy Creek, small gravelly areas, and areas of soils that have a surface layer of silt loam. This soil is suited to crops and pasture, but the hazard of flooding should be considered in planning its use. The streambank needs stabilization in some areas. (Capability unit IIw–6; not in a woodland group)

Purdy Series

The Purdy series consists of deep, poorly drained, nearly level soils that have a slowly permeable, clayey layer in the subsoil. These soils occur in slightly depressed spots on stream terraces above the level of overflow, mostly along Sinking Creek and Muddy Creek. They formed in old alluvium washed from uplands underlain by acid sandstone and shale. Slope ranges from 0 to 3 percent.

In a typical profile, the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 30 inches. The upper part is light brownish-gray, firm silty clay loam mottled with yellowish brown. The lower part is gray, firm silty clay loam that is distinctly mottled with yellowish brown. Below the subsoil is gray, slightly sticky silty clay to clay that extends to a depth of 60 inches or more.

Permeability is slow. The available moisture capacity and natural fertility are moderate to low. Ordinarily, tilth is not good.

These soils are generally used for pasture, and if drained, they can be used for general crops. Their use is severely limited by the high water table and the slow permeability.

Typical profile of Purdy silt loam, in a meadow near Hughart.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine mottles of yellowish brown (10YR 5/8); weak, fine, granular structure and weak, fine, subangular blocky; friable to firm; medium acid; abrupt, wavy boundary.

B21tg—8 to 20 inches, light brownish-gray (10YR 6/2) silty clay loam; few, medium, yellowish-brown (10YR 5/6 and 5/8) mottles; moderate, fine and medium, subangular blocky structure; firm; common thin clay films; very strongly acid; clear, wavy boundary.

B22tg—20 to 30 inches, gray (10YR 5/1) silty clay; many, medium, yellowish-brown (10YR 5/6) mottles; moderate, medium and coarse, subangular blocky structure; firm, slightly sticky; few clay films; very strongly acid; gradual, wavy boundary.

Cg—30 to 60 inches +, gray (10YR 5/1) silty clay to clay; massive; firm, slightly sticky; very strongly acid.

In places the A horizon is silt loam marginal to silty clay loam. The B horizon ranges from silty clay loam to clay in texture, and it has clay films that range from few to common in abundance. The horizon is moderately expressed. The depth to bedrock is more than 4 feet. Natural reaction ranges from strongly acid to very strongly acid.

Purdy soils occur with the moderately well drained Monongahela soils on terraces, and in places occupy positions above Atkins soils, which are on bottom lands. They are more acid than Sees soils.

Purdy silt loam (Pu).—Included with this soil in mapping were some areas of dark-colored soils in small depressions. If drained, this soil can be used successfully for corn and mixtures of water-tolerant plants grown for hay or pasture. Restricted drainage is the main limitation, and artificial drainage is only moderately effective. In many places water stands on or near the surface early in spring. (Capability unit IVw–1; not in a woodland group)

Rock Land, Steep

Rock land, steep (RkF) consists of small areas where there are many very large outcrops of sandstone. The rock occurs as narrow ridges and as outcrops on side slopes. Small vertical cliffs are common. In places a thin surface layer of dark-colored humus has formed, but generally there is little soil material between the rocks.

This land type is important mainly as scenic spots and as landmarks in rough, mountainous areas. The vegetation consists mainly of slow-growing trees. Commercial production of timber is not practical. (Capability unit VIIIs–1; not in a woodland group)

Sees Series

The Sees series consists of deep, somewhat poorly drained, nearly level, clayey soils. These soils are in slight depressions on limestone uplands in the central part of the county. They formed mainly in residuum weathered from limestone but partly in colluvium from surrounding slopes that are underlain by limestone. Slope ranges from 0 to 3 percent.

In a typical profile, the surface layer is dark grayish-brown silty clay loam about 9 inches thick. The subsoil extends to a depth of 34 inches. The upper part is grayish-brown, firm, plastic and sticky silty clay loam mottled

with strong brown. The lower part is gray, very firm, plastic and sticky silty clay loam mottled with strong brown. Below the subsoil is gray, firm, plastic and sticky clay. Limestone bedrock begins at a depth of 54 inches.

Permeability is moderately slow, and the available moisture capacity is moderate to low. Natural fertility is moderate to high.

In most areas these soils are in pasture, but if drained, they can be used for crops. Their use is severely limited by the high water table and by slow permeability in the subsoil.

Typical profile of Sees silty clay loam, in a meadow near Richland.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silty clay loam; few fine mottles of strong brown (7.5YR 5/6); weak, fine, granular structure; slightly firm; slightly acid; abrupt, wavy boundary.

B21tg—9 to 15 inches, grayish-brown (10YR 5/2) silty clay loam; many medium mottles of strong brown (7.5YR 5/6); strong, coarse, blocky structure; hard, firm, plastic and sticky; few manganese concretions; few clay films; medium acid; clear, wavy boundary.

B22tg—15 to 34 inches, gray (10YR 5/1) silty clay; many coarse mottles of strong brown (7.5YR 5/6); strong, coarse, blocky structure; hard, very firm, plastic and sticky; common small concretions of manganese; common, thin clay films; slightly acid; gradual, wavy boundary.

Cg—34 to 54 inches, gray (2.5Y 5/0) clay; common coarse mottles of strong brown (7.5YR 5/6); massive, but some breakage to weak, coarse, blocky structure; firm, plastic and sticky; common fine and medium concretions of manganese; slightly acid; abrupt, wavy boundary.

R—54 inches +, limestone bedrock.

In places the Ap horizon is very dark grayish brown instead of dark grayish brown. The B horizon ranges from silty clay loam to clay in texture. It has strong-brown or yellowish-brown mottles that range from few to many in abundance. The depth to limestone bedrock ranges from about 3½ to 6 feet. Natural reaction ranges from strongly acid to medium acid in the A horizon and the upper part of the B horizon, but it is slightly acid below a depth of about 1½ feet. In this county Sees soils have a slightly grayer A horizon than is normal for the series.

Sees soils occur in shallow depressions with the moderately well drained Pickaway soils. They are generally surrounded by the well-drained Frankstown soils. They are less acid than Purdy soils.

Sees silty clay loam (Sc).—This soil occurs mainly as small, nearly level areas, but in places the slope is as much as 3 percent. Included in mapping were small spots of very poorly drained soils that have a dark-colored surface layer.

This soil is better suited to water-tolerant grasses and legumes than to other crops. In most places areas of this soil are farmed along with other soils, generally Pickaway soils, because they are too small to be farmed separately. The response to surface drainage is moderately good where outlets are available. (Capability unit IIIw–5; not in a woodland group)

Steep Eroded Land, Shale Materials

Steep eroded land, shale materials (Sp), consists of many small areas where most or all the surface layer has been removed by erosion and the remaining soil material is mainly shallow or very shallow to bedrock. Slope ranges from 25 to 65 percent. Generally, the content of shale is high, and red or gray shale is exposed in spots.

The soil material in this land type is droughty. Commonly, a large amount of runoff is received from higher areas. Erosion is a very serious hazard, and shallow gullies are common.

Steep eroded land, shale materials, is closely associated with Teas, Calvin, Litz, and Westmoreland soils.

This land type is better suited to trees and other woody vegetation than to other plants. It should be kept under a permanent cover of vegetation to check further erosion. Diversion terraces and other water control measures are needed in many places. (Capability unit VIIe–5; woodland group 7)

Stony Rock Land

Stony rock land (Sr) consists of gently sloping to moderately steep, exposed mountain ridges in the extreme northwestern part of the county. Elevations are 4,000 to 4,400 feet. Slope ranges from 3 to 20 percent. Drainage ranges from excessive in the moderately steep areas to poor in the nearly level spots. Loose stones and boulders, as much as 8 feet across, cover about two-thirds to as much as all of the surface, and there are common to many outcrops of rock ledge, especially along the margin of ridges.

The soil material between the rocks is extremely variable in depth and in composition within short distances. It is underlain by massive sandstone at a depth of 1 foot to 2½ feet. It has the characteristics commonly associated with strong podzolization. Thin, discontinuous, reddish-brown layers and iron concentrations are common. The uppermost 10 to 12 inches is high in content of organic matter.

The vegetative cover on this land type consists of stands of red spruce, which grows at a moderate rate. Roots are concentrated in the uppermost 10 to 12 inches of the organic layer. Windthrow is common in these high, exposed areas. Use is limited to woodland and to esthetic purposes. (Capability unit VIIs–5; woodland group 15)

Strip Mine Spoil

Strip mine spoil (St) is in areas where coal has been strip mined. These areas are extensive in the northwestern part of the county, mainly in areas of Dekalb and Gilpin soils. The spoil consists of soil material, shale, and sandstone. These materials were mixed together as they were stripped away, moved to one side, and then piled into high mounds. The mounds are continuous and generally follow the contour around hillsides.

Some areas have been leveled, and the coal face has been covered. This leveling reduced the slope gradients in the area stripped, but a vertical wall 20 to 50 feet high and a steep outer slope remain. This vertical wall is on the upper part of the slopes above the coal seam. The outer slope is generally steep or very steep and stony and is subject to severe erosion.

Revegetation is difficult in many places because of the erosion, the low pH value, the stoniness, and the low available moisture capacity. Formerly, strip mines were left to revegetate naturally, but more recently trees and shrubs have been planted in some areas. Onsite investigation is needed to determine proper measures for revegetation and stabilization of the strip mine spoil. (Not in a capability unit or in a woodland group)

Summers Series

The Summers series consists of moderately deep, well-drained, gently sloping to moderately steep soils that have a dark-colored surface layer. These soils occur on mountain ridges, mainly at elevations above 3,000 feet in the high-rainfall area in the northwestern part of the county. They formed in residuum weathered from acid sandstone. Slope ranges from 5 to 25 percent.

In a typical profile, the surface layer consists of black channery loam in the uppermost 8 inches and very dark grayish-brown channery loam in the next 4 inches. The subsoil extends to a depth of 27 inches. The upper part is dark-brown, very friable channery loam; the lower part is yellowish-brown very channery fine sandy loam that is about 50 percent sandstone fragments. Sandstone bedrock begins at a depth of 27 inches.

Permeability is moderately rapid. The available moisture capacity and natural fertility are moderate to low.

The cleared nonstony areas are used for pasture and general crops, but most of the stony areas are in woodland.

Typical profile of Summers channery loam, 5 to 15 percent slopes, in a meadow near Rupert.

A11—0 to 8 inches, black (10YR 2/1) channery loam; moderate, fine, granular structure; very friable; many roots; 25 percent channery-size sandstone fragments; strongly acid; clear, wavy boundary.

A12—8 to 12 inches, very dark grayish-brown (10YR 3/2) channery loam; weak, fine, granular structure; very friable; many fine roots; 25 percent channery-size sandstone fragments; strongly acid; clear, wavy boundary.

B2—12 to 22 inches, dark-brown (7.5YR 4/4) channery loam that is slightly finer textured than that of the A12 horizon; weak, fine, subangular blocky structure; very friable; 35 percent sandstone fragments; common roots; strongly acid; gradual, wavy boundary.

B3—22 to 27 inches, yellowish-brown (10YR 5/4) very channery fine sandy loam; very weak, fine, subangular blocky structure; friable; few roots; 60 percent sandstone fragments; very strongly acid; gradual, wavy boundary.

R—27 inches +, hard, grayish, acid sandstone.

The A horizon ranges from channery loam to fine sandy loam, and in much of the acreage, it is very stony. The Ap or A1 horizon ranges from 7 to 10 inches in thickness. The B horizon is brown, dark brown, or yellowish brown. Coarse fragments commonly make up 35 to 50 percent of the solum. The depth to sandstone bedrock ranges from about 20 to 30 inches. Natural reaction ranges from strongly acid to very strongly acid.

Summers soils are closely associated with Dekalb soils.

Summers channery loam, 5 to 15 percent slopes (SuC).—This soil has the profile described as typical of the series. The material on the surface consists mainly of channery-size sandstone fragments, but there are a few large sandstone boulders. Included in mapping were small areas of lighter colored soils.

This soil is suited to most crops commonly grown in the county, but lime and fertilizer should be applied at shorter intervals than is usual. Most crops grow fairly well, even though the growing season is somewhat shorter and cooler at this elevation. If tilled crops are grown, contour stripcropping is needed to help control erosion. The sandstone fragments make plowing difficult, and in some places, they interfere with mowing. (Capability unit IIIe–12; woodland group 8)

407-696—72——3

Summers very stony loam, 5 to 25 percent slopes (SyD).—This soil is similar to Summers channery loam, 5 to 15 percent slopes, except that the surface stones are more numerous. A few areas have been cleared and are used for bluegrass pasture. If these areas are not too stony, bluegrass grows fairly well even if it is not fertilized. Suitability for trees is fair to good. The stones on the surface severely limit the use of farm machinery. (Capability unit VIIs–2; woodland group 8)

Teas Series

The Tea series consists of moderately deep, well-drained, gently sloping to very steep, reddish-brown soils. These soils occur extensively on the dissected uplands in the western part of the county. They formed in residuum weathered from reddish shale and siltstone, some of which is weakly calcareous. In most places slope is more than 15 percent, but it ranges from 3 to 65 percent.

In a typical profile in a wooded area, a thin mat of dark-colored organic matter covers the surface. The surface layer, below this mat, is mainly reddish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 22 inches. The upper part is reddish-brown, friable light silty clay loam. The lower part is reddish-brown, friable, very channery silty clay loam that has a high proportion of siltstone fragments. Reddish siltstone bedrock begins at a depth of 22 inches.

Permeability is moderate, and the available moisture capacity and natural fertility are low to moderate.

In many areas these soils are used for pasture and general crops. The steeper areas are used for pasture and woodland. The erosion hazard is moderately severe, and severe erosion is fairly widespread. The use of these soils for cropland is limited by slope, shallowness, and erodibility.

Typical profile of Teas silt loam, in an area of Teas and Litz silt loams, 15 to 25 percent slopes, in woodland, 1 mile east of Lewisburg along U.S. Highway 60.

O1—3 inches to ½ inch, hardwood leaf litter.

O2—½ inch to 0, compacted hardwood leaf mull.

A1—0 to 1 inch, dark reddish-brown (5YR 3/3) silt loam; moderate, fine, granular structure; very friable; medium acid; clear, wavy boundary.

A2—1 inch to 8 inches, reddish-brown (5YR 5/3) silt loam; weak, fine, subangular blocky structure and weak, thin, platy; very friable; many fine roots; few siltstone fragments; medium acid; clear, wavy boundary.

B2—8 to 14 inches, reddish-brown (2.5YR 4/4) light silty clay loam; weak to moderate, fine and medium, subangular blocky structure; friable; thin, discontinuous silt coatings; 15 percent siltstone fragments; strongly acid; clear, wavy boundary.

B3—14 to 22 inches, reddish-brown (2.5YR 4/4) very channery silty clay loam; weak, fine, subangular blocky structure; friable; 65 percent blocky siltstone fragments; strongly acid; gradual, wavy boundary.

R—22 inches +, reddish siltstone.

In places the A horizon is stony. The B horizon is reddish brown or weak red and ranges from channery silt loam to light silty clay loam and very channery silty clay loam. It is weakly expressed. Rock fragments make up 10 to 50 percent of this horizon. The depth to bedrock ranges from about 20 to 26 inches. In most places natural reaction is strongly acid, but the lower part of the B horizon is medium acid.

Teas soils occur extensively with Litz soils, which have a yellowish-brown subsoil. In places they are near the browner, sandier Dekalb soils, the browner Gilpin soils, and the Fred-

erick soils, which have a more clayey subsoil. In places they are near the reddish Calvin soils, which formed in more acid material. In many places they are upslope from the deep Albrights soils.

Teas and Litz silt loams, 3 to 8 percent slopes (TlB).—The soils of this undifferentiated group occur on relatively smooth slopes near the top of hills or on rolling ridges. Any given area of this group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of their respective series, except that they are slightly deeper.

Included in mapping were small areas of Gilpin soils and Dekalb soils. Also included were small severely eroded areas.

These soils are suited to the crops commonly grown in the county. Tilled crops should be grown in contour strips to control erosion. Diversion ditches are needed on some of the long slopes to intercept water received from higher areas. (Capability unit IIe–10; woodland group 12)

Teas and Litz silt loams, 8 to 15 percent slopes (TlC).—Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of their respective series, but in places they are slightly deeper. They have fairly smooth, uniform slopes.

Included in mapping were small areas of Gilpin soils and Dekalb soils. Also included were small severely eroded areas.

These soils are suited to the crops commonly grown in the county. Crop rotations of moderate length are suitable. The crops should be grown in contour strips to help control erosion. Diversion terraces may be needed on some of the long slopes to control or intercept runoff. (Capability unit IIIe–10; woodland group 12)

Teas and Litz silt loams, 8 to 15 percent slopes, severely eroded (TlC3).—Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of their respective series, but they are shallower to bedrock. Most of the original surface layer has been lost through erosion, and the remaining surface layer is silt loam, shaly silt loam, or heavy silt loam. In places there are small outcrops of shale. Included in mapping were small areas of Gilpin and Dekalb soils.

These soils need the protection of long rotations that include a row crop and several years of hay. Contour stripcropping and diversion ditches help to intercept runoff and to control erosion. (Capability unit IVe–2; woodland group 12)

Teas and Litz silt loams, 15 to 25 percent slopes (TlD).—Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of the series. They have low fertility in most places and severe erodibility. Included in mapping were small severely eroded spots and small areas of Gilpin and Dekalb soils.

These soils are better suited to long rotations that include only an occasional row crop than they are to other cropping systems. If properly limed and fertilized, they are well suited to alfalfa-grass mixtures. Tilled crops should be grown in contour strips to control erosion. Diversion terraces are needed on some of the long slopes. (Capability unit IVe–2; woodland group 12)

Teas and Litz silt loams, 15 to 25 percent slopes, severely eroded (TlD3).—Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of their respective series, except that most of the original surface layer has been lost through erosion and consequently the soils are shallower to bedrock. The remaining surface layer is finer textured than is typical and, in many places, contains considerable shale. There are some small gullies, and in places shale bedrock crops out.

Included in mapping were small areas of Gilpin and Dekalb soils. Within these included areas are small, narrow areas where shale bedrock crops out.

If well managed, these soils are fairly well suited to bluegrass or tall pasture plants. They are well suited to trees. Permanent cover is needed to protect the soils. (Capability unit VIe–2; woodland group 12)

Teas and Litz silt loams, 25 to 40 percent slopes (TlE).—Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both; Teas soils make up a large part of most areas.

These soils have profiles similar to the ones described as typical of their respective series, but they are a few inches shallower to bedrock. The erosion hazard is very severe. There are stones and rock outcrops in some areas. Included in mapping were small severely eroded areas and areas of Gilpin and Dekalb soils.

These soils are better suited to trees, pasture, or other permanent cover than to other purposes, because of the slope and the erosion hazard. If used for pasture, they need careful management that checks loss of soil and water. (Capability unit VIe–2; woodland group 12)

Teas and Litz silt loams, 25 to 40 percent slopes, severely eroded (TlE3).—Areas of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both; Teas soils make up most of the acreage.

These soils have profiles similar to the ones described as typical of their respective series, except that most of the original surface layer has been lost through erosion and consequently the soils are shallower to bedrock. These soils have rather short slopes. The present surface layer is silt loam, shaly silt loam, or silty clay loam. Erosion is a severe hazard, and some gullies have formed. Sandstone ledges crop out in places, and shale crops out in spots. Included in mapping were small areas of Gilpin and Dekalb soils.

These soils are better suited to trees than to other uses. In places, diversion terraces, mulching, use of suitable plant species, and other erosion control measures are needed to check further loss of soil and water. (Capability unit VIIe–2; woodland group 12)

Teas and Litz silt loams, 40 to 65 percent slopes (TlF).—Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of their respective series, except that they are slightly shallower. Rock ledges crop out in a few places.

Included in mapping were small severely eroded areas, small stony areas, and small areas of Gilpin and Dekalb soils.

These soils are not well suited to pasture. Trees grow well, and they provide better protection from loss of soil and water than other plants. Slope and erodibility severely limit the use of these soils. (Capability unit VIIe–2; woodland group 12)

Teas and Litz silt loams, 40 to 65 percent slopes, severely eroded (TlF3).—Any given area of this undifferentiated group may consist of one or the other of these soils, or, more commonly, of both.

These soils have profiles similar to the ones described as typical of their respective series, except that most of the original surface layer has been lost through erosion and consequently the soils are considerably shallower. These soils are more droughty than is typical. The present surface layer generally contains a considerable amount of shale fragments. Erosion is a very severe hazard, and small shallow gullies are common. In places shale bedrock or sandstone ledge crops out. Included in mapping were small areas of Dekalb and Gilpin soils and small stony areas.

These soils are better suited to trees than to other uses because of the slope and the erosion hazard. In places special vegetation and water control measures are needed to limit further loss of soil and water. (Capability unit VIIe–2; woodland group 12)

Weikert Series

The Weikert series consists of shallow to very shallow, excessively drained, strongly sloping to very steep soils. These soils are on foothills and are very extensive on mountain slopes in the eastern part of Greenbrier County. They formed in residuum weathered from acid, gray siltstone; shale; and some thin-bedded sandstone. In most places these soils are very steep, but slope ranges from 10 to 65 percent.

In a typical profile in a wooded area, a thin mat of black organic matter covers the surface. The surface layer, below this mat, is very dark grayish-brown shaly silt loam in the uppermost 2 inches and brown shaly silt loam in the next 4 inches. The subsoil extends to a depth of 12 inches. It is yellowish-brown and brown, firm, very shaly heavy silt loam that is about 60 percent shale fragments. Below the subsoil is weathered gray, yellowish-red, and brown shale that has 10 to 20 percent yellowish-brown silt loam in cracks. Shale bedrock is at a depth of 15 inches.

Permeability is moderately rapid, and the available moisture capacity is low. Natural fertility is low.

Almost the entire acreage is in mixed stand of oaks and other hardwoods, but there are small patches of Virginia pine.

Typical profile of Weikert shaly silt loam, 45 to 65 percent slopes, in woodland near White Sulphur Springs.

O1—2 inches to ¾ inch, hardwood leaf litter.
O2—¾ inch to 0, black decomposed mull.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) shaly silt loam; moderate, medium, granular structure; loose; 20 percent shale chips; many roots; very strongly acid; abrupt, irregular boundary.
A2—2 to 6 inches, brown (10YR 5/3) shaly silt loam; weak, medium, granular structure and weak, fine, subangular blocky; very friable; 30 percent shale fragments ¼ to 1 inch long; many roots; very strongly acid; clear, wavy boundary.
B2—6 to 12 inches, yellowish-brown (10YR 5/4) and brown (7.5YR 5/4) very shaly heavy silt loam; brown (10YR 5/3) material from the A2 horizon is common on faces and in cracks; weak, fine and medium, subangular blocky structure; firm; 60 percent shale fragments up to 2 inches long; few roots; very strongly acid; clear, wavy boundary.
C—12 to 15 inches, 80 to 90 percent weathered, gray, yellowish-red, and brown shale; yellowish-brown (10YR 5/4) to brown (7.5YR 5/4) silt loam in cracks; massive; firm; strongly acid; gradual, wavy boundary.
R—15 inches +, fissile shale, fractured; about 5 percent fine material.

In places the A horizon is channery silt loam instead of shaly silt loam. The B horizon is yellowish brown, strong brown, brown, or, in a few places, light olive brown. Its texture includes very shaly silt loam and very channery silt loam. Coarse fragments make up 40 to 70 percent of the B horizon. The depth to firm bedrock ranges from 10 to 20 inches.

Weikert soils occur extensively in mixed patterns with the deeper Berks soils. They are next to the deeper, more sandy Dekalb soils and the cherty Elliber soils. Weikert soils are in higher areas than the deep, moderately well drained Ernest and Monongahela soils. They contain more stone fragments than the deeper Litz and Gilpin soils.

Weikert shaly silt loam, 10 to 20 percent slopes (WeC).—This soil is shallow, very droughty, and erodible. Included in mapping were a few small areas of less strongly sloping soils and small areas where most of the original surface layer has been lost through erosion.

This soil is better suited to tall grasses, pasture, or woodland than to other purposes. It is used for all the crops commonly grown in the county. The crops do not grow well even if adequate amounts of lime and fertilizer are applied. (Capability unit IVe–32; woodland group 7)

Weikert shaly silt loam, 20 to 30 percent slopes (WeD).—This soil has a profile similar to the one described as typical of the series, except that the depth to bedrock ranges from about 10 inches to 16 inches. This soil is very droughty. Included in mapping were small, severely eroded areas.

Much of the acreage has been cleared and is used for pasture, but the soil is only poorly suited to fairly well suited to pasture, even under good management. Well-managed permanent pasture or woodland is needed to protect the soil from erosion. (Capability unit VIe–31; woodland group 7)

Weikert shaly silt loam, 30 to 45 percent slopes (WeE).—This soil is extensive, and it is droughty. The depth to bedrock is about 10 to 16 inches. There are some chert fragments on the surface in areas near Elliber soils. Included in mapping were small, severely eroded areas.

This soil is too steep and too droughty to be used for pasture. Although not highly productive of wood products, most of the acreage is in forest. The trees provide adequate protection from loss of soil and water. (Capability unit VIIe–3; woodland group 7)

Weikert shaly silt loam, 45 to 65 percent slopes (WeF).—This soil occurs as very large areas on mountain slopes. It has the profile described as typical of the series. It is very droughty. The depth to bedrock ranges from about 10 to 16 inches.

This soil is suited only to woodland; productivity is only poor to fair. Most of the acreage is in forest, and the woodland provides adequate protection from loss of soil and water. The use of woodland equipment is severely limited by the slope. (Capability unit VIIe–3; woodland group 7)

Weikert-Berks complex, 20 to 30 percent slopes (WkD).—This complex occurs mainly on rounded ridgetops in the eastern part of the county. The Weikert soil makes up about 55 percent of the acreage, the Berks soil about 25 percent, and other soils make up the rest.

These soils have profiles that are generally similar to the ones described as typical of their respective series, except that the Weikert soil has a profile that contains more sandstone fragments and less shale fragments. Both soils have a surface layer of channery silt loam. They are droughty in most places, and they have low fertility. Included in mapping were small areas of Dekalb soils and severely eroded areas.

These soils are better suited to woodland or pasture than to other purposes. A few areas have been cleared and are used for pasture, but most of the acreage is in forest. Even under good management, these soils are only fairly well suited to pasture. (Capability unit VIe–31; woodland group 6)

Weikert-Berks complex, 30 to 45 percent slopes (WkE).—This complex occurs mainly as large areas in the eastern part of the county. The Weikert soil is mainly on southern and western exposures and points of ridges, and the Berks soil is mainly on the northern and eastern exposures and in coves. The Weikert soil makes up about 55 percent of the acreage, the Berks soil about 25 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of their respective series, except that they contain more and larger stone fragments and flagstones. Both soils have a surface layer of channery silt loam. They are droughty.

Included in mapping were small areas of very shallow, extremely shaly soils, small areas of Dekalb soils, and small severely eroded areas.

These soils are better suited to woodland and wildlife habitat than to other purposes because of the slope and the droughtiness. They are only poorly suited to moderately well suited to trees, but most of the acreage is in forest and should remain in forest to limit the loss of soil and water. (Capability unit VIIe–3; woodland group 6)

Weikert-Berks complex, 45 to 65 percent slopes (WkF).—This complex commonly occurs as large areas in the eastern part of the county. The Weikert soils are mainly on southern and western exposures and points of ridges, and the Berks soils are mainly on northern and eastern exposures and in coves. The Weikert soil makes up about 65 percent of the acreage, the Berks soil about 20 percent, and other soils make up the rest.

These soils have profiles similar to the ones described as typical of their respective series, except that they are shallower to bedrock and contain more shale and stone fragments. Both soils have a surface layer of channery silt loam. Stones and rock outcrops are scattered over the surface. Included in mapping were small areas of Dekalb soils and small severely eroded areas.

Most of the acreage is in forest. The forest cover is needed to provide protection from loss of soil and water. The use of woodland equipment is more difficult on these soils than on less sloping soils. (Capability unit VIIe–3; woodland group 6)

Westmoreland Series

The Westmoreland series consists of moderately deep, gently sloping to very steep soils. These soils are on dissected uplands, mainly along the western edge of the limestone valley. They formed in material weathered from interbedded limestone, gray shale, and some sandstone. Slope ranges from 3 to 65 percent.

In a typical profile, the surface layer is dark-brown and dark yellowish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 28 inches. The uppermost 5 inches is dark-brown, friable heavy silt loam, and the rest is strong-brown and yellowish-brown, friable to firm shaly silty clay loam. Below the subsoil is yellowish-brown, firm very shaly clay loam. Calcareous shale bedrock begins at a depth of 34 inches.

Permeability is moderate, and the available moisture capacity is high. Natural fertility is moderate.

These soils are used mostly for crops and pasture, and where not too steep, they are well suited to this use. In the steeper areas, they are used for pasture and woodland. These are excellent soils for black walnut, yellow-poplar, and other high-value trees. Soil and water conservation practices are needed in most areas.

Typical profile of Westmoreland silt loam, 20 to 30 percent slopes, in a pasture near Hughart.

Ap1—0 to 3 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; slightly acid; clear, smooth boundary.

Ap2—3 to 8 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, thin, platy structure and weak, medium, granular; very friable; strongly acid; clear, wavy boundary.

B1—8 to 13 inches, dark-brown (7.5YR 4/4) heavy silt loam; weak, fine, subangular blocky structure; friable; few, thin, discontinuous clay films; 10 percent shale chips; strongly acid; clear, wavy boundary.

B21t—13 to 24 inches, strong-brown (7.5YR 5/6) shaly silty clay loam; moderate, fine and medium, subangular blocky structure; friable to firm; common thin clay films; 20 percent shale fragments; medium acid; clear, wavy boundary.

B22t—24 to 28 inches, yellowish-brown (10YR 5/6) shaly silty clay loam; moderate, fine and medium, subangular blocky structure; firm; common clay films; 30 percent shale fragments; medium acid; clear, wavy boundary.

C—28 to 34 inches, yellowish-brown (10YR 5/6) very shaly silty clay loam; massive; firm; 80 percent shale fragments; few clay films; medium acid; gradual, irregular boundary.

R—34 inches +, partly weathered, gray and brown, calcareous shale.

In places the A horizon is silt loam marginal to loam. The B2 horizon ranges from 12 to 20 inches in thickness. Coarse fragments make up 10 to 30 percent of the solum. The depth to bedrock ranges from about 24 to 40 inches. Natural reaction ranges from strongly acid in the A horizon and upper part of the B horizon to medium acid in the lower part of the B horizon and in the C horizon.

Westmoreland soils occur on limestone uplands near Frederick and Frankstown soils, which have a redder, finer textured subsoil. They are next to Gilpin soils, which have more acid lower horizons, the sandier Dekalb soils, and the redder Teas soils. Westmoreland soils commonly are in higher areas than the deep, moderately well drained Clarksburg soils, which occupy colluvial slopes.

Westmoreland silt loam, 3 to 10 percent slopes (WmB).—This soil occupies ridgetops and smooth benches. Included in mapping were small, severely eroded areas and small areas where there are limestone outcrops.

This soil is well suited to bluegrass pasture and to the crops commonly grown in the county. Tilled crops should be grown in contour strips to control erosion. Diversion ditches are needed on some of the long slopes. (Capability unit IIe–11; woodland group 13)

Westmoreland silt loam, 10 to 20 percent slopes (WmC).—Included with this soil in mapping were small, severely eroded areas and some areas that have outcrops of limestone. This soil is well suited to bluegrass pasture and to all the crops commonly grown in the county. Intensive conservation measures, such as contour stripcropping and diversion ditches, help to control runoff and to check soil loss. (Capability unit IIIe–11; woodland group 13)

Westmoreland silt loam, 20 to 30 percent slopes (WmD).—This soil has the profile described as typical of the series. Included in mapping were some small, severely eroded areas and areas that have limestone outcrops.

This soil is better suited to long-term hay than to other crops. It is well suited to bluegrass pasture. Row crops can be included in a long term rotation if contour strips are used where possible when reseeding. In places diversion ditches are needed to intercept runoff. Bluegrass pasture provides the protection needed to control loss of soil and water. (Capability unit IVe–11; woodland group 13)

Westmoreland silt loam, 20 to 30 percent slopes, severely eroded (WmD3).—This soil has a profile similar to the one described as typical of the series, except that most of the original surface layer has been lost through erosion, and consequently, the soil is shallower. In places the remaining surface layer is silty clay loam. There are some outcrops of limestone. Included in mapping were small areas of the shallow Litz soils.

This soil is better suited to pasture or woods than to other purposes. If used for pasture, proper management of grazing is needed to check further erosion. (Capability unit VIe–1; woodland group 13)

Westmoreland silt loam, 30 to 45 percent slopes (WmE).—This soil has a profile similar to the one described as typical of the series, except that it is slightly shallower. Erosion is a severe hazard. Included in mapping were some small, severely eroded areas and some areas where limestone crops out.

This soil is well suited to woodland. It can be used for pasture to some extent, but careful management is necessary because of the severe erodibility. (Capability unit VIe–1; woodland group 13)

Westmoreland silt loam, 30 to 45 percent slopes, severely eroded (WmE3).—This soil has a profile similar to the one described as typical of the series, except that most of the original surface layer has been lost through erosion and, consequently, the soil is shallower. Erosion is a severe hazard. In places the surface layer is silty clay loam. Limestone crops out in places. Included in mapping were fairly common areas of the shallower Litz soils.

This soil is better suited to trees than to other uses because of the slope and erodibility. (Capability unit VIIe–1; woodland group 13)

Westmoreland silt loam, 45 to 65 percent slopes (WmF).—This soil has a profile similar to the one described as typical of the series, except that it is shallower. The erosion hazard is very severe. Included in mapping were small, severely eroded areas and some areas where limestone crops out. Also included were small areas of the shallower Litz soils.

Trees provide better protection from severe erosion than other crops. (Capability unit VIIe–1; woodland group 13)

Use and Management of the Soils

This section explains the system of capability grouping used by the Soil Conservation Service and discusses the management of the soils in Greenbrier County by capability units. Estimated yields under two levels of management are given. Also discussed are the management of soils for woodland and for wildlife. The properties and features that affect engineering practices and the limitations that affect recreational and nonfarm uses are enumerated, mainly in tables.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or for engineering.

In the capability system, the kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

Capability Classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife habitat. (There are no class V soils in Greenbrier County).

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows 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); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. A capability unit is generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-10. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by Capability Units

In the following pages each of the capability units in Greenbrier County is described, and suggestions for the use and management of the soils are given.

The capability units are not numbered consecutively, because not all of the units in the Statewide system are represented in this county. Crops commonly grown in the county include corn, oats, wheat, and barley. Alfalfa and alfalfa-clover-grass mixtures are grown for hay and pasture. Bluegrass is grown extensively for pasture. Specific statements cannot be made concerning the use of fertilizer, desirable varieties and mixtures of seeds, or favorable dates and seeding rates for planting. Up-to-date Statewide information is published from time to time by the West Virginia Agricultural Experiment Station. Personnel of the local office of the Soil Conservation Service, the Agricultural Experiment Station, and the Cooperative Extension Service can furnish information helpful in interpreting the Statewide information on a county basis.

The names of the soil series represented are mentioned in the description of each unit, but the listing of the series name does not necessarily indicate that all the soils of a series are in the same capability unit. The miscellaneous land types Mine dumps and Strip mine spoil are not given a capability classification. The capability classification of each soil is given in the "Guide to Mapping Units."

CAPABILITY UNIT I–6

This unit consists of deep, nearly level soils of the Chavies and Huntington series. These soils are on the high bottoms along major streams and small drainageways and in shallow sinkholes in the limestone valley. The Chavies soil is slightly droughty and infrequently flooded. The Huntington soil is occasionally ponded for a short period by runoff from hillsides.

The available moisture capacity and fertility are high in the Huntington soil. Reaction is acid in the Chavies soil and slightly acid to neutral in the Huntington soil. The erosion hazard is only slight on both soils.

These soils are easily worked. They are well suited to all the crops grown in the county, but the slight droughtiness of the Chavies soil makes it less well suited than the Huntington soil. Row crops can be grown continuously on both soils if fertility and organic-matter content are maintained and a winter cover crop is grown. Truck and specialty crops can be grown also.

These soils are suitable for irrigation, and in many places, stream water is nearby. Crop residue should be plowed under to help maintain the organic-matter content.

CAPABILITY UNIT IIe–1

This unit consists of deep, well-drained, gently sloping to strongly sloping soils of the Frederick and Frankstown series. These soils formed in material weathered from limestone. They are in limestone valley areas, and shallow sinkholes are fairly common. There are some small, severely eroded areas around the rims of the sinkholes. The slopes are short and irregular.

Surface runoff is medium, and the erosion hazard is moderate. The available moisture capacity is high, and natural fertility is moderate to high. The organic-matter content is low, but with good management, favorable tilth can be maintained. Where the soils have not been limed, reaction is strongly acid in the surface layer.

These soils are well suited to all crops commonly grown in the county. Suitable crops for hay, silage, and pasture include alfalfa-grass mixtures and red clover-grass mixtures. A bluegrass-white clover mixture (fig. 2) is also suitable for pasture.

Contour stripcropping, minimum tillage, field strips, and suitable crop rotations are measures that help to control surface runoff and erosion on cropland. The waterways should be maintained in sod.

CAPABILITY UNIT IIe–4

This unit consists of deep, well-drained, gently sloping to strongly sloping, loamy soils of the Clymer and Laidig series. These soils are on smooth ridges and on concave foot slopes at the base of mountains. They formed in material weathered mainly from sandstone.

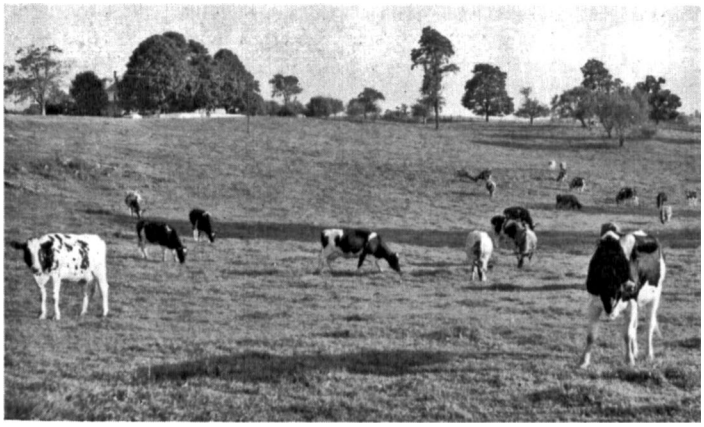

Figure 2.—**In the foreground is a highly productive bluegrass-white clover pasture on Frederick cherty silt loam, 3 to 8 percent slopes, which is in capability unit IIe–1. In the background is Frederick cherty silt loam, 8 to 15 percent slopes, which is in capability unit IIIe–1.**

These soils are mellow and easy to work. The erosion hazard is generally moderate. The available moisture capacity is moderate, and natural fertility is low to moderate. The natural reaction is acid. In places the Laidig soil receives concentrations of runoff from higher hillsides.

These soils are well suited to crops commonly grown in the county. Working crop residue into the soil helps to maintain tilth and the content of organic matter. Contour stripcropping helps to control loss of soil and water. Diversion ditches are useful in places on foot slopes. Drainageways should be maintained in sod.

CAPABILITY UNIT IIe–10

This unit consists of Teas and Litz silt loams, 3 to 8 percent slopes. These soils are moderately deep, well drained, and slightly droughty. They occur on fairly smooth ridgetops and benches. They formed in material weathered from red and gray siltstone and shale, and some of the material is calcareous.

These soils are easily tilled. The hazard of erosion is moderate to severe, and small included areas are severely eroded. The available moisture capacity and natural fertility are low to moderate. Reaction is medium acid to strongly acid.

These soils can be used for all the crops commonly grown in the county. They are only moderately well suited to crops and pasture, however, because they are slightly droughty and their subsoil contains many rock fragments. Incorporating crop residue into the soil and other practices that help to maintain organic-matter content are important. Contour stripcropping is needed to help control loss of soil and water. Diversion ditches are needed on some of the long slopes.

CAPABILITY UNIT IIe–11

This unit consists of Westmoreland silt loam, 3 to 10 percent slopes, a moderately deep soil that formed in material weathered from interbedded shale, sandstone, and limestone. This soil occurs on ridgetops and smooth benches on the western edge of the limestone valley.

Surface runoff is medium, and the hazard of erosion is moderate. Permeability is moderate, the available moisture capacity is high, and natural fertility is moderate. Reaction is medium acid.

This soil is well suited to all the crops commonly grown in the county. It is especially well suited to alfalfa and other deep-rooted legumes, as well as to bluegrass pasture.

Farming in contour strips helps to control loss of soil and water.

CAPABILITY UNIT IIe–13

This unit consists of deep, moderately well drained, gently sloping soils of the Cookport, Ernest, and Monongahela soils. These soils have a slowly permeable layer in the lower part of the subsoil. They occur on colluvial foot slopes, on smooth ridges, and on old stream terraces.

Surface runoff is medium, and the hazard of erosion is moderate. Water moves readily through the upper layers but slowly through the lower layers. It accumulates above the fragipan in wet periods, and seep spots are fairly common. The available moisture capacity is moderate to high, and natural fertility is low to moderate. Natural reaction is acid.

These soils are fairly well suited to all the crops commonly grown in the county. Alfalfa and other deep-rooted plants are subject to damage because of the slow permeability in the subsoil and the seasonal high water table.

Contour stripcropping is needed to help control erosion and loss of water. Diversion ditches are needed on some of the long slopes. The seep spots can be improved by artificial drainage. Waterways need to be maintained in sod. These soils are likely to be low in supply of plant nutrients, and consequently, soil tests are especially important.

CAPABILITY UNIT IIe–14

This unit consists of deep, moderately well drained, gently sloping to strongly sloping soils of the Albrights, Clarksburg, and Pickaway series. These soils are on foot slopes and in slight depressions in limestone valley areas. They formed in material weathered from limestone and limy shale. They have a moderately slowly permeable fragipan in the lower part of the subsoil.

Surface runoff is medium, and the hazard of erosion is moderate. Water moves readily through the upper layers but slowly through the fragipan. It accumulates above the fragipan in wet periods, and seep spots are fairly common. The available moisture capacity is moderate to high, and natural fertility is moderate in most places. Reaction is medium acid to strongly acid.

These soils are suited to the crops commonly grown in the county. Alfalfa and other deep-rooted crops may be damaged because of the seasonal high water table and the slowly permeable layer in the subsoil.

Drainage of the small seep spots improves the usability of these soils. Small natural drainageways should be maintained in sod. Contour stripcropping helps to limit loss of soil and water.

CAPABILITY UNIT IIw–6

This unit consists of Pope fine sandy loam, a deep, nearly level, well-drained soil that formed in stream deposits washed from acid sandstone and shale. This soil is on bottom lands and is occasionally flooded. The included narrow strips adjacent to streams are frequently

flooded, which results in some deposition of material and some removal of soil material where the streambanks have been gouged and undercut.

Permeability is moderately rapid, and the soil is slightly droughty. The available moisture capacity and natural fertility are moderate. Reaction is strongly acid.

This soil is suited to all the crops commonly grown in the county. It is well suited to bluegrass pasture. Row crops can be grown year after year if they are followed by a winter cover crop.

The frequently flooded areas should be kept in permanent pasture or sod. The likelihood of local flooding affects the choice of crops and the time of planting.

CAPABILITY UNIT IIw–7

This unit consists of deep, nearly level, moderately well drained soils of the Lindside and Philo series. These soils are on bottom lands and in upland depressions. The Lindside soil occurs mainly as small areas in sinkholes and along small drainageways in valley areas underlain by limestone. In places it is flooded or ponded for short periods. The Philo soil occurs on bottom lands along streams that drain upland areas underlain by sandstone and shale. It is flooded every few years.

In places the water table is near the surface in winter and early in spring. The available moisture capacity is moderate to high in both the Lindside and Philo soils. Natural fertility is moderate to high in the Lindside soil and moderate in the Philo soil. Reaction is slightly acid in the Lindside soil and strongly acid to very strongly acid in the Philo soil.

These soils are suited to most crops commonly grown in the county. In places cultivated crops can be grown every year if they are followed by a winter cover crop. Alfalfa is not well suited, because of the seasonal high water table and possible winter damage.

The areas most frequently flooded or ponded need the protection of permanent sod pasture. Drainage can be improved in seepy areas by tile or open ditches.

CAPABILITY UNIT IIIe–1

This unit consists of deep, well-drained, gently sloping to moderately steep, loamy soils of the Frankstown, Frederick, and Murrill series. These soils occur mainly on short, irregular slopes in areas underlain by limestone. Shallow sinkholes are common. Small, severely eroded areas commonly occur around the rims of the sinkholes. There are some colluvial areas below the sandstone uplands.

Runoff is medium to rapid, and the hazard of erosion is moderately severe or severe. The available moisture capacity is high, and natural fertility is moderate to high. Reaction in the surface layer is strongly acid if the soil is not limed.

These soils are well suited to all the crops commonly grown in the county. Mixtures of alfalfa and grass or of red clover and grass are well suited to hay, silage, or pasture. These soils also produce excellent stands of bluegrass-white clover pasture.

Stripcropping, minimum tillage, and a suitable crop rotation help to control loss of soil and water. In the many small areas that are too uneven for contour stripcropping, field strips placed across the dominant general slope provide some protection. In places diversion terraces are needed on long slopes and on the slopes that receive surface runoff from higher areas. Waterways should be maintained in sod. The response to applications of fertilizer and other management practices is especially good.

CAPABILITY UNIT IIIe–4

This unit consists of deep, well-drained, strongly sloping to moderately steep, loamy soils of the Clymer and Laidig series. These soils formed in material weathered from sandstone. They occur on smooth ridges and on concave foot slopes at the base of mountains. Scattered large stones occur on the foot slopes.

These soils are easy to work, and they tend to warm up early in spring. The hazard of erosion is moderate in most places, but it is severe on foot slopes that receive concentrations of runoff from higher areas. The available moisture capacity is moderate to high, and natural fertility is moderate to low. Reaction is strongly acid.

Most of the acreage has been cleared. These soils are suited to all the crops commonly grown in the county, but they are only fairly well suited to bluegrass.

Crop residue should be worked into these rather light soils to help maintain the organic-matter content. Stripcropping helps to control loss of soil and water. Diversion ditches are needed in places to intercept runoff from higher areas. Natural drainageways should be maintained in sod.

CAPABILITY UNIT IIIe–10

This unit consists of Teas and Litz silt loams, 8 to 15 percent slopes. These are moderately deep, well-drained soils that formed in material weathered from red and gray shale that contains some slightly calcareous layers. They have smooth slopes. Small areas have been severely eroded and are shallower and more droughty than other areas.

These soils are easily tilled. The erosion hazard is moderate to severe. The available moisture capacity and natural fertility are low to moderate. Reaction is medium acid to strongly acid.

These soils are fairly well suited to all the crops commonly grown in the county. They are also fairly well suited to bluegrass-white clover pasture. The suitability of these soils for crops and pasture is somewhat limited by their tendency to be droughty.

In places contour stripcropping is needed to help control loss of soil and water. Diversion ditches are needed in places on long slopes. The bluegrass-white clover pasture, if properly managed, provides good protection from erosion, but small spots that are bare as a result of erosion need special attention.

CAPABILITY UNIT IIIe–11

This unit consists of Westmoreland silt loam, 10 to 20 percent slopes, a moderately deep soil that formed in material weathered from interbedded gray shale, sandstone, and limestone. This soil occurs on ridges and benches.

Surface runoff is moderate, and the erosion hazard is moderate to severe. Permeability is moderate, and the available moisture capacity is moderate to high. Natural fertility is moderate to high. Reaction is medium acid.

This soil is well suited to crops commonly grown in the county. It is especially well suited to alfalfa and

other deep-rooted legumes. It is also well suited to bluegrass pasture.

In places contour stripcropping is needed to help control erosion and reduce water loss. The organic-matter content can be maintained by returning crop residue to the soil. Natural drainageways should be maintained in sod.

CAPABILITY UNIT IIIe–12

This unit consists of strongly sloping, moderately deep, somewhat droughty soils of the Dekalb and Summers series. These soils formed in material weathered from sandstone. They occur mainly on smooth mountain ridgetops. In many areas elevations are more than 3,000 feet. Small fragments of sandstone are scattered on the surface and throughout the profile.

These soils warm up early in spring. The hazard of erosion is moderate. Permeability is moderately rapid, and the available moisture capacity is low to moderate. Natural fertility is low.

These soils are fairly well suited to the crops commonly grown in the county, but their suitability is limited by their tendency to be droughty. About two-thirds of the acreage is used for general crops and pasture. Deep-rooted grasses and legumes ordinarily produce more forage than bluegrass.

The stones on and in the soil do not seriously interfere with cultivation. In places contour stripcropping is needed to reduce loss of soil and water. The organic-matter content can be maintained if cover crops are grown and crop residue is worked into the soil. These soils ordinarily need more frequent applications of fertilizer than the less sandy and more silty soils common in the county.

CAPABILITY UNIT IIIe–13

This unit consists of gently sloping to moderately steep soils of the Dekalb, Buchanan, Cookport, Ernest, and Monongahela series.

Dekalb soils are moderately deep, well drained, and low to moderate in natural fertility. They developed in material weathered from sandstone. They are moderately rapidly permeable and tend to be droughty. They occur on ridges and benches, mainly in intermingled patterns with Buchanan and Cookport soils.

The other soils in this unit are deep and moderately well drained. They have a firm, slowly permeable layer in the lower part of the subsoil and a seasonal high water table. They formed in material weathered from sandstone and shale and are on ridges, stream terraces, and foot slopes. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe.

These soils are suited to the crops commonly grown in the county. Dekalb soils are less productive than the other soils. In the moderately well drained soils, alfalfa and other deep-rooted crops are subject to winter damage.

Contour stripcropping is needed in cultivated fields to help control loss of soil and water. Natural drainageways should be maintained in sod. In places diversion terraces help to intercept water from adjoining hillsides.

CAPABILITY UNIT IIIw–1

This unit consists of Atkins silt loam, a deep, nearly level, poorly drained soil that formed in alluvium washed from acid sandstone and shale of the uplands. Most areas of this soil occupy narrow strips of bottom land at the base of hills some distance from the streams. It is flooded about once in 3 or 4 years, usually in winter and early in spring.

The surface layer is fairly mellow when dry but somewhat sticky and easily compacted when wet. The subsoil is moderately fine textured, and water moves through it slowly. The water table is at or near the surface during much of the winter and early in spring. Reaction is strongly acid to very strongly acid, and fertility is moderate. The soil warms up late in spring.

This soil is suited to water-tolerant grasses and legumes. If drained, it is suited to crops that will tolerate some wetness.

The soil drains fairly well if tile and open ditches are used. In some places tile or open ditches are needed at the base of adjoining slopes to intercept runoff and seepage. Pasture should not be grazed while the ground is wet and soft, in order to avoid soil compaction.

CAPABILITY UNIT IIIw–5

This unit consists of Sees silty clay loam, a deep, nearly level, poorly drained soil that formed in material weathered from limestone. This soil occurs in slight depressions in the limestone valley areas.

Surface drainage is generally poor, and some areas are ponded for short periods after heavy rains. Permeability is moderately slow, and the available moisture capacity is moderate. Natural fertility is moderate to high. Reaction is slightly acid to medium acid.

This soil is better suited to water-tolerant plants than to other plants, but drainage is needed. Adequately drained areas are especially well suited to bluegrass pasture.

This soil drains fairly well if tile or open ditches are used, but finding suitable outlets is a problem in places. When the soil is wet, proper stocking is particularly important in limiting damage to pasture plants and in avoiding excessive soil compaction.

CAPABILITY UNIT IVe–1

This unit consists of deep, well-drained, strongly sloping to moderately steep, loamy or cherty soils of the Frankstown, Frederick, and Murrill series. These soils occur as scattered areas in limestone valleys. They are underlain by limestone, and shallow sinkhole depressions are common. Severely eroded spots occur around the rims of many of the sinkholes. In places ledges of limestone crop out. Some areas of colluvial soils occur at the edge of the valley below the sandstone uplands.

Runoff is rapid, and the erosion hazard is severe. Permeability is moderate, and the available moisture capacity is high to moderate. Natural fertility is high. Reaction is strongly acid in the surface layer unless the soils have been limed.

These soils are suitable for cultivation in a regular rotation, but they should not be used for row crops more often than about 1 year in 5. They are well suited to permanent pasture and are also suitable for long term hay.

In some areas, contour tillage or contour stripcropping helps to control erosion, but in areas that have karst topography, sinkholes make the slope so irregular that these practices are not feasible. Field strips and minimum tillage protect the soils to some extent. Keeping tillage

407–696—72——4

to a minimum when preparing to reseed hay and grain also helps to control soil loss. Waterways should be kept in permanent sod.

CAPABILITY UNIT IVe-2

This unit consists of moderately deep, slightly droughty, strongly sloping and moderately steep soils of the Teas and Litz series. These soils occur in the western part of the county. They formed in material weathered from red and gray shale that contains some slightly calcareous layers. The strongly sloping soils have lost most of their surface layer through erosion, and they tend to be droughty.

These soils are easily tilled. The erosion hazard is severe to very severe. Permeability is moderate, and the available moisture capacity is low to moderate. Fertility is low to moderate. Reaction is strongly acid.

These soils are fairly well suited to crops commonly grown in the county, but their suitability is limited by their droughtiness.

Control of surface runoff and erosion are especially important on these soils. In places contour stripcropping and diversion ditches are needed to limit loss of soil and water. Waterways need to be maintained in sod. Small, bare, eroding areas generally need special care, such as water diversion. Proper management of pasture is needed to maintain a good sod and to limit the loss of soil and water.

CAPABILITY UNIT IVe-5

This unit consists of moderately deep, strongly sloping and moderately steep soils of the Dekalb series. These soils are mostly on smooth ridges. They formed in material weathered from sandstone, and small fragments of sandstone are scattered on the surface and throughout the profile.

These soils warm up early in spring. The hazard of erosion is moderately severe. Permeability is moderately rapid, and the available moisture capacity is low to moderate. Natural fertility is low, and the content of organic matter is low. Reaction is strongly acid or very strongly acid.

These soils are better suited to long-term hay than to other crops, but a row crop can be grown when hay is reseeded. Deep-rooted grasses and legumes produce more forage than bluegrass.

About two-thirds of the acreage has been cleared. The small fragments of sandstone do not seriously interfere with tillage. Organic-matter content can be maintained by growing hay and cover crops. In places contour stripcropping is needed to reduce loss of soil and water. Because the soils are open, they require more frequent applications of fertilizer than would ordinarily be needed.

These soils are good to excellent for tree crops, but most forested areas are not readily accessible by road. In general, there are more stones on the surface in forested areas than in cleared areas.

CAPABILITY UNIT IVe-11

This unit consists of Westmoreland silt loam, 20 to 30 percent slopes, a moderately deep soil that formed in material weathered from interbedded shale, sandstone, and limestone. This soil is on the western edge of the limestone valley.

Surface runoff is medium to rapid, and the erosion hazard is severe. Permeability is moderate, and the available moisture capacity is moderate to high. Natural fertility is moderate. Reaction is medium acid.

This soil is well suited to the crops commonly grown in the county. It is especially well suited to alfalfa and other deep-rooted legumes. A long crop rotation is desirable, and a row crop can be included once in 5 years. This soil is also well suited to bluegrass pasture, but adequate management is needed to maintain good stands and avoid excessive runoff and soil loss. The soil is excellent for woodland; yellow-poplar and black walnut grow especially well.

Contour stripcropping and diversion ditches help to control loss of water and soil. Waterways should be maintained in sod.

CAPABILITY UNIT IVe-32

This unit consists of Weikert shaly silt loam, 10 to 20 percent slopes, a shallow, droughty soil. This soil is in the eastern part of the county.

The erosion hazard is severe to very severe. Permeability is moderately rapid, and the available moisture capacity is low or very low. Natural fertility is low. Reaction is very strongly acid.

This soil is better suited to deep-rooted grasses and legumes than to other crops. Suitable crops can be grown in long rotations, and an occasional row crop can be included. Because of the droughtiness, the suitability of the soil is only fair. The soil is also suited to woodland, which provides maximum protection from erosion. Contour stripcropping and diversion ditches also help to control the loss of soil and water.

CAPABILITY UNIT IVw-1

This unit consists of Purdy silt loam, a deep, nearly level, poorly drained soil that has a slowly permeable, clayey subsoil. This soil formed in mixed material weathered from sandstone and shale. It occurs in slight depressions on stream terraces.

The water table is near the surface during much of the winter and spring. The available moisture capacity is moderate, and fertility is low. Reaction is strongly acid. The erosion hazard is generally slight.

This soil is better suited to water-tolerant grasses and legumes than to other crops. Even if drained, it is only fairly well suited to row crops and small grain. Drained areas are fairly well suited to bluegrass pasture.

Drainage is necessary if the soil is to be even fairly well suited to crops, but the slow permeability in the subsoil limits the effectiveness of tile. Open ditches are useful in many places. The application of lime to this soil is especially important.

CAPABILITY UNIT VIe-1

This unit consists of moderately steep and steep, moderately deep to deep, well-drained soils of the Frederick and Westmoreland series. These soils formed in material weathered from limestone or interbedded limestone and shale. They occur along the western edge of the limestone valley area. Some areas are severely eroded.

The erosion hazard is severe to very severe. Permeability is moderate, and the available moisture capacity is

moderate to high. Reaction is strongly acid in the surface layer.

These soils are better suited to pasture and woodland than to other uses because of the slope. Under good management, they are suited to bluegrass pasture. These soils are excellent for trees, especially black walnut and yellow-poplar. Most areas are in pasture.

Water diversions and other erosion control measures are needed on the small, bare spots. If pastures are broken for reseeding, the reseeding should be done in contour strips. Natural drainageways should be kept in sod.

CAPABILITY UNIT VIe–2

This unit consists of shallow to moderately deep, moderately steep and steep, medium-textured soils of the Teas and Litz series. These soils formed in material weathered from red and gray shale that has some limy layers. Many of the moderately steep areas have lost most of the original surface layer through erosion, and in these areas, the soils are droughty.

The erosion hazard is severe to very severe. Permeability is moderate, and the available moisture capacity is low to moderate. Reaction is strongly acid.

These soils need the protection of pasture or trees, and many areas are growing up to woodland.

If used for pasture, these soils need careful management to check the loss of soil and water. Pasture should be seeded in contour strips, and proper stocking of livestock is especially important. Diversion terraces can be used on long slopes or upslope from actively eroding areas. Natural waterways should be left in sod.

CAPABILITY UNIT VIe–4

This unit consists of Dekalb channery loam, 25 to 35 percent slopes, a moderately deep soil that formed in material weathered from acid, gray sandstone. This soil occurs mainly on mountain crests and upper side slopes. There are many small sandstone fragments on the surface and a few large stones.

The erosion hazard is moderately severe. Permeability is moderately rapid, and the available moisture capacity is low to moderate. Natural fertility is low. Reaction is strongly acid.

This soil is better suited to pasture or trees than to other uses. It is well suited to woodland, and about half the acreage is wooded. Bluegrass pasture is not well suited. If the soil is used for pasture, proper management that includes liming, fertilizing, and proper stocking is especially important.

CAPABILITY UNIT VIe–31

This unit consists of infertile, moderately steep, droughty, shallow and moderately deep soils of the Berks and Weikert series. These soils occur in the mountainous eastern part of the county. They formed in material weathered from folded shale and thin-bedded sandstone, and they contain many fragments of shale and sandstone. In small areas, most of the original surface layer has been lost through erosion.

The erosion hazard is severe. Water moves rapidly through these soils. Reaction is strongly acid.

These soils need the protection afforded by pasture or woodland. They are poorly suited to pasture, and good management is essential. Much of the acreage is in woodland.

CAPABILITY UNIT VIw–1

This unit consists of Alluvial land, a nearly level land type along streams throughout the county. This land type is flooded at intervals ranging from once a year to several times a year. It receives deposition of sandy, gravelly, or cobbly material. The soil material is deep, and the texture ranges from silt loam to sandy loam. It is droughty in places and poorly drained in others.

This land type is suited to bluegrass pasture in the areas that are not too sandy, too gravelly, or too wet. It has fair to good potential for woodland, and much of the acreage is in brushy open woods, which are generally grazed.

Drainage is generally not practical. The frequency of flooding governs how successfully individual areas can be managed for pasture.

CAPABILITY UNIT VIw–2

This unit consists of Atkins silty clay loam, a deep, poorly drained, nearly level soil. This soil is on bottom lands, and almost all of the acreage occurs along the Meadow River in the western part of the county. It is frequently flooded. The flooding is caused mostly by slow-moving backwater, and in places it occurs several times a season.

The water table is at or near the surface for long periods of time. Permeability is slow in the subsoil. The available moisture capacity is moderate. Fertility is moderate, and reaction is strongly acid.

This soil is not well suited to row crops or small grain. If drained, it is suited to pasture made up of bluegrass or tall, water-tolerant grasses. It is well suited to woodland.

This soil does not respond well to tile ditching, and outlets are lacking in places. In most areas surface drainage can be improved by the use of open ditches, including those that intercept water received from nearby hills. If used for pasture, proper stocking and the exclusion of livestock when the soil is wet are essential to limit soil compaction and the damage to pasture that result from trampling.

CAPABILITY UNIT VIs–1

This unit consists of moderately deep to deep, gently sloping to moderately steep, rocky, very rocky, very stony, or very cherty soils of the Elliber, Frankstown, Frederick, and Murrill series. These soils occur as small patches in areas underlain by limestone. They formed in material weathered from limestone or in material affected by limestone. There are rocks, large loose stones, or chert on the surface. The Frankstown soils generally are smoother than some of the other soils, and in most places they have fewer rock outcrops. The Murrill soil occurs on foot slopes and receives runoff from the hillsides.

The available moisture capacity is moderate to high, and natural fertility is moderate. The erosion hazard is severe in most places. Natural reaction is acid in the surface layer.

These soils are better suited to permanent pasture or trees than to other uses. They are fairly well suited to

bluegrass pasture, although they are somewhat droughty in summer. They are good to excellent for trees, but the acreage in trees is not extensive. Many small areas are kept wooded to provide shade for livestock.

There are enough rocks, stones, or chert on these soils to make tillage impractical. On much of the acreage, farm machinery can be used for mowing and fertilizing, but bluegrass pasture is somewhat difficult to mow and to fertilize. Distribution of grazing is important on these soils, and providing water for livestock helps to distribute the grazing.

CAPABILITY UNIT VIIe–1

This unit consists of steep and very steep, moderately deep soils of the Westmoreland series. These soils formed in material weathered from interbedded shale, sandstone, and limestone. They occur along the western edge of the limestone valley. Most of the steep soils have been severely eroded, and small inclusions of very rocky soils are common.

The erosion hazard is severe to very severe. Permeability is moderate, and the available moisture capacity is moderate to high. Natural reaction is acid in the surface layer.

Because of the slope and the erosion hazard, these soils need the protection of permanent sod or trees. They are fairly well suited to bluegrass pasture. They are excellent for trees; black walnut and yellow-poplar grow especially well.

The use of machinery is difficult or impractical. If the soils are used for pasture, proper stocking and other management practices that maintain good sod and limit loss of soil and water are especially important.

CAPABILITY UNIT VIIe–2

This unit consists of steep and very steep, moderately deep soils of the Teas and Litz series. These soils formed in material weathered from lime-affected, red and gray shale. They occur in the central and western parts of the county. Most of the steep areas have been severely eroded.

The erosion hazard is severe to very severe. Permeability is moderate, and the available moisture capacity is low to moderate. Fertility is moderate.

Because of the slope and the erosion hazard, these soils are better suited to woodland than to other uses. They are generally poorly suited to pasture and are difficult to manage. Many areas formerly used for pasture have been allowed to grow up to woods.

CAPABILITY UNIT VIIe–3

This unit consists of steep and very steep, shallow to moderately deep, droughty soils of the Berks and Weikert series. These soils formed in material weathered from folded, acid shale and thin-bedded sandstone. They are extensive in the mountainous areas in the eastern part of the county.

Natural fertility is low, and reaction is strongly acid.

Because of the slope, droughtiness, and erodibility, these soils are not suited to crops and pasture. They are only fairly well suited to poorly suited to trees, but they are better suited to woodland than to other uses. The trees give better protection against erosion than other crops. Most of the acreage is in mixed oaks, but some areas that were once cleared have been allowed to grow up to Virginia pine.

CAPABILITY UNIT VIIe–5

This unit consists of Steep eroded land, shale materials, a land type that occurs as many small areas near soils of the Teas, Calvin, Litz, and Westmoreland series. The original surface layer and much of the subsoil have been removed through erosion. The remaining soil material is very droughty, and in most places, is shallow or very shallow to bedrock. Very severely eroded areas occur mainly as small spots in pasture or in brushy areas, and in many places, red or gray shale is exposed. Shallow gullies are common.

Most of the areas are reverting to brushy woods, but natural revegetation is slow. The establishment and maintenance of a permanent cover of sod or trees is needed to check further loss of soil and water and to limit damage to surrounding areas.

Special care is needed in selecting and planting suitable species. Establishing the plant cover may be difficult because of the active erosion and the droughtiness. In many places diversion terraces are needed to control water. This land type is poorly suited to trees.

CAPABILITY UNIT VIIs–1

This unit consists of deep, moderately steep to very steep, very rocky or very stony soils of the Elliber, Frederick, and Murrill series. These soils occur as small areas throughout the limestone valley areas. They formed in material weathered from or influenced by limestone, and there are rock outcrops and large loose stones on the surface.

Generally, the available moisture capacity is moderate, but areas near the numerous rock outcrops are definitely droughty. The erosion hazard is severe. Where the soil has not been limed, the reaction in the surface layer is acid.

These soils are better suited to trees than to other uses, but they can be used to a limited extent for permanent pasture (fig. 3). Many of the wooded areas are used for pasture or to provide shade for cattle. Good to excellent stands of timber can be produced, if they are well managed and protected from fire and grazing.

In general, machinery cannot be used because of the large, loose stones on the surface and the rock outcrops. In the included less steep areas, farm machinery can be used for a limited amount of mowing, liming, and fertilizing. The soils should not be broken to reseed pasture. The pastures should be carefully stocked to prevent overgrazing and to reduce loss of soil and water.

CAPABILITY UNIT VIIs–2

This unit consists of moderately deep to deep, gently sloping to very steep, very stony soils of the Berks, Calvin, Cookport, Dekalb, Gilpin, Laidig, and Summers series. These soils occur mostly as large or very large areas in the rougher, mountainous parts of the county. They occupy nearly a third of the county. They formed in material weathered from acid sandstone and shale.

The available moisture capacity is generally moderate, and fertility is low to moderate.

About 90 percent of the acreage is wooded. Generally, the forest consists of mixed oaks, but there are some

Figure 3.—**In the background is permanent bluegrass pasture and trees on steep and very steep Frederick very rocky silt loam, which is in capability unit VIIs–1. In the foreground is gently sloping, Frederick cherty silt loam, which is in capability unit IIe–1.**

stands of pine. These soils are too stony for cultivation and are difficult to manage as pasture. Small areas are used as unimproved pasture, but the soils are poorly suited to this use. The use of machinery for liming and fertilizing is generally not practical.

CAPABILITY UNIT VIIs–4

This unit consists of deep, gently sloping to moderately steep, well drained to moderately well drained, extremely stony soils of the Ernest and Laidig series. The soils occur in the high, mountainous area in the western part of the county. They formed in colluvium derived from sandstone and shale.

Permeability is moderate to moderately slow, and the available moisture capacity is moderate to high.

Because of the numerous stones on the surface, the use of these soils is limited to woodland, and almost all the acreage is wooded. These soils are excellent for forest of black cherry, birch, and red oak.

CAPABILITY UNIT VIIs–5

This unit consists of moderately deep to deep, nearly level to moderately steep, excessively drained to poorly drained, extremely stony soils of the Andover, Dekalb, and Nolo series and of Stony rock land. These soils occur in the high mountainous area in the western part of the county at elevations ranging from about 3,500 to 4,500 feet. In this area the annual precipitation is about 55 inches. Stones cover 25 percent of the surface to as much as the entire surface. The available moisture capacity ranges from low to moderate.

Most of these soils have a thick organic surface layer in which tree roots grow. The entire acreage is woodland that consists of red spruce and associated hardwoods.

CAPABILITY UNIT VIIIs–1

This unit consists of Rock land, steep, which occurs as small steep or very steep areas on ridges and bluffs in the mountainous areas of the county. It is made up of massive outcrops of sandstone; in many places the sandstone cliffs are vertical. There is little soil material between the rocks.

This land type is wooded, but it is poorly stocked and the growth rate is slow. Commercial production cannot be expected. The areas are used for watershed protection, and they have value for scenic spots for recreational use and as landmarks in the rough, mountainous areas.

Estimated Yields

In table 2 are listed the estimated yields of the principal grain and forage crops and of permanent pasture grown in Greenbrier County, under two levels of management. These estimates cover an average 10-year period. They are based on census data, on records kept by farmers, and on the observations and experiences of other agricultural workers. New techniques may increase future yields, but the relative response of different soils cannot be expected to change much. Most land types and

those soils that are severely limited by slope, stoniness, and very severe erosion are not considered suitable for crops or pasture and have been omitted from the table.

The figures in columns A are estimates of yields to be obtained under ordinary management.

The figures in columns B are estimates of yields that can be expected under the best management now practical on these soils. This management consists of liming the soil to the pH value required by the crop, fertilizing according to the results of soil tests, using a good crop rotation, and using drainage and other practices that conserve soil and water where needed. Generally, improved management does not include the extensive use of manure, except on dairy farms, nor does it include irrigation. The management of permanent pasture includes using enough fertilizer to provide phosphate and potash as needed and enough lime to maintain a pH of 6.0 to 6.5.

TABLE 2.—*Estimated average yields per acre of the principal crops under two levels of management*

[Yields in columns A are obtained under ordinary management; those in columns B can be expected under improved management. Dashes indicate that the crop is not well suited at the specified level of management. Most land types and those soils that are severely limited by slope, stoniness, or very severe erosion are not considered suitable for crops or pasture and have been omitted]

Soil	Corn		Oats		Wheat		Clover and grass		Alfalfa and grass		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Albrights silt loam, 3 to 8 percent slopes	60	100	40	70	30	40	2.0	3.0	2.0	3.5	90	150
Alluvial land											50	100
Atkins silt loam	35	100	30	60	20	30	1.8	2.8			70	140
Atkins silty clay loam		80		50				2.5			60	130
Chavies fine sandy loam	70	120	40	75	25	45	2.0	3.5	2.5	4.5	90	155
Clarksburg silt loam, 3 to 10 percent slopes	60	100	40	65	30	40	2.0	3.0	2.0	3.5	90	150
Clymer fine sandy loam, 3 to 10 percent slopes	60	110	40	70	25	40	1.8	2.8	2.0	3.5	80	140
Clymer fine sandy loam, 10 to 20 percent slopes	50	100	35	65	22	35	1.6	3.2	2.8	4.2	60	140
Cookport loam, 3 to 8 percent slopes	40	90	40	65	22	35	1.8	3.0	1.6	3.2	60	135
Dekalb fine sandy loam, 5 to 12 percent slopes	40	70	28	50	18	30	1.5	2.4	1.6	2.8	40	110
Dekalb fine sandy loam, 12 to 25 percent slopes	35	65	26	45	16	25	1.3	2.2	1.4	2.6	35	100
Dekalb channery loam, 5 to 12 percent slopes	45	75	30	55	20	35	1.6	2.8	1.6	3.2	50	120
Dekalb channery loam, 12 to 25 percent slopes	40	70	28	50	18	30	1.4	2.6	1.6	3.0	40	105
Dekalb channery loam, 25 to 35 percent slopes											35	95
Dekalb-Buchanan loams, 5 to 20 percent slopes:												
Dekalb	40	70	28	50	18	30	1.5	2.4	1.6	2.8	40	110
Buchanan	40	70	35	50	20	30	1.6	2.6	1.8	3.0	60	130
Dekalb-Cookport loams, 3 to 12 percent slopes:												
Dekalb	45	75	30	55	20	35	1.6	2.8	1.6	3.2	50	120
Cookport	40	90	40	65	22	35	1.8	3.0	1.6	3.2	60	135
Elliber very cherty silt loam, 10 to 25 percent slopes	50	85	35	55	20	30	1.3	2.4	1.8	3.2	75	115
Ernest silt loam, 3 to 8 percent slopes	55	95	35	60	20	35	1.8	3.0	1.8	3.5	80	145
Ernest silt loam, 8 to 15 percent slopes	50	90	35	55	20	30	1.8	3.0	1.8	3.5	70	140
Frankstown silt loam, 3 to 10 percept slopes	75	120	40	70	30	40	2.2	3.5	2.5	4.5	110	165
Frankstown silt loam, 10 to 20 percent slopes	70	115	40	65	28	35	2.0	3.2	2.2	4.3	105	160
Frankstown silt loam, 20 to 30 percent slopes	65	105	30	55	25	35	1.8	3.0	2.0	4.0	100	150
Frankstown silt loam, karst, 10 to 20 percent slopes	70	110	40	60	28	38	2.0	3.2	2.0	4.3	105	160
Frankstown rocky silt loam, 10 to 20 percent slopes											100	130
Frankstown rocky silt loam, 20 to 30 percent slopes											90	125
Frederick cherty silt loam, 3 to 8 percent slopes	75	120	45	70	32	40	2.2	3.5	2.5	4.5	110	165
Frederick cherty silt loam, 8 to 15 percent slopes	70	115	45	65	30	35	2.0	3.2		4.3	105	155
Frederick cherty silt loam, 15 to 25 percent slopes	65	95	35	60	28	30	1.8	3.0		4.0	100	150
Frederick cherty silt loam, 25 to 45 percent slopes											90	135
Frederick cherty silt loam, karst, 3 to 8 percent slopes	75	115	45	70	32	45	2.2	3.5	2.5	4.5	110	165
Frederick cherty silt loam, karst, 8 to 15 percent slopes	70	110	45	60	30	35	2.0	3.2		4.3	105	155
Frederick very rocky soils, 3 to 15 percent slopes											80	130
Frederick very rocky soils, 15 to 25 percent slopes											70	120
Huntington silt loam, local alluvium	80	135	45	85	30	45	2.5	3.5	3.0	5.0	120	175
Laidig channery loam, 3 to 8 percent slopes	65	100	30	65	22	35	1.8	3.0	2.0	4.0	70	135
Laidig channery loam, 8 to 15 percent slopes	60	90	30	60	22	35	1.8	3.0	2.0	4.0	65	130
Lindside silt loam, local alluvium	75	125	32	80	25	40	2.2	3.5	2.5	4.0	115	170
Monongahela silt loam, 2 to 8 percent slopes	40	100	30	65	20	40	1.8	3.0	1.8	3.5	60	130
Monongahela silt loam, 8 to 15 percent slopes	35	90	28	60	20	35	1.8	3.0	1.8	3.2	55	120
Murrill channery loam, 8 to 15 percent slopes	55	105	30	65	22	35	1.6	2.9	2.2	3.8	75	140
Murrill channery loam, 15 to 25 percent slopes	50	95	28	60	20	30	1.4	2.8	2.2	3.6	70	130
Murrill very stony loam, 10 to 25 percent slopes											60	110
Philo silt loam	60	125	30	80	20	40	2.0	3.5	2.2	4.2	100	165

See footnotes at end of table.

TABLE 2.—*Estimated average yields per acre of the principal crops under two levels of management*—Continued

Soil	Corn		Oats		Wheat		Clover and grass		Alfalfa and grass		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Pickaway silt loam, 3 to 8 percent slopes	70	115	35	70	25	35	1. 8	3. 2	2. 0	4. 2	90	155
Pope fine sandy loam	70	120	35	70	25	40	2. 0	3. 2	2. 5	4. 5	90	150
Purdy silt loam	30	75	20	50	-----	-----	1. 5	2. 5	------	------	70	115
Sees silty clay loam	35	80	25	55	-----	-----	2. 0	3. 0	------	------	90	145
Summers channery loam, 5 to 15 percent slopes	40	70	25	50	18	30	1. 5	2. 4	1. 6	2. 8	60	120
Teas and Litz silt loams, 3 to 8 percent slopes	55	80	25	60	22	35	1. 8	3. 0	2. 2	3. 5	70	130
Teas and Litz silt loams, 8 to 15 percent slopes	50	75	25	55	22	35	1. 6	2. 8	2. 0	3. 2	65	120
Teas and Litz silt loams, 8 to 15 percent slopes, severely eroded	45	70	20	50	10	30	1. 5	2. 4	1. 8	3. 0	55	110
Teas and Litz silt loams, 15 to 25 percent slopes	40	65	20	50	18	30	1. 5	2. 4	1. 8	3. 0	55	100
Teas and Litz silt loams, 15 to 25 percent slopes, severely eroded	-----	-----	-----	-----	-----	-----	------	------	------	------	50	90
Teas and Litz silt loams, 25 to 40 percent slopes	-----	-----	-----	-----	-----	-----	------	------	------	------	50	80
Weikert shaly silt loam, 10 to 20 percent slopes	30	60	20	45	-----	-----	1. 5	2. 2	------	------	40	80
Weikert shaly silt loam, 20 to 30 percent slopes	-----	-----	-----	-----	-----	-----	------	------	------	------	40	65
Weikert-Berks complex, 20 to 30 percent slopes	-----	-----	-----	-----	-----	-----	------	------	------	------	40	65
Westmoreland silt loam, 3 to 10 percent slopes	60	100	28	70	25	40	2. 0	3. 0	2. 5	4. 0	95	145
Westmoreland silt loam, 10 to 20 percent slopes	55	90	26	65	23	35	1. 8	3. 0	2. 2	3. 8	85	135
Westmoreland silt loam, 20 to 30 percent slopes	50	85	22	60	20	30	1. 8	2. 8	2. 0	3. 5	75	125
Westmoreland silt loam, 20 to 30 percent slopes, severely eroded	-----	-----	-----	-----	-----	-----	------	------	------	------	65	110
Westmoreland silt loam, 30 to 45 percent slopes	-----	-----	-----	-----	-----	-----	------	------	------	------	60	110

[1] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for two cows has a carrying capacity of 60 cow-acre-days.

The response to good management is best on deep soils that have favorable texture and high available moisture capacity, such as those of the Frederick series. The response is limited on soils that have a relatively high natural fertility but poor physical properties, such as those of the Sees series. Under improved management, yields of hay and pasture can be expected to increase more than yields of corn and small grain because management practices now commonly used to produce corn and small grain are already better than average.

Use of the Soils for Woodland [2]

Soil properties have a strong influence on the growth of trees and the management of woodland. Differences in depth and texture, for example, cause differences in available moisture capacity and thereby influence the growth rate of trees. Other features, such as slope, aspect, stoniness, rockiness, or a clayey subsoil, affect woodland management.

About 78 percent of Greenbrier County, or approximately 513,000 acres, is woodland. Nearly 20 percent of the woodland, or 99,000 acres, is in the Monongahela National Forest. About 5,400 acres is in the Greenbrier State Forest, near White Sulphur Springs. In the extensive wooded areas in the eastern part of the county east of the Greenbrier River, the soils are mostly of the Dekalb, Berks, Weikert, and Ernest series. In these areas the average annual precipitation is about 38 inches. In the large wooded areas in the mountainous area northwest of Williamsburg, the soils are mainly of the Dekalb, Gilpin, Laidig, and Ernest series. In these areas the average annual precipitation is between 50 and 55 inches. Elevations are generally about 3,000 feet to as much as 4,000 feet. Small farm woodlots make up most of the remaining woodland.

The most common forest types, or natural associations of trees, are the oak-hickory type, which makes up about 70 percent of the forested area; the beech-birch-maple type, which makes up about 20 percent; other hardwoods, which make up about 5 percent; and white pine, pitch pine, Virginia pine, Table-Mountain pine, and other pines, which make up about 5 percent (*5*).

Woodland yields

Table 3 shows estimated yields per acre for even-aged, fully stocked, natural stands of selected trees. The data in this table are based on data shown in USDA Technical Bulletin No. 356 (*10*) and No. 560 (*15*) and on U.S. Forest Service Paper No. 124 (*11*). Comparable data were not available for black cherry, sugar maple, and other northern hardwoods, or white pine.

Woodland groups

The soils that have significant woodland acreage in Greenbrier County have been placed in 15 woodland groups. Each group consists of soils that have about the same suitability for wood crops, that require about the same management, and that have about the same potential productivity. The names of soil series represented are mentioned in the description of each group, but this

[2] ROSS H. MELLINGER, woodland conservationist, Soil Conservation Service, helped prepare this section.

TABLE 3.—*Yields per acre from upland oaks, yellow-poplar, and Virginia pine in even-aged, fully stocked, natural stands*

[All numbers are rounded to the nearest whole number. Dashes indicate that data were not available or do not apply]

Site index	Age of stand	Merchantable volume				
		Upland oaks		Yellow-poplar		Virginia pine
	Years	*Cords* [1]	*Bd. ft.* [2]	*Cords* [3]	*Bd. ft.* [2]	*Cords* [4]
40	30	3	100	------	--------	----------
	50	12	1, 400	------	--------	----------
	70	21	4, 250	------	--------	----------
50	30	6	350	------	--------	[5] 11
	50	19	3, 250	------	--------	[5] 18
	70	30	8, 150	------	--------	----------
60	30	10	850	10	1, 000	19
	50	26	6, 300	21	5, 600	31
	70	39	12, 800	------	--------	----------
70	30	15	1, 750	15	2, 650	33
	50	33	9, 750	31	11, 400	54
	70	47	17, 700	------	--------	----------
80	30	20	3, 350	21	5, 500	57
	50	41	13, 750	41	17, 620	93
	70	56	23, 100	------	--------	----------
90	30	------	--------	27	8, 710	----------
	50	------	--------	52	24, 400	----------
	70	------	--------	------	--------	----------
100	30	------	--------	32	12, 150	----------
	50	------	--------	62	32, 150	----------
	70	------	--------	------	--------	----------

[1] Unpeeled volume of merchantable stems to a top diameter of 4 inches, outside bark.

[2] According to International rule, 1/8 inch, for stems to a top diameter of 5 inches, inside bark.

[3] Peeled volume of all trees 5 inches or more in diameter breast high and to a top diameter of 3 inches, inside bark. Based on conversion factor of 86.4 cubic feet of solid wood per cord.

[4] Merchantable volume of all stems 4 inches or more in diameter breast high and to a top diameter of 4 inches, outside bark, in stands of 100 percent density. Based on a conversion factor of 85 cubic feet equals 1 standard cord.

[5] Extrapolated value.

does not mean that all the soils in a given series are in the group. The woodland group classification of each soil is given in the "Guide to Mapping Units." Soils that are not suitable for woodland or are not considered important to such use are not in a woodland group, and for these soils, onsite investigation is needed. Among these are soils of the Atkins, Chavies, Huntington, Lindside, Philo, Pickaway, Pope, Purdy, and Sees series, as well as Alluvial land, Mine dump, Strip mine spoil, and Rock land, steep.

The potential of a soil for a species is expressed as site index. The site index represents the average height, in feet, of the dominant and codominant trees on a given soil at an age of 50 years. For several soils in Greenbrier County, the site index was obtained by measuring the height of certain trees at a given age and on known soils. These and other site index measurements that were made on the same or similar soils in nearby counties were used to establish the estimated range of site index. There are variations in site index from one area to another of the same soil because of differences in aspect, which is shown as either north or south. Slopes that face north or east of a line drawn from true northwest to true southeast have a north aspect, and those that face south or west of this line have a south aspect.

Plant competition from brush, grass, vines, and other plants affects the establishment of tree seedlings in planted or natural stands. The competition is slight if unwanted plants are no special problem. It is moderate if invading plants delay but do not prevent the establishment of desirable seedlings. Some site preparation may be required, and after the seedlings are established, some release may be necessary. Competition is severe if undesirable plants prevent adequate regeneration of planted or natural stands. Where competition is severe, intensive site preparation is necessary, and generally more than one release by chemical or mechanical means is needed.

Seedling mortality reflects the expected loss of tree seedlings in natural or planted stands, but plant competition is assumed not to be a limiting factor. It is also assumed that acceptable grades of planting stock are planted during normal spring weather. The important features considered are soil texture, depth, and aspect. A rating of slight means that loss of less than 25 percent of the seedlings can be expected; a rating of moderate means that loss of 25 to 50 percent can be expected; and a rating of severe means that loss of more than 50 percent can be expected.

The erosion hazard is based on the risk of gully erosion incurred in managing and harvesting tree crops. It is generally related to layout, construction, and care of woodland roads and skid trails. The rating is slight if potential erosion is unimportant; it is moderate if some attention, such as diversion of water, is needed to limit accelerated erosion; and it is severe if intensive treatment is needed to control soil loss. If the hazard is severe, special care is needed in locating and building woodland roads and skid trails, in diverting water during and after logging operations, and, in places, in seeding grass.

The ratings for equipment limitations indicate the degree to which ordinary equipment that is used in tending and harvesting trees is commonly restricted. They are based on the effect of such soil features as internal drainage, texture, slope, and number and size of stones. The limitation is slight if there are no restrictions as to kind of equipment, or to time of year the equipment can be used. The limitation is also generally slight where slope is less than 15 percent. It is moderate if the use of equipment is restricted for less than 3 months a year or if the slope generally ranges from 15 to 35 percent. The limitation is severe if equipment cannot be used for more than 3 months of the year, if specially designed equipment is needed, if large or numerous stones seriously interfere with cultivation or with harvesting, or if the slope is more than 35 percent.

WOODLAND GROUP 1

This group consists of deep, well-drained, mostly gently sloping to steep soils of the Elliber, Frankstown, and Frederick series. These soils formed in material

weathered from limestone. Chert fragments are common, and ledges of limestone crop out in places. These soils occupy much of the acreage of smoother slopes in the limestone valley areas in the central part of the county. They are used mainly for crops and pasture. They are moderately fertile and hold moisture well.

Most of the woodlots are small, and many of them include overmature oaks. The woodlots are generally grazed. Most management problems are related to limitations on the use of equipment, competition from unwanted plants, and control of erosion.

The soils in this group are excellent for growing high-quality hardwoods. The estimated site index is 75 to 85 for upland oaks and 85 or more for yellow-poplar.

The species preferred for high-quality timber in natural stands are yellow-poplar, basswood, red oak, black oak, white oak, white ash, and black walnut. Those suitable for plantings in open land or understocked woodland are white pine, red pine, Norway spruce, Japanese larch, black walnut, black locust, and yellow-poplar. The species preferred for Christmas tree plantings in nonstony areas where the slope is less than 30 percent are white pine, Scotch pine, Norway spruce, and Douglas-fir.

Plant competition is moderate in managed natural stands of hardwoods, but it is severe where conifers have been introduced. Large openings in the tree canopy encourage the growth of grasses and undesirable trees and shrubs. In old fields, planted seedlings have competition from sod grasses, annual weeds, and brush, so careful preparation of the site is generally needed. Natural seeding cannot be relied upon to restock large open areas with suitable species.

Where sites are adequately prepared, seedling mortality is only slight.

The erosion hazard is moderate to severe where the slope is more than 20 percent. In places the diversion of water and the seeding of grasses is needed to stabilize roads and skid trails after logging.

Limitations on the use of equipment range from slight to severe. The combination of moderate to steep slopes and the moderately fine to fine texture of the subsoil causes moderate to severe restrictions on the Frederick and Frankstown soils. In winter and early in spring, logging operations should be restricted to times when the ground is frozen. Equipment limitations on Elliber soils progress from slight to severe as the slope increases. The high content of chert supports heavy equipment well.

WOODLAND GROUP 2

This group consists of deep, well-drained, very rocky, mostly strongly sloping to steep soils of the Frederick series. These soils formed in material weathered from limestone. They occur in the limestone valley areas in the central part of the county. They are used almost exclusively for bluegrass pasture. Outcrops of limestone ledges are common. These soils hold water well, except in the small spots where bedrock is near the surface. Included were many small spots that are moderately deep or shallow over limestone bedrock.

Generally, the woodlots are small. They occur mainly in the steeper areas and are generally grazed. Most management problems are caused by the rockiness that limits the use of equipment and causes variations in site quality.

The soils in this group are fair to excellent for growing hardwoods. The estimated site index is 60 to 85 for upland oaks and 65 to 95 for yellow-poplar. This wide range in estimated site index is based on the effects of variation in soil depth and of outcrops of ledge rock; otherwise, most of these soils would be in the upper two-thirds of the range.

The species generally preferred for timber in natural stands on the deep soils are red oak, white oak, black oak, yellow-poplar, white ash, basswood, and black walnut. Those suitable for plantings are white pine, red pine, Japanese larch, black locust, yellow-poplar, and black walnut. The trees better suited for plantings in shallow soils are the pines, larch, and black locust. These soils are not well suited to Christmas trees.

Plant competition that is moderate to severe can be expected. Grasses and undesirable trees come in when large openings are made in the tree canopy to obtain natural reproduction. They interfere with the establishment and growth of desirable tree seedlings. Grass sod, annual weeds, and brush compete with planted seedlings in old fields. Planting sites need to be well prepared before planting. Natural reseeding cannot be relied on to stock large open fields with suitable tree species.

When sites are prepared to reduce competition, only slight seedling mortality is to be expected.

The erosion hazard is slight where the slope is not more than 15 percent, moderate where the slope is 15 to 25 percent, and severe on slopes of more than 25 percent. Careful layout of roads on gentle gradients, diversion of water, and the seeding of grasses soon after logging help to stabilize the slopes.

Limitations on the use of logging equipment are moderate to severe. The use of the equipment is restricted by a combination of slope, rock outcrops, and clayey subsoil.

WOODLAND GROUP 3

This group consists of deep, well drained to moderately well drained, gently sloping to steep, loamy soils of the Albrights, Clarksburg, Ernest, Laidig, and Murrill series. These soils formed in colluvium accumulated from upland areas underlain by shale and sandstone. They occur as small areas scattered throughout the eastern two-thirds of the county, mainly at elevations of 1,800 to 2,500 feet. In these areas the annual precipitation is about 38 inches. A large part of the acreage is used for crops or pasture. The available moisture capacity is high to moderate.

Most of the management problems are related to control of erosion, to limitations on the use of equipment, and to severe plant competition for pines.

The soils in this group are good for timber. The estimated site index is generally 65 to 75 for upland oaks, 70 to 85 for yellow-poplar, and 75 to 85 for white pine.

The species generally preferred for timber in natural stands are yellow-poplar, red oak, white oak, black oak, white ash, black walnut, and white pine. Those suitable for plantings in open land or understocked woodland are white pine, red pine, Japanese larch, Virginia pine, black locust, and yellow-poplar. Black walnut is suitable for plantings on Albrights, Laidig, and Murrill soils.

The species preferred for Christmas tree plantings in nonstony areas where the slope is less than 30 percent are Scotch pine, white pine, and Norway spruce. Douglas-fir can also be used if it is kept out of forest pockets.

Plant competition for hardwoods, which regenerate readily, is slight; but it is moderate to severe for pines, whether naturally seeded or planted. The pines have competition from hardwood brush.

Seedling mortality of planted or naturally seeded trees is only slight.

The erosion hazard is slight where the slope is 3 to 15 percent, moderate where the slope is 15 to 25 percent, and severe where the slope is more than 25 percent. When building woodland roads, deep cuts should be avoided because of the hazard of land slippage. More attention to water disposal is needed on soils of this group than on other soils because these soils are at the base of long slopes.

Limitations on the use of equipment are moderate to severe, because of the combination of seep spots, a seasonal high water table, stones, and, in places, slope. Summer or early fall is the most favorable time for logging, but harvesting can also be done in winter, when the snow is packed and the ground is frozen.

WOODLAND GROUP 4

This group consists of deep, well drained and moderately well drained, gently sloping to moderately steep, extremely stony soils of the Ernest and Laidig series. These soils formed in colluvium accumulated by soil creep from upslope areas. They occur on the lower part of foot slopes and in concave areas in the middle of long slopes in the mountainous areas in the extreme northwestern part of the county. Elevations are as much as 3,500 feet. Rainfall is well above average in these areas. There are numerous large stones, and boulders as much as 10 feet across are common. Seep spots are fairly common throughout the acreage. The well drained Laidig soils make up about three-fourths of the acreage, and the moderately well drained Ernest soils make up most of the rest. Fertility is moderate, and the available moisture capacity is moderate to high.

Almost all the acreage is woodland. Management problems are related mainly to the control of erosion and to equipment limitations.

The soils in this group are excellent for growing high-quality hardwoods. The estimated site index generally is 75 to 85 for upland oaks, black cherry, and white ash; it is 85 to 95 for yellow-poplar.

The preferred species for high-value timber in natural stands are red oak, yellow-poplar, black cherry, white ash, and sugar maple. There is little or no need for planting on these soils. If needed, however, preferred species are yellow-poplar, red oak, white ash, black cherry, or white pine. These soils are not suited to Christmas trees.

Plant competition is slight for hardwoods, which readily reproduce naturally.

Seedling mortality is slight. High rainfall and good available moisture capacity assure a high survival rate for seedlings.

The erosion hazard is slight where the slope is 3 to 15 percent and moderate where the slope is 15 to 30 percent. It is greater near the bottom of long slopes than in other areas because runoff is received from above. Consequently, more attention to diverting water from roads is needed. There is some hazard of land slippage if deep cuts are made when building roads in steeper areas.

Limitations on the use of equipment are moderate to severe in many places. The use of equipment is restricted by the numerous large stones and boulders, the high water table in winter and early in spring, and the numerous seep spots. Summer or early fall is the most favorable time for logging. Logging in winter on packed snow or frozen ground helps to avoid damage to the soil and tree roots.

WOODLAND GROUP 5

This group consists of deep, moderately well drained, gently sloping to strongly sloping soils of the Cookport and Monongahela series. These soils formed in acid material weathered from sandstone or shale. They occur on ridges and stream terraces. They have a firm, slowly permeable layer or fragipan at a depth of about 2 feet. The fragipan restricts the movement of water and the growth of roots, and water accumulates above the fragipan in wet periods. Seep spots are fairly common. Most of the acreage is used for general farming. The available moisture capacity is moderate.

The woodlots are generally small, but there are some fairly large tracts of woodland on smooth ridges on the Cookport soil. Hardwoods grow on the soils of this group in the northwestern part of the county. Oak and pine grow on Monongahela soils in the ridge and valley part of the county. Management problems are related mainly to equipment limitations and to plant competition for pine on Monongahela soils.

The soils in this group are good for trees. The estimated site index is 65 to 75 for upland oaks, black cherry, white ash, and Virginia pine. It is 75 to 85 for white pine.

The preferred species for timber in natural stands on the Cookport soil are red oak, black cherry, white ash, and sugar maple. The preferred species for sawtimber on Monongahela soils are red oak, black oak, white ash, and white pine; for pulpwood, it is Virginia pine. Trees suitable for planting on Monongahela soils are white pine, red pine, Japanese larch, and Virginia pine. Tree plantings are not likely to be needed on Cookport soils. The species suitable for Christmas tree plantings are white pine, Scotch pine, Norway spruce, and Douglas-fir.

Plant competition is only slight for hardwoods, but it is moderate to severe for pines.

Seedling mortality is only slight.

The erosion hazard is generally slight because these soils have gentle slopes.

Limitations on the use of equipment are moderate because water stands above the fragipan in winter. In winter or early in spring, logging should be done only on packed snow or when the ground is frozen hard.

WOODLAND GROUP 6

This group consists of shallow and moderately deep, moderately steep to very steep, droughty, medium-textured soils of the Berks and Weikert series. These soils formed in material weathered from shale, siltstone, and thin-bedded sandstone. They are mapped as com-

plexes and are extensive in the ridge and valley section in the eastern part of the county. The shallow Weikert soils most commonly occur on south-facing slopes and on ridges and exposed points. The moderately deep Berks soils, which are somewhat less droughty, are most common on north-facing slopes below the ridges and in sheltered coves and draws. These soils have a high content of small rock fragments. The available moisture capacity is low to moderately low.

Most of the acreage has remained in woodland of mixed oaks and Virginia pine, but there are some white pines, either singly or in small stands. Some of the acreage has been cleared and then allowed to grow up to Virginia pine or mixed oaks. The pines are more productive than are the hardwoods. Management problems are related mainly to limitations on equipment in steep areas, control of erosion, plant competition where hardwood stands are converted to pines, and seedling mortality on south aspects, ridgetops, and points.

The soils in this group are poor to fair for trees. Site quality is affected by the depth of the soil and the aspect. The sites on north aspects below the ridges and in sheltered coves and draws are better than those in other areas. The estimated site index for oaks and Virginia pine is 55 to 65 on north aspects and 45 to 55 on south aspects; for white pine, it is 65 to 75 on north aspects and 55 to 65 on south aspects.

The trees generally preferred for commercial production in natural stands are pines, but the main species growing in natural stands are white oak, black oak, red oak, scarlet oak, chestnut oak, hickory, Virginia pine, pitch pine, white pine, and Table-Mountain pine. These soils are not well suited to high-quality sawtimber. The species preferred for planting in old fields or understocked woodland are white pine and Virginia pine. The species preferred for Christmas tree plantings where the slope is not more than 30 percent are Scotch pine and white pine.

Plant competition is slight for hardwoods and slight to severe for pines. Pines have more serious competition on north aspects and in coves than in other places.

Seedling mortality for natural and planted tree seedlings is severe on south aspects, ridges, and points.

The erosion hazard is slight where the slope is 20 to 30 percent and moderate where the slope is more than 30 percent. Good layout of roads and simple water diversion measures generally control erosion.

Limitations on the use of equipment range from moderate where the slope is 20 to 30 percent to severe where the slope is more than 30 percent. Once roads have been properly established, seasonal restrictions on the use of equipment are slight. The shale and sandstone fragments in these soils make a favorable base for roads. Logging roads are needed for harvesting in steep areas.

WOODLAND GROUP 7

This group consists of shallow and very shallow, strongly sloping to very steep, very droughty Weikert soils and of Steep eroded land, shale materials. Weikert soils formed in material weathered from thin-bedded shale. These soils occur on steep foothills along Anthony Creek and Little Creek in the eastern part of the county. Steep eroded land occurs as many small, very severely eroded areas scattered throughout the shale and siltstone areas. Fertility is generally low. The available moisture capacity is low to very low. The erosion hazard is severe.

Most areas of Weikert soils have remained in woods, and many areas of Steep eroded land are growing up to Virginia pine and hardwoods. Pines are more productive than are hardwoods. The most important management problems are related to loss of seedlings caused by droughtiness and the limitations on the use of equipment caused by the slope.

These are poor soils for trees, and they are not suitable for hardwood sawtimber. The estimated site index is 45 to 55 for upland oaks and Virginia pine, and it is 55 to 65 for white pine.

The species preferred in natural stands are Virginia pine and white pine. Among the hardwoods preferred for cordwood are chestnut oak and scarlet oak. The species preferred for plantings are Virginia pine and white pine, and those suitable for Christmas tree plantings where the slope is less than 30 percent are white pine and Scotch pine.

Pines can be grown on these soils with only slight to moderate plant competition from hardwood brush. Plant competition is slight for hardwoods.

Seedling mortality is severe in planted or natural stands, especially on south aspects.

The erosion hazard is generally moderate. It is severe where the slope is more than 30 percent.

The limitations on the use of equipment are slight where the slope is 10 to 20 percent, moderate where the slope is 20 to 30 percent, and severe where the slope is more than 30 percent. Where woodland roads have been established, seasonal restrictions on the use of equipment are slight. The high content of shale in these soils makes a good base for roads and skid trails.

WOODLAND GROUP 8

This group consists mainly of moderately deep, gently sloping to moderately steep, channery or very stony soils of the Cookport, Dekalb, Gilpin, and Summers series. These soils formed in material weathered from interbedded shale and sandstone. They are on high mountain ridges in the extreme northwestern part of the county at elevations of about 3,000 to 4,000 feet. Winters are severe in these areas, and the annual precipitation is about 50 to 55 inches. The available moisture capacity is moderate in most places. The Cookport soils are slightly wet.

More than three-quarters of the acreage is in red spruce and mixed oaks and other northern hardwoods (fig. 4). Except for seasonal limitations on the use of equipment on Cookport soils, there are few soil-related management problems. Ice glaze and snow damage occur frequently in these high, exposed areas.

The soils in this group are well suited to oaks and northern hardwoods. The estimated site index is generally 65 to 75 for oaks, black cherry, and white ash.

The main species suitable for high-value hardwoods in natural stands are red oak, black cherry, white ash, and sugar maple. Tree plantings are seldom needed, but if needed, black cherry, white ash, red oak, white pine, and Norway spruce may be used. The soils are not generally suitable for Christmas tree plantings, because of the stones that limit intensive cultivation. In nonstony areas, Scotch pine, white pine, and Norway spruce could be grown.

Figure 4.—A 50-year-old stand of northern hardwoods. The trees are black cherry, sugar maple, and white ash. This is an area of gently sloping Cookport soil, which is in woodland group 8. The elevation is 3,800 feet.

Plant competition is only slight for hardwoods, but it is moderate to severe for conifers. Conifers have competition from hardwood brush.

Seedling mortality is generally slight.

The erosion hazard is only slight. It is associated with logging roads and skid trails.

The limitations on the use of equipment are slight on Dekalb and Summers soils. They are moderate for use of logging equipment on Cookport soils because these soils have a high water table in winter and early in spring.

WOODLAND GROUP 9

This group consists of moderately deep, mainly moderately steep to very steep, very stony soils of the Calvin, Dekalb, and Gilpin series. These soils formed in material weathered from interbedded shale and sandstone. They occur mostly on side slopes in the high mountainous area in the northwestern part of the county. Elevations are 2,500 to 4,000 feet. In these areas the annual precipitation is 50 to 55 inches. The available moisture capacity is moderate to high.

Almost all the acreage is in mixed oaks and other northern hardwoods. Large areas are within the Monongahela National Forest. The main management problems are caused mainly by the slope, but to some extent, by stones.

The soils in this group are well suited to excellent for high-quality hardwoods. The sites on south aspects are good, and those on north aspects are excellent. The estimated site index for upland oaks, black cherry, and white ash is 75 to 85 on north aspects and 65 to 75 on south aspects.

The hardwood species commonly preferred for high-value timber in natural stands are red oak, black cherry, white ash, black walnut, and sugar maple. Tree plantings are generally not needed, but if they are needed, the suitable species are white pine, Norway spruce, black cherry, white ash, and red oak. The soils are not well suited to Christmas trees, because the numerous stones seriously interfere with cultivation.

Plant competition is only slight for hardwoods but is moderate for conifers on south aspects and severe on north aspects. Conifers have competition from hardwoods.

Seedling mortality is only slight.

The hazard of gully erosion on logging roads and skid trails ranges from slight, where the slope is 10 to 25 percent, to moderate, where the slope is more than 25 percent.

The limitations on the use of equipment are moderate where the slope is 10 to 25 percent, but severe where the slope is more than 25 percent. In some places stones are also a limitation.

WOODLAND GROUP 10

This group consists of moderately deep to deep, gently sloping to moderately steep soils of the Buchanan and Dekalb series. Dekalb soils formed in material weathered from sandstone. They are moderately deep and slightly droughty. They occur on sandstone benches and on low mountain ridges in the eastern part of the county. Buchanan soils are deep and moderately well drained. They occur with Dekalb soils on the lower part of slopes.

Elevations range from about 2,000 to 3,000 feet. The annual precipitation is about 36 to 38 inches. The available moisture capacity is moderate to moderately low.

More than half the acreage is in woodland that consists mainly of mixed oaks and associated hardwoods (fig. 5). There are some stands of Virginia pine, and in some places white pine is associated with the hardwoods. The main management problem is plant competition in the stands of pine.

The soils in this group are fairly well suited to trees. The estimated site index is 60 to 70 for upland oaks, Virginia pine, and pitch pine. It is 70 to 80 for white pine. The estimated site indexes for trees on the Buchanan soil are at the top of the range for this group.

The species preferred for timber in natural stands are red oak, white oak, black oak, and white pine. Other hardwoods common in natural stands are hickory, chestnut oak, scarlet oak, red maple, and black locust. Species suitable for pulpwood in natural stands are Virginia pine, pitch pine, and Table-Mountain pine. Species suitable for planting are white pine, red pine, Virginia pine, and Japanese larch. Hardwoods are not well suited for planting. The Dekalb fine sandy loams are better suited to Christmas trees than are the other soils. The species generally preferred for Christmas tree plantings are Scotch pine, white pine, Norway spruce, and Douglas-fir.

Moderate to severe competition can be expected in the reproduction of pines. There is little difficulty with hardwoods except for the tendency of chestnut oak and scarlet oak to dominate new stands.

Seedling mortality is generally slight.

Erosion is only a slight hazard in the construction and use of logging roads and skid trails.

The limitations on the use of equipment on the Dekalb soil are slight where the slope is 5 to 12 percent and moderate where the slope is 12 to 25 percent. The limitations are moderate on the Buchanan soil because of the seasonal high water table.

WOODLAND GROUP 11

This group consists of moderately deep, mostly very stony soils of the Berks and Dekalb series. These soils are steep to very steep in most places, but in some places they are moderately steep. They formed in material weathered from interbedded shale and sandstone. They occur on uplands on the side slopes of low mountains and ridges in the eastern part of the county. Elevations are about 2,000 to 3,000 feet. Precipitation ranges from about 36 inches to 38 inches. The available moisture capacity is moderate to moderately low.

Almost all the acreage is wooded. The stands are most commonly mixed oaks and other hardwoods, but there are small stands of Virginia pine and scattered white pines. Most of the management problems are associated with the use of equipment and the erosion hazard caused by the long, steep slopes and by stones.

The soils in this group are poorly suited to well suited to trees. The estimated site index for upland oaks and Virginia pine is 60 to 75 on north aspects and 50 to 65 on south aspects; that for white pine is 70 to 85 on north aspects and 60 to 75 on south aspects.

Figure 5.—A 50-year-old stand of mixed oaks on top of Kates Mountain. The soil is Dekalb very stony loam, which is in woodland group 10.

The species suitable for high-value wood crops in natural stands on north aspects are commonly red oak, black oak, white oak, and sugar maple. In coves there are smaller amounts of yellow-poplar, cucumbertree, and basswood. Those suitable in natural stands on south aspects are white pine, Virginia pine, pitch pine, scarlet oak, chestnut oak, black oak, and hickory. The pines are potentially more productive than the hardwoods. The species preferred for planting are white pine, red pine, Virginia pine, and Japanese larch. These soils are generally not suitable for Christmas trees, because of the slope and the numerous stones.

For reproduction of pines, plant competition from hardwoods is moderate to severe on north aspects and slight to moderate on south aspects. Usually, only slight competition develops for hardwoods. However, such species as scarlet oak and chestnut oak tend to dominate hardwood reproduction.

Seedling mortality is generally slight, but it is moderate on the upper part of south-facing slopes.

The hazard of gully erosion is moderate because of the generally steep slopes. The numerous small sandstone fragments and shale chips reduce the hazard of serious gullying on roads and trails, even in the steeper areas.

The limitations on the use of equipment are severe because of the slope and the numerous stones.

WOODLAND GROUP 12

This group consists of moderately deep, gently sloping to very steep soils of the Litz and Teas series. These soils formed in material weathered from red and gray shale and siltstone, some strata of which are weakly calcareous. They are on foothills in and around the limestone valley areas in the central and western parts of the county. Elevations range from 1,800 to about 2,600 feet. Precipitation averages about 38 inches. The available moisture capacity is moderate in most places.

Much of the steeper acreage is in mixed oaks and other associated hardwoods, but a large part of the smooth slopes have been cropped and severe erosion is common. Fairly large areas have been allowed to grow up to woodland, and many of these areas have stands of Virginia pine. The most important management problems are the limitations on the use of equipment and the control of erosion caused by the slope.

The soils in this group are fairly well suited to well suited to trees. The estimated site index for upland oaks and Virginia pine is 65 to 75 on north aspects and 55 to 65 on south aspects; that for white pine is 75 to 85 on north aspects and 65 to 75 on south aspects.

The species preferred for high-quality sawtimber in natural stands on north aspects and in coves are red oak, basswood, yellow-poplar, sugar maple, white ash, and some black walnut. Those hardwood species preferred in natural stands on south aspects are red oak, black oak, white oak, sugar maple, white pine, and Virginia pine. The species suitable for planting on north aspects are white pine, Virginia pine, Japanese larch, Norway spruce, red oak, white ash, and black locust. Those preferred for planting on south aspects are white pine and Virginia pine. The species suitable for Christmas tree plantings in nonstony areas where the slope is less than 30 percent are Scotch pine, white pine, Norway spruce, and Douglas-fir.

Plant competition is moderate to severe for stands of pines on north aspects but slight to moderate on south aspects. The pines have competition from hardwoods.

Seedling mortality is generally only slight, but it is moderate in some severely eroded areas where the slope has a north aspect.

The erosion hazard is slight where the slope is 3 to 15 percent, moderate where the slope is 15 to 40 percent, and severe where the slope is 40 to 60 percent.

The limitations on the use of equipment are slight where the slope is 3 to 15 percent, moderate where the slope is 15 to 25 percent. They are severe where the slope is more than 25 percent.

WOODLAND GROUP 13

This group consists of moderately deep, well-drained soils of the Westmoreland series. These soils are steep to very steep in most places, but they range from gently sloping to very steep. They formed in material weathered from interbedded shale, limestone, and sandstone. They occur on low hills, mostly on the western side of the limestone valley in the central part of the county. Elevations are mainly 2,000 to 2,800 feet. The average annual precipitation is about 38 inches. Most of these soils have been used for pasture. The available moisture capacity is high to moderate.

Some of the severely eroded areas have been allowed to grow up to mixed hardwoods, and some of the steeper areas have remained in oaks, yellow-poplar, and other hardwoods. The most important management problems are the limitations on the use of equipment and the control of erosion on the steep slopes.

The soils in this unit are well suited to excellent for high-quality hardwoods. Conifers are well suited to plantations in old fields. The estimated site index for upland oaks is 75 to 85 on north aspects and 65 to 75 on south aspects. For white pine, it is 85 to 95 on north aspects and 75 to 85 on south aspects. The estimated site index for yellow-poplar on north aspects is 85 to 95.

The species most commonly preferred for high-value timber in natural stands are red oak, black oak, white oak, yellow-poplar, white ash, sugar maple, black locust, and black walnut. Those suitable for planting are white pine, red pine, Norway spruce, Japanese larch, yellow-poplar, red oak, and black locust. The hardwoods are better suited to planting on north aspects. The species suitable for Christmas tree plantings where the slope is less than 30 percent are Scotch pine, white pine, Norway spruce, and Douglas-fir.

Plant competition is moderate to severe for stands of trees in old fields. The trees have competition from grasses and brush. The competition is moderate in hardwood stands. The hardwoods have competition from unwanted shrubs, grasses, and herbaceous plants.

Seedling mortality is only slight for natural or planted seedlings.

The erosion hazard is slight where the slope is 3 to 20 percent, moderate where the slope is 20 to 30 percent, and severe where the slope is more than 30 percent.

WOODLAND GROUP 14

This group consists of deep, well-drained, gently sloping to strongly sloping, loamy soils of the Clymer series. These soils formed in material weathered from sandstone. They occur on sandstone flats in and around the

limestone valley in the central part of the county. They are most extensive near Auto and on Muddy Creek Mountain. Elevations range from about 2,000 to about 2,800 feet. The annual precipitation is about 38 inches. More than half the acreage is used for crops and pasture. The available moisture capacity is high.

The woodland consists mainly of mixed oaks and other hardwoods. There are no important management problems associated with these soils.

These soils are excellent for growing trees. The estimated site index is 75 to 85 for upland oaks and 85 to 95 for white pine.

The species suitable for high-value trees in natural stands are red oak, black oak, white ash, and white pine. Those suitable for planting are white pine, red pine, Norway spruce, Japanese larch, yellow-poplar, red oak, and white ash. These soils are excellent for Christmas trees. The species suitable for Christmas tree plantings are white pine, Scotch pine, Douglas-fir, and Norway spruce.

Plant competition is severe in stands of pine but slight in stands of hardwoods, which reproduce easily. Scarlet oak tends to dominate many new stands. Pines have competition from hardwoods.

Seedling mortality, the erosion hazard, and the limitations on the use of equipment are slight.

WOODLAND GROUP 15

This group consists of well-drained to poorly drained soils of the Andover, Dekalb, and Nolo series, and of Stony rock land. Elevations range from 3,000 to more than 4,000 feet. Winters are severe. The annual precipitation is about 55 inches, and snow covers the ground for long periods. Stones cover about 15 percent to essentially the entire surface, and there are many large boulders. A mat of black organic matter, as much as 10 inches thick, commonly covers the surface. Beneath the mat, the surface layer is loam to sandy loam.

The entire acreage is wooded. Red spruce in dense stands is most typical, but in places there are also hemlock, red maple, and yellow birch. The most important management problem is the limitation of equipment caused by the extreme stoniness.

Generally, these soils are poorly suited to trees. The estimated site index is 45 to 55 for red spruce.

The principal species suitable for natural stands is red spruce. Tree plantings are not needed and are not feasible.

Plant competition is slight in stands of spruce.

Seedling mortality is probably severe because the numerous stones make an unfavorable seedbed and rooting medium.

The erosion hazard is slight.

The limitations on the use of equipment are severe because of the many large stones.

Use of the Soils for Wildlife [3]

Greenbrier County has a relative abundance of native wildlife because of its favorable climate and soils and its extensive woodland and farming areas. White-tailed deer, grouse, wild turkeys, squirrels, and a few black bears find habitat in the large woodland areas. Quail, rabbits, squirrels, mourning doves, and woodchucks find habitat in the farming areas. Ducks and other wetland wildlife are not numerous.

The demand for areas developed either solely or mainly as wildlife habitat is increasing. The kind and number of wildlife depend largely on the availability of food, cover, and water. Unless the habitat provides these elements throughout the year, some kinds of wildlife will be scarce or absent. The habitat can be improved by inducing the natural establishment of plants, manipulating the existing vegetation, establishing new plantings, and improving the water supply.

The soil-wildlife interpretations in this section are based upon soil maps. The interpretations are guides, but for detailed planning and application, they must be supplemented by onsite investigation. No attempt is made to relate individual kinds of wildlife to soils. Neither was consideration given to present land use, size of areas, economic values, existing vegetation, the relationship of one soil to another, and the mobility of wildlife.

The information in this section can be used in—

1. Planning for parks, wildlife refuges, nature study areas, recreational developments, and other broad-scale land use as wildlife habitat.
2. Selecting the better suited soils for the creation, improvement, and maintenance of wildlife habitat.
3. Determining the management intensity needed for satisfactory results.
4. Determining areas in which habitat preservation is desirable and those that are suitable for acquisition as wildlife habitat.

The suitability of the soils for elements of wildlife habitat (*1*) and to kinds of wildlife is shown in table 4. The ratings in this table are based on limitations imposed by the characteristics and the behavior of the soils. Particular soil properties commonly result in varying degrees of suitability for different habitat elements. For example, because one of the Dekalb soils has slopes of 25 to 35 percent, it has moderate limitations and a rating of "suited" for wild herbaceous upland plants but severe limitations and a rating of "unsuited" for grain and seed crops.

The ratings for kinds of wildlife were made on the basis of the ratings shown in the columns headed "Elements of wildlife habitat." Each rating was based on the ratings listed for the elements of habitat shown in the first part of the table. All elements were considered, but their importance varies from one kind of wildlife to another. For example, the rating for openland wildlife was based largely on the ratings shown for grain and seed crops and for grasses and legumes, but the ratings for wild herbaceous plants on uplands, for hardwood and coniferous plants, and for other elements also were considered. In determining the suitability rating for woodland wildlife, extra weight was given to the ratings for wild herbaceous plants and for hardwood and coniferous trees and shrubs. Because wetland wildlife must have wet or swampy areas, the rating for this kind of wildlife was based principally on the ratings listed for wetland food and cover plants, for shallow water developments, and for impoundments.

[3] WILLIAM J. MELVEN, field biologist, Soil Conservation Service, helped prepare this section.

TABLE 4.—*Suitability of the soils for elements*

[Dashes indicate that onsite

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants
Albrights: AbB	Suited	Well suited	Well suited	Well suited	Poorly suited
Alluvial land: Ad	---	---	---	---	---
Andover-Nolo: AnB	Unsuited	Poorly suited to unsuited.	Suited	Suited	Suited
Atkins:					
At	Poorly suited	Suited	Suited	Well suited	Suited
Ay	Unsuited	Poorly suited	Suited	Well suited	Suited
Calvin and Gilpin:					
CgD, CgE	Unsuited	Poorly suited	Suited	Suited	Suited
CgF	Unsuited	Unsuited	Suited	Suited	Suited
Chavies: Ch	Well suited	Well suited	Well suited	Well suited	Poorly suited
Clarksburg: ClB	Suited	Well suited	Well suited	Well suited	Poorly suited
Clymer: CmB, CmC	Suited	Well suited	Well suited	Well suited	Poorly suited
Cookport: CpB	Suited	Well suited	Well suited	Well suited	Poorly suited
Dekalb:					
DbB, DcB	Suited	Suited	Suited	Suited	Suited
DbC, DcC	Poorly suited	Suited	Suited	Suited	Suited
DcD, DeC	Unsuited	Poorly suited	Suited	Suited	Suited
DgC	Unsuited	Unsuited	Poorly suited	Poorly suited	Suited
Dekalb-Berks:					
DlE	Unsuited	Poorly suited	Suited	Suited	Suited
DlF	Unsuited	Unsuited	Suited	Suited	Suited
Dekalb-Buchanan: DnC	Poorly suited	Suited	Suited	Suited	Suited
Dekalb-Cookport:					
DoB	Suited	Suited	Suited	Suited	Suited
DpC	Unsuited	Poorly suited	Suited	Suited	Suited
Dekalb-Gilpin:					
DsC, DsE	Unsuited	Poorly suited	Suited	Suited	Suited
DsF	Unsuited	Unsuited	Suited	Suited	Suited
Elliber:					
EbD	Unsuited	Poorly suited	Suited	Suited	Suited
EbF	Unsuited	Unsuited	Suited	Suited	Suited
ElD	Poorly suited	Poorly suited	Suited	Suited	Suited
Ernest: ErB, ErC	Suited	Well suited	Well suited	Well suited	Poorly suited
Frankstown:					
FaB, FaC	Suited	Well suited	Well suited	Well suited	Poorly suited
FaD	Poorly suited	Suited	Well suited	Well suited	Poorly suited
FbC	Poorly suited	Well suited	Well suited	Well suited	Poorly suited
FeC, FeD	Poorly suited	Suited	Well suited	Well suited	Poorly suited
Frederick:					
FhB, FhC, FkB, FkC	Suited	Well suited	Well suited	Well suited	Poorly suited
FhD	Poorly suited	Suited	Well suited	Well suited	Poorly suited
FhE	Unsuited	Suited	Well suited	Well suited	Poorly suited
FrC, FrD	Poorly suited	Poorly suited	Suited	Suited	Suited
FrE, FrE3, FrF	Unsuited	Poorly suited	Suited	Suited	Suited
Huntington: Hu	Well suited	Well suited	Well suited	Well suited	Poorly suited
Laidig:					
LaB, LaC	Suited	Well suited	Well suited	Well suited	Poorly suited
LbC, LbD	Unsuited	Poorly suited	Well suited	Well suited	Poorly suited

of wildlife habitat and kinds of wildlife

determination of suitability is necessary]

Elements of wildlife habitat—Continued			Kinds of wildlife that find habitat in—		
Wetland food and cover plants	Shallow water developments	Impoundments	Openland	Woodland	Wetland
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Suited	Suited	Poorly suited to unsuited.	Suited	Well suited	Suited.
Suited	Suited	Unsuited	Poorly suited	Well suited	Suited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Unsuited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.

TABLE 4.—*Suitability of the soils for elements of*

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants
Laidig-Ernest: LeC, LeD	Unsuited	Unsuited	Well suited	Well suited	Poorly suited
Lindside: Ln	Suited	Well suited	Well suited	Well suited	Poorly suited
Mine dump: Md	---	---	---	---	---
Monongahela: MgB, MgC	Suited	Well suited	Well suited	Well suited	Poorly suited
Murrill:					
MuC	Suited	Well suited	Well suited	Well suited	Poorly suited
MuD	Poorly suited	Suited	Well suited	Well suited	Poorly suited
MvD, MvE	Unsuited	Poorly suited	Well suited	Well suited	Poorly suited
Philo: Ph	Suited	Well suited	Well suited	Well suited	Poorly suited
Pickaway: PkB	Suited	Well suited	Well suited	Well suited	Poorly suited
Pope: Po	Suited	Well suited	Well suited	Well suited	Poorly suited
Purdy: Pu	Poorly suited	Poorly suited	Suited	Suited	Suited
Rock land, steep: RkF	---	---	---	---	---
Sees: Sc	Poorly suited	Suited	Well suited	Well suited	Suited
Steep eroded land: Sp	---	---	---	---	---
Stony rock land: Sr	Unsuited	Unsuited	Poorly suited	Poorly suited	Well suited
Strip mine spoil: St	---	---	---	---	---
Summers:					
SuC	Suited	Suited	Suited	Suited	Suited
SyD	Unsuited	Poorly suited	Suited	Suited	Suited
Teas and Litz:					
TIB, TIC	Suited	Suited	Suited	Suited	Suited
TIC3, TID	Poorly suited	Suited	Suited	Suited	Suited
TID3, TIE	Unsuited	Poorly suited	Suited	Suited	Suited
TIE3, TIF, TIF3	Unsuited	Unsuited	Suited	Suited	Suited
Weikert:					
WeC	Poorly suited	Poorly suited	Suited	Suited	Suited
WeD	Unsuited	Poorly suited	Suited	Suited	Suited
WeE, WeF	Unsuited	Unsuited	Suited	Suited	Suited
Weikert-Berks:					
WkD	Poorly suited	Suited	Suited	Suited	Suited
WkE, WkF	Unsuited	Unsuited	Suited	Suited	Suited
Westmoreland:					
WmB, WmC	Suited	Suited	Suited	Suited	Suited
WmD	Poorly suited	Suited	Suited	Suited	Suited
WmD3	Unsuited	Poorly suited	Suited	Suited	Suited
WmE, WmE3, WmF	Unsuited	Poorly suited to unsuited.	Suited	Suited	Suited

wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued			Kinds of wildlife that find habitat in—		
Wetland food and cover plants	Shallow water developments	Impoundments	Openland	Woodland	Wetland
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Poorly suited to unsuited.	Poorly suited to unsuited.	Poorly suited to unsuited.	Well suited	Well suited	Poorly suited to unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Unsuited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Well suited	Well suited	Well suited	Poorly suited	Suited	Well suited.
Poorly suited	Poorly suited	Poorly suited to unsuited.	Suited	Well suited	Poorly suited.
Unsuited	Unsuited	Unsuited	Unsuited	Suited to poorly suited.	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited to unsuited.	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Unsuited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.

Four levels of suitability are recognized—well suited, suited, poorly suited, and unsuited. These ratings are defined in the following paragraphs.

Well suited means that the limitations are negligible and that generally only a low intensity of management is needed to create, improve, and maintain the habitat with assurance of satisfactory results.

Suited means that the limitations are moderate and that fairly frequent attention and moderate intensity of management are needed for satisfactory results.

Poorly suited means that limitations are severe; that creating, improving, and maintaining the habitat is difficult and perhaps expensive; and that intensive management is needed for satisfactory results. Poorly suited soils, however, may provide habitat that is easy to establish but has temporary value.

Unsuited means that the limitations are very severe and that management of the habitat is highly impractical.

Grain and seed crops are seed-producing annuals that are planted to furnish food for wildlife. These include corn, sorghum, wheat, millet, buckwheat, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that have been established by planting and that furnish food and cover. These plants include fescue, bluegrass, timothy, orchardgrass, reed canarygrass, clover, alfalfa, and sericea lespedeza.

Wild herbaceous upland plants are native or introduced perennial grasses and forbs (weeds) that are established mainly through natural processes and that provide food and cover principally for upland wildlife. These plants include indiangrass, wildrye, oatgrass, pokeweed, strawberry, lespedeza, beggarweed, ragweed, goldenrod, and dandelion.

Hardwood woody plants are nonconiferous trees, shrubs, and woody vines that are used extensively by wildlife as food. These plants are commonly established through natural processes, but they can also be planted. They include oak, beech, hickory, walnut, cherry, dogwood, poplar, grape, honeysuckle, and briers.

Coniferous woody plants are cone-bearing trees and shrubs, mostly evergreen. These plants are important as cover, and they also furnish browse and seeds. They include white pine, Virginia pine, and redcedar. They may be established through natural processes on bare soil or in areas where the plant cover is thin. Such soil characteristics as shallowness and dryness, which cause plants to grow slowly and delay closure of the canopy, provide the better conditions for this element of habitat. On poorly suited soils, widely spaced plants may quickly but temporarily produce desirable growth. Management may be difficult because the soils are well suited to competing hardwoods, which invade and overtop the conifers. Topping and thinning of the fast-growing conifers are necessary.

Wetland foods and cover plants are annual and perennial wild herbaceous plants that grow on moist to wet sites and produce food and cover mainly for wetland wildlife. These plants include smartweed, wild millet, rushes, sedges, reeds, wildrice, switchgrass, and cattails, but they do not include submerged or floating aquatics.

Shallow water developments include impoundments, excavations, or control of water, generally not more than 6 feet deep. Examples of such developments are low dikes and levees, shallow dugouts, level ditches, and devices that control the water level in marshy drainageways or channels.

Impoundments refer to water in dugouts or impoundments behind low dikes, or a combination of these. They have ample water of a quality and depth suitable for the production of fish and wildlife. Examples of impoundments are ponds, built on nearly level land, that cover a surface area of at least a quarter of an acre. These ponds have an average depth of 6 feet over at least a fourth of the acreage, and their sources of water are dependable.

The kinds of wildlife that find habitat in openland are birds and mammals that commonly frequent cropland, meadows, pasture, and areas that are overgrown with grasses, weeds, and shrubs. These birds and mammals include bobwhite quail, ring-necked pheasants, mourning doves, woodcocks, meadowlarks, killdeers, field sparrows, and cottontail rabbits.

The kinds of wildlife that find habitat in woodland are birds and mammals that commonly frequent wooded areas. These include ruffed grouse, wild turkeys, wood thrushes, warblers, vireos, deer, squirrels, and raccoons.

The kinds of wildlife that find habitat in wetland are birds and mammals that commonly frequent ponds, marshes, swamps, and other wet areas. These include ducks, geese, herons, snipes, rails, coots, muskrats, minks, and beavers.

Use of the Soils in Engineering [4]

This section provides information of special interest to engineers, contractors, farmers, and others who use soil as structural material or as foundation material upon which structures are built. Information is given in this section about those properties of the soils that affect construction and maintenance of roads and airports, pipelines, building foundations, water storage facilities, erosion control structures, drainage systems, and sewage disposal systems. Among the soil properties most important in engineering are permeability, shear strength, density, shrink-swell potential, water-holding capacity, grain-size distribution, plasticity, and reaction (*13*).

Information concerning these and related soil properties is given in tables 5, 6, and 7. The estimates and interpretations of soil properties in these tables can be used in:

1. Planning and designing agricultural drainage systems, farm ponds, irrigation systems, diversion terraces, and other structures for controlling water and conserving soil.
2. Selecting potential locations for highways, airports, pipelines, and underground cables.

[4] DAVID C. RALSTON, State conservation engineer, Soil Conservation Service, helped prepare this section.

3. Locating probable sources of sand, gravel, or rock suitable for use as construction material.
4. Selecting potential industrial, commercial, residential, and recreational areas.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used in this publication have a special meaning to soil scientists and a different meaning to engineers. The Glossary defines many such terms as they are used in soil science.

Engineering classification systems

Two systems of classifying soils for engineering purposes are in general use. Classification of the soils of Greenbrier County according to both of these systems is given in this survey.

The system used by the American Association of State Highway Officials (AASHO) (*2*) is based on field performance of soils in highways. In this system, soil materials are classified into seven principal groups, designated A-1 through A-7. The best materials for use in highway subgrades (gravelly soils of high bearing capacity) are classified as A-1, and the poorest (clayey soils having low strength when wet) are classified A-7. The relative engineering value of the soils within each group is indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest.

The Unified system of soil classification was developed by the Department of Defense (*22*)). In this system, soil materials are identified as coarse grained (G or S), fine grained (M or C), and highly organic (O), and symbols are used to identify each group. For example, soils that consist primarily of fine-grained material, either plastic or nonplastic, are identified by the symbols ML or CL if the liquid limit is low and by MH or CH if the liquid limit is high.

Estimated engineering properties

Table 5 gives estimates of physical properties that are most likely to affect engineering practices. These estimates are based on interpretations given in table 6, on data for similar soils given in the Monroe County Soil Survey (*21*), and on coordinated data collected from large areas of the northeastern United States.

The percentage passing sieves has the normal range in size of soil particles passing the respective screen sizes.

Permeability refers to the rate of movement of water downward through undisturbed soil. The rate depends largely on texture, porosity, and structure.

Available moisture capacity is the amount of water in a moist soil, at field capacity, that can be removed by plants. These ratings, expressed in inches of water per inch of soil depth, are of particular value to engineers doing irrigation work.

Shrink-swell potential is a rating of the ability of soil material to change volume when subjected to changes in moisture content. Those soil materials rated high are normally undesirable for engineering use because the increase in volume when the dry soil is wetted is usually accompanied by a loss in bearing capacity. In general, soils classed as CH and A-7 have a high shrink-swell potential. Clean sands and gravel (single grain material) and soils having small amounts of nonplastic to slightly plastic fines have a low shrink-swell potential.

Engineering interpretations

Table 6 gives ratings of the soils according to their suitability for winter grading, their susceptibility to frost action, and their suitability as a source of topsoil and road fill. It also names characteristics that affect suitability of the soils for location of highways, for construction and maintenance of pipelines, and for practices used in agricultural engineering.

Ratings for suitability for winter grading are based on winter conditions common in Greenbrier County. Winter grading is affected chiefly by soil features, especially unfavorable ones, that are relevant to moving, mixing, and compacting soil in roadbuilding when temperatures are below freezing. The depth to the water table, shrink-swell characteristics, and stability where frozen and thawed are among the soil features considered.

Susceptibility to frost action is largely dependent on the relative silt content of the soil; generally, the higher the silt content, the higher the susceptibility to frost heaving. The depth to the water table is also considered.

Topsoil is a term used to designate a fertile soil or soil material, ordinarily rich in organic-matter content, used as a topdressing for lawns, gardens, and roadbanks. The ratings indicate suitability for such use. For ratings other than good, major soil limitations are given. Soil factors, such as natural fertility, erodibility, thickness, depth to the water table, and content of stones are important in making the ratings.

Road fill is material used to build embankments. The ratings indicate performance of soil material moved from borrow areas for these purposes. In general, a sandy material that contains adequate binder is best for road fill, and plastic clays or organic materials are poorest. Texture, compaction characteristics, stability, erodibility, and depth to the water table are among the factors considered in making ratings.

Highway location is influenced by features of the undisturbed soil that affect construction and maintenance of highways. The soil features, favorable as well as unfavorable, are the principal ones that affect geographic location of highways. Soil features important to highway location, such as depth to bedrock (fig. 6), depth to the water table, and the hazard of flooding, are shown for the soils.

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Kind of bedrock or substratum	Depth from surface	Classification		
					USDA texture	Unified	AASHO
	Feet	*Feet*		*Inches*			
Albrights: AbB	1½–2	5	Shale and siltstone.	0–10	Silt loam	ML or CL	A–4 or A–6
				10–26	Silty clay loam	CL or ML	A–6 or A–7
				26–38	Shaly silty clay loam	CL or ML	A–6
				38–50	Very shaly silt loam	SM or GM	A–2 or A–4
Alluvial land: [2] Ad	0–1	6	Gravel, or shale and sandstone.	0–60	Silt loam to sandy loam.	[3]	[3]
Andover: AnB	0–½	5	Sandstone.	0–6	Channery loam	ML or CL	A–4 or A–6
For Nolo part, see Nolo series.				6–38	Clay loam	ML or CL	A–6 or A–7
				38–50	Silty clay	CL or MH	A–6 or A–7
Atkins: [2] At, Ay	0	6	Shale and sandstone.	0–8	Silt loam	ML or CL	A–4 or A–6
				8–36	Silty clay loam	ML or CL	A–6
				36–50	Silty clay loam	ML or CL	A–4 or A–6
Berks	5	1½–2½	Shale, siltstone, and thin-bedded sandstone.	0–8	Channery silt loam	ML or GM	A–2 or A–4
				8–26	Very channery silt loam.	GM	A–2
Buchanan	1½–2	4	Sandstone.	0–13	Loam to fine sandy loam.	SM or ML	A–4
				13–25	Sandy clay loam	SM or ML	A–4 or A–6
				25–54	Sandy clay loam	GM or CL	A–4, A–2 or A–6
Calvin: CgD, CgE, CgF	5+	1½–2½	Shale and siltstone.	0–7	Silt loam	ML	A–4
For Gilpin part, see Gilpin series.				7–23	Heavy silt loam to very channery silt loam.	ML or GM	A–4 or A–2
Chavies: [2] Ch	4+	6	Variable.	0–8	Fine sandy loam	SM	A–2 or A–4
				8–33	Fine sandy loam	ML or SM	A–4
				33–60	Fine sandy loam	SM	A–2 or A–4
Clarksburg: ClB	1½–2	4	Variable.	0–9	Silt loam	ML or CL	A–4 or A–6
				9–25	Silty clay loam	CL	A–6
				25–55	Shaly silty clay loam	CL	A–6
Clymer: CmB, CmC	4+	3½–4	Sandstone.	0–17	Fine sandy loam	SM	A–2 or A–4
				17–32	Clay loam	SM or CL	A–4 or A–6
				32–40	Channery clay loam	SM	A–2 or A–4
Cookport: CpB	1½–2	3–4	Sandstone.	0–14	Loam	ML	A–4
				14–25	Clay loam	ML or CL	A–6
				25–40	Light clay loam	SC or CL	A–6 or A–2
Dekalb: DbB, DbC, DcB, DcC, DcD, DeC, DgC, DlE, DlF, DnC, DoB, DpC, DsC, DsE, DsF.	4+	2–3½	Sandstone.	0–10	Channery loam	SM, ML, or MH	A–2, A–4 or A–5
				10–19	Channery fine sandy loam.	SM–GM, ML–CL	A–2 or A–4
For Berks part of DlE and DlF, for Buchanan part of DnC, for Cookport part of DoB and DpC, and for Gilpin part of DsC, DsE, and DsF, see the respective series.				19–33	Very channery sandy loam.	SC, SM or GM	A–2 or A–4

See footnote at end of table.

engineering properties

Material larger than 3 inches	Percentage passing sieve—			Permeability[1]	Available moisture capacity	Reaction	Shrink-swell potential
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
Percent				*Inches per hour*	*Inches per inch of soil*	*pH*	
0–5	80–90	75–85	60–75	2. 0–6. 3	0. 18–0. 2	5. 1–5. 5	Low.
0–5	80–100	80–95	65–90	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Moderate.
0–10	75–95	70–85	60–70	0. 20–0. 63	0. 12–0. 15	5. 1–5. 5	Moderate.
10–20	30–70	25–60	15–45	0. 63–2. 0	0. 12–0. 15	5. 1–5. 5	Low.
[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3].
0–10	90–100	85–100	75–85	2. 0–6. 3	0. 18–0. 20	4. 5–5. 0	Moderate.
0–10	90–100	85–100	85–95	0. 2–0. 63	0. 15–0. 18	4. 5–5. 0	Moderate.
5–20	80–95	80–90	75–90	<0. 2	0. 08–0. 12	4. 5–5. 0	Moderate.
----------	90–100	90–100	75–95	0. 63–2. 0	0. 18–0. 24	5. 1–5. 5	Low.
----------	90–100	90–100	80–95	0. 2–0. 63	0. 15–0. 18	5. 1–5. 5	Moderate.
----------	90–95	90–95	70–95	<0. 2	0. 12–0. 15	4. 5–5. 0	Moderate.
0–5	70–90	70–80	30–60	2. 0–6. 3	0. 15–0. 18	4. 5–5. 5	Low.
10–30	40–60	30–45	20–30	2. 0–6. 3	0. 12–0. 15	4. 5–5. 5	Low.
0–10	70–85	70–85	40–60	2. 0–6. 3	0. 15–0. 18	4. 5–5. 0	Low.
5–10	60–85	50–85	35–60	0. 63–2. 0	0. 15–0. 18	4. 5–5. 0	Low to moderate.
5–20	50–80	50–75	25–55	0. 20–0. 63	0. 12–0. 15	4. 5–5. 0	Low.
0–5	75–90	70–90	60–80	2. 0–6. 3	0. 15–0. 18	5. 1–5. 5	Low.
5–15	65–85	60–80	25–60	0. 63–2. 0	0. 12–0. 15	5. 1–5. 5	Low.
----------	90–100	85–95	30–50	2. 0–6. 3	>0. 18	6. 1–6. 5	Low.
----------	95–100	85–95	35–60	2. 0–6. 3	0. 15–0. 18	5. 1–5. 5	Low.
0–5	80–95	75–85	25–50	2. 0–6. 3	0. 12–0. 15	5. 1–5. 5	Low.
----------	80–100	75–90	65–80	2. 0–6. 3	>0. 18	5. 6–6. 0	Low.
0–5	85–100	80–95	65–90	0. 63–2. 0	0. 15–0. 18	5. 1–6. 0	Moderate.
0–10	75–95	70–95	60–85	<0. 20	0. 12–0. 15	5. 6–6. 0	Moderate.
----------	90–95	85–95	25–45	2. 0–6. 3	0. 15–0. 18	5. 1–5. 5	Low.
----------	90–95	85–95	40–65	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Low.
0–5	80–90	75–85	25–40	0. 63–2. 0	0. 12–0. 15	5. 1–5. 5	Low.
----------	90–100	90–100	55–70	2. 0–6. 3	0. 15–0. 18	5. 1–5. 5	Low.
0–5	90–100	90–100	65–75	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Moderate.
0–10	80–90	75–85	30–55	<0. 20	0. 12–0. 15	5. 1–5. 5	Low.
5–15	60–90	[4] 45–80	20–55	2. 0–6. 3	0. 15–0. 18	4. 5–5. 0	Low.
10–20	50–80	45–80	20–60	2. 0–6. 3	0. 12–0. 15	4. 5–5. 0	Low.
10–40	40–75	35–75	20–45	2. 0–6. 3	0. 08–0. 12	4. 5–5. 0	Low.

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Kind of bedrock or substratum	Depth from surface	Classification		
					USDA texture	Unified	AASHO
	Feet	*Feet*		*Inches*			
Elliber: EbD, EbF, ElD	4+	4–6	Cherty limestone.	0–15	Very cherty silt loam	GM	A–2 or A–4
				15–38	Very cherty silt loam	GM	A–2 or A–4
				38–50	Extremely cherty loam	GM	A–2
Ernest: ErB, ErC	1½–2	4	Shale or sandstone.	0–8	Silt loam	ML or CL	A–4 or A–6
				8–26	Channery silty clay loam.	ML or CL	A–6
				26–50	Channery silt loam	ML or CL	A–4 or A–6
Frankstown: FaB, FaC, FaD, FbC, FeC, FeD.	4+	3½–6	Silty limestone.	0–11	Silt loam	ML or CL	A–4
				11–28	Silty clay loam	CL, CH or MH	A–6 or A–7
				28–47	Silty clay loam	CL, CH or MH	A–6 or A–7
Frederick: FhB, FhC, FhD, FhE, FkB, FkC, FrC, FrD, FrE, FrE3, FrF.	4+	5	Hard limestone.	0–10	Cherty silt loam	ML–CL	A–6 or A–4
				10–28	Silty clay loam	CL, MH or CH	A–6 or A–7
				28–62	Clay	MH or CH	A–7
Gilpin	3+	1½–2½	Shale and sandstone.	0–8	Silt loam	ML	A–4
				8–22	Silty clay loam	ML or CL	A–4 or A–6
				22–28	Very shaly silt loam	ML or GM	A–2 or A–4
Huntington:[2] Hu	4+	4	Limestone.	0–34	Silt loam	ML or CL	A–4 or A–6
				34–48	Stratified material	ML, CL, SM	A–4, A–6, A–2
Laidig: LaB, LaC, LbC, LbD, LeC, LeD. For Ernest part of LeC and LeD, see Ernest series.	4+	5	Shale or sandstone.	0–13	Channery loam	SM or ML	A–4
				13–39	Channery sandy clay loam.	SC or CL	A–4 or A–6
				39–60	Channery sandy clay loam.	SM or GM	A–2 or A–4
Lindside:[2] Ln	1½–2	4	(3).	0–17	Silt loam	ML or CL	A–4 or A–6
				17–36	Silty clay loam	ML–CL	A–6 or A–4
				36–42	Stratified material	[3]CL–ML	[3] A–4, A–6, A–7
Litz	3+	1½–2	Shale and siltstone.	0–10	Silt loam	ML	A–4
				10–16	Heavy silt loam	ML–CL	A–4 or A–6
				16–22	Very shaly silt loam	ML, CL, GM	A–4 or A–6
Mine dump: Md	(3)	(3)	(3).	(3)	(3)	(3)	(3)
Monongahela: MgB, MgC	1½–2	4	(3).	0–10	Silt loam	ML	A–4
				10–27	Silty clay loam	CL	A–6
				27–55	Silt loam	ML or CL	A–6
Murrill: MuC, MuD, MvD, MvE.	4+	5	Limestone.	0–11	Channery loam	ML	A–4
				11–38	Channery silty clay loam.	CL	A–6
				38–50	Clay loam	ML or CL	A–6 or A–7
Nolo	0–½	1½–3	Sandstone.	0–11	Loam	CL or SM	A–4 or A–6
				11–17	Clay loam	CL	A–6 or A–7
				17–26	Channery sandy loam	CL or SM	A–4 or A–2

See footnotes at end of table.

engineering properties—Continued

Material larger than 3 inches	Percentage passing sieve—			Permeability[1]	Available moisture capacity	Reaction	Shrink-swell potential
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
Percent				*Inches per hour*	*Inches per inch of soil*	*pH*	
5–10	30–60	20–50	15–40	>6. 3	0. 15–0. 18	4. 5–5. 0	Low.
10–35	30–50	20–45	10–40	2. 0–6. 3	0. 12–0. 15	4. 5–5. 0	Low.
15–40	25–45	20–40	10–30	2. 0–6. 3	0. 12–0. 15	4. 5–5. 0	Low.
5–15	75–90	70–85	60–75	2. 0–6. 3	>0. 18	5. 1–5. 5	Low.
5–20	80–95	75–90	70–85	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Moderate.
5–25	75–90	70–85	60–80	0. 20–0. 63	0. 12–0. 15	5. 1–5. 5	Moderate.
----------	90–100	90–100	75–85	2. 0–6. 3	>0. 18	5. 6–6. 5	Low.
----------	90–100	90–100	85–100	0. 63–2. 0	0. 18–0. 21	5. 1–6. 0	Moderate to high.
0–5	80–100	80–100	75–100	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Moderate to high.
0–5	60–90	60–90	50–90	2. 0–6. 3	>0. 18	5. 6–6. 0	Low.
0–5	70–95	70–95	70–95	0. 63–2. 0	0. 15–0. 18	5. 6–6. 0	Moderate to high.
0–5	75–95	80–95	70–95	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Moderate to high.
----------	80–95	80–90	70–85	2. 0–6. 3	>0. 18	4. 5–5. 0	Low.
----------	65–90	55–80	50–75	0. 63–2. 0	0. 15–0. 18	4. 5–5. 0	Moderate.
0–10	35–70	30–65	20–60	0. 63–2. 0	0. 12–0. 15	4. 5–5. 0	Moderate.
----------	90–100	90–100	80–90	0. 63–2. 0	>0. 18	6. 1–6. 5	Moderate.
----------	80–95	80–95	[3]	2. 0–6. 3	0. 15–0. 18	6. 1–6. 5	Moderate.
----------	60–90	60–85	35–60	2. 0–6. 3	0. 15–0. 18	5. 1–5. 5	Low.
----------	60–90	60–85	40–65	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Low.
----------	50–75	40–70	25–50	0. 2–0. 63	0. 12–0. 15	5. 1–5. 5	Low.
----------	95–100	95–100	85–95	2. 0–6. 3	>0. 18	6. 1–7. 0	Low.
----------	95–100	90–100	85–95	0. 63–2. 0	0. 15–0. 18	6. 1–6. 5	Moderate.
----------	90–100	80–90	60–85	0. 63–6. 3	0. 12–0. 15	6. 1–6. 5	Moderate.
----------	85–100	80–90	70–85	2. 0–6. 3	>0. 18	5. 1–5. 5	Low.
----------	80–95	75–85	70–80	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Moderate.
0–5	50–80	40–65	35–60	2. 0–6. 3	0. 12–0. 15	5. 1–5. 5	Moderate.
[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3].
----------	90–100	80–100	70–95	0. 63–2. 0	>0. 18	5. 1–5. 5	Low.
----------	90–100	85–100	80–95	0. 63–2. 0	0. 15–0. 18	4. 5–5. 5	Moderate.
0–15	80–95	70–90	65–85	<0. 20	0. 12–0. 15	4. 5–5. 5	Moderate.
0–10	70–90	70–85	55–80	2. 0–6. 3	>0. 18	5. 1–5. 5	Low.
0–10	75–95	70–90	60–80	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Moderate.
0–10	70–90	65–85	55–75	0. 63–2. 0	0. 12–0. 15	5. 1–5. 5	Moderate.
----------	75–90	70–85	40–65	2. 0–6. 3	0. 15–0. 18	4. 5–5. 0	Low.
----------	70–90	70–85	50–70	0. 2–0. 63	0. 12–0. 15	4. 5–5. 0	Moderate.
0–5	65–90	60–85	30–55	0. 06–0. 20	0. 12–0. 15	4. 5–5. 0	Low.

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Kind of bedrock or substratum	Depth from surface	Classification		
					USDA texture	Unified	AASHO
	Feet	*Feet*		*Inches*			
Philo:[2] Ph	1½–2	6	(3).	0–19	Silt loam	ML	A–4
				19–38	Silt loam	ML or SM	A–4
				38–45	Stratified sand, gravel, and silt.	CL, SM, GM	A–2, A–4, or A–6
Pickaway: PkB	1½–2	4	Limestone.	0–12	Silt loam	ML or CL	A–4 or A–6
				12–25	Silt loam	CL or ML,	A–6 or A–7
				25–61	Silt loam to silty clay loam.	CL, ML or CH	A–6 or A–7
Pope:[2] Po	4+	5	(3).	0–25	Fine sandy loam	SM	A–2 or A–4
				25–40	Sandy loam	SM or ML	A–2 or A–4
				40–60	Stratified gravel, sand, or silt.	(3)	(3)
Purdy: Pu	0–½	4	(3).	0–20	Silt loam to silty clay loam.	ML or CL	A–6
				20–60	Silty clay to clay	CL or CH	A–6 or A–7
Rock land, steep: RkF	(3)	(3)	(3).	(3)	(3)	(3)	(3)
Sees: Sc	0–½	3½–6	Limestone.	0–15	Silty clay loam	ML or CL	A–6 or A–7
				15–54	Silty clay or clay	CL or CH	A–6 or A–7
Steep eroded land, shale materials: Sp.	(3)	(3)	(3).	(3)	(3)	(3)	(3)
Stony rock land: Sr	(3)	(3)	(3).	(3)	(3)	(3)	(3)
Strip mine spoil: St	(3)	(3)	(3).	(3)	(3)	(3)	(3)
Summers: SuC, SyD	4+	1½–2½	Sandstone.	0–12	Channery loam	SM	A–4
				12–22	Channery loam	SM or ML	A–4 or A–2
				22–27	Very channery fine sandy loam.	SM or GM	A–2
Teas: TIB, TIC, TIC3, TID, TID3, TIE, TIE3, TIF, TIF3. For Litz part, see Litz series.	5+	1½–2½	Shale and siltstone.	0–14	Silt loam	ML or CL	A–4, A–6, or A–7
				14–22	Very channery silty clay loam.	CL or GM	A–2, A–4, or A–6
Weikert: WeC, WeD, WeE, WeF, WkD, WkE, WkF. For Berks part of WkD, WkE, and WkF, see series.	5+	1–2	Folded shale.	0–6	Shaly silt loam	ML or GM	A–4 or A–2
				6–15	Very shaly silt loam	GM	A–2
Westmoreland: WmB, WmC, WmD, WmD3, WmE, WmE3, WmF.	5+	2–3½	Shale, sandstone, or limestone.	0–13	Silt loam	ML or CL	A–4 or A–6
				13–28	Shaly silty clay loam	CL	A–6
				28–34	Very shaly silty clay loam.	CL or GC	A–6 or A–2

[1] Ratings are as follows:
Slow: 0.06–0.2
Moderately slow: 0.2–0.63
Moderate: 0.63–2.0
Moderately rapid: 2.0–6.3
Rapid: >6.3

engineering properties—Continued

Material larger than 3 inches	Percentage passing sieve—			Permeability[1]	Available moisture capacity	Reaction	Shrink-swell potential
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
Percent				*Inches per hour*	*Inches per inch of soil*	*pH*	
	90–100	90–100	60–80	2. 0–6. 3	>0. 18	5. 1–5. 5	Low.
	85–90	85–90	45–75	0. 63–2. 0	0. 15–0. 18	4. 5–5. 5	Moderate.
[3]	[3]	[3]	[3]	[3]	[3]	5. 1–5. 5	Moderate.
	95–100	95–100	75–100	2. 0–6. 3	>0. 18	5. 5–6. 0	Low.
	90–100	85–100	70–100	0. 63–2. 0	0. 15–0. 18	5. 1–5. 5	Moderate.
	85–100	80–100	80–100	0. 2–0. 63	0. 12–0. 15	5. 1–5. 5	Moderate.
	90–100	85–95	30–50	2. 0–6. 3	0. 15–0. 18	5. 1–5. 5	Low.
	90–100	80–95	35–55	2. 0–6. 3	0. 12–0. 15	5. 1–5. 5	Low.
[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3].
	90–100	85–95	80–90	0. 2–0. 63	0. 15–0. 18	4. 5–5. 5	Moderate.
	90–100	85–95	80–95	<0. 20	0. 12–0. 15	4. 5–5. 5	Moderate to high.
[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3].
	90–100	90–100	85–95	0. 63–2. 0	0. 15–0. 18	5. 6–6. 0	Moderate.
	90–100	90–100	85–100	0. 2–0. 63	0. 08–0. 12	6. 1–6. 5	Moderate to high.
[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3].
[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3].
[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3].
	50–85	40–75	35–50	2. 0–6. 3	0. 15–0. 18	5. 1–5. 5	Low.
0–5	50–85	40–75	30–55	2. 0–6. 3	0. 12–0. 15	5. 1–5. 5	Low.
5–20	40–60	30–50	20–35	2. 0–6. 3	0. 08–0. 12	4. 5–5. 5	Low.
	75–90	70–90	65–85	2. 0–6. 3	>0. 18	5. 1–5. 5	Low.
0–15	50–80	45–75	25–60	0. 63–2. 0	0. 12–0. 15	4. 5–5. 5	Moderate.
0–10	45–75	40–65	30–60	2. 0–6. 3	0. 15–0. 18	4. 5–5. 0	Low.
10–20	30–60	25–50	10–30	2. 0–6. 3	0. 08–0. 12	4. 5–5. 5	Low.
	85–100	80–100	70–85	2. 0–6. 3	>0. 18	5. 1–5. 5	Low.
0–5	80–100	75–100	70–95	0. 63–2. 0	0. 15–0. 18	5. 6–6. 0	Moderate.
5–10	30–70	25–65	20–55	0. 63–2. 0	0. 12–0. 15	5. 6–6. 0	Moderate.

[2] Subject to periodic flooding.
[3] Soil material is too variable for reliable evaluation.
[4] Dekalb fine sandy loam is finer textured than is typical of the series; as much as 100 percent of the material passed the No. 4 and No. 10 sieves.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—		Soil features affecting—
			Topsoil	Road fill	Highway location
Albrights: AbB	Poor	Moderate	Fair	Fair	Seasonal high water table; seeps; instability.
Alluvial land: Ad	Poor to unsuitable.	Moderate to high.	Fair to poor	Poor	Subject to flooding; high water table.
Andover: AnB For Nolo part, see Nolo series.	Poor	High	Poor to unsuitable.	Poor to fair	High water table; seeps; stony; instability.
Atkins: At, Ay	Unsuitable	High	Fair	Poor	Subject to flooding; high water table.
Berks	Fair	Moderate	Fair to poor	Fair to good	Weathered shale bedrock at a depth of 20 to 30 inches.
Buchanan	Poor	Moderate	Fair	Fair to good	Seasonal high water table; seeps above pan; instability.
Calvin: CgD, CgE, CgF For Gilpin part, see Gilpin series.	Fair	Moderate	Fair to poor	Fair to good	Weathered shale bedrock at a depth of 20 to 30 inches.
Chavies: Ch	Good	Low	Good	Fair to good	Infrequent flooding
Clarksburg: ClB	Poor	Moderate	Fair to good	Fair	Seasonal high water table; seeps above pan; instability.
Clymer: CmB, CmC	Fair	Low to moderate.	Fair	Good	Sandstone bedrock at a depth below 3½ to 4 feet.
Cookport: CpB	Poor	Moderate	Fair: poor in stony areas.	Fair	Seasonal high water table; seeps; sandstone bedrock at a depth below 3 to 4 feet.
Dekalb: DbB, DbC, DcB, DcC, DcD, DeC, DgC, DlE, DlF, DnC, DoB, DpC, DsC, DsE, DsF. For Berks part of DlE and DlF, for Buchanan part of DnC, for Cookport part of DoB and DpC, for Gilpin part of DsC, DsE, and DsF, see the respective series.	Good	Low	Fair to poor; stony.	Fair to good	Sandstone bedrock at a depth of 24 to 42 inches; surface stones in many areas; steep.

interpretations

Soil features affecting—Continued					
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions
	Reservoir area	Embankment			
Seasonal high water table.	Low seepage loss	Fair to good stability.	Seasonal high water table; moderately slow permeability in pan.	Seasonal high water table; moderately slow permeability in pan.	Erodible; seeps.
Subject to flooding; high water table.	Subject to flooding; seepage possible in sandy layers.	Stability varies according to material; subject to flooding.	Permeability varies according to material; subject to flooding; outlet problems.	High water table; subject to flooding.	Subject to flooding.
High water table; stony.	Stony surface; may have pervious layers in substratum; high water table.	Instability; stony surface.	Slow permeability; high water table; stony surface.	Slow permeability; high water table; stony.	High water table; stony surface; seeps.
Subject to flooding; high water table.	Subject to flooding; few sandy layers.	Instability; subject to flooding.	Slow permeability; subject to flooding; outlet problems; high water table.	Slow permeability; subject to flooding; high water table.	High water table.
Bedrock at a depth of 20 to 30 inches.	Pervious; shale bedrock at a depth of 20 to 30 inches.	Fair stability; pervious material.	Well drained	Low water storage capacity.	Bedrock at a depth of 20 to 30 inches.
Seasonal high water table; instability.	Low seepage loss	Fair stability; may be stony.	Seasonal high water table.	Seasonal high water table.	Seepage above pan.
Shale bedrock at a depth of 20 to 30 inches; stony.	Pervious shale bedrock at a depth of 20 to 30 inches.	Fair stability; pervious material.	Well drained	Low water storage capacity; stony.	Shale bedrock at a depth of 20 to 30 inches; stony.
Infrequent flooding	Pervious substratum	Fair stability; permeable material.	Well drained	Moderate water storage capacity.	Infrequent flooding.
Seasonal high water table; hazard of soil slippage.	Low seepage loss	Fair stability	Slow permeability in pan; seasonal high water table.	Seasonal high water table; slow permeability in pan.	Erodible; seeps.
Sandstone bedrock at a depth below 3½ to 4 feet.	Pervious substratum	Stable	Well drained	Features generally favorable.	A few sandstone ledges at a depth below 2 feet.
Seasonal high water table; bedrock at a depth below 3 to 4 feet.	Pervious substratum below a depth of 3 feet; stony in some areas.	Moderately stable; stony in some areas.	Slow permeability; seasonal high water table.	Slow permeability; seasonal high water table.	Seeps above pan; stony in some areas.
Sandstone bedrock at a depth of 24 to 42 inches.	Sandstone bedrock at a depth of 24 to 42 inches; pervious substratum.	Pervious material; stony surface in many areas.	Well drained	Low water storage capacity; stony in many areas.	Sandstone bedrock at a depth of 24 to 42 inches; stony in many areas.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—		Soil featuring affecting—
			Topsoil	Road fill	Highway location
Elliber: EbD, EbF, ElD	Good	Low	Poor: cherty	Good	Cherty limestone bedrock at a depth below 4 feet; steep.
Ernest: ErB, ErC	Poor	Moderate	Fair: poor in stony areas.	Fair	Seasonal high water table; seeps above pan; instability.
Frankstown: FaB, FaC, FaD, FbC, FeC, FeD.	Fair	Moderate	Good	Fair to poor	Limestone bedrock at a depth below 3½ feet; solution caverns.
Frederick: FhB, FhC, FhD, FhE, FkB, FkC, FrC, FrD, FrE, FrE3, FrF.	Fair to poor	Moderate to high.	Fair to good	Fair to poor	Solution caverns; rock ledges; steep.
Gilpin	Fair	Moderate	Good where not too stony.	Fair	Shale and sandstone bedrock at a depth of 20 to 30 inches; steep; stony.
Huntington: Hu	Fair	Moderate	Good	Fair	Subject to flooding
Laidig: LaB, LaC, LbC, LbD, LeC, LeD. For Ernest part of LeC and LeD, see Ernest series.	Fair	Low to moderate.	Fair in LaB and LaC. Poor in LbC, LbD, LeC, and LeD.	Good in LaB, LaC, LbC, and LbD. Fair in LeC and LeD.	Large stones on surface.
Lindside: Ln	Poor	Moderate	Good	Fair	Subject to flooding; seasonal high water table.
Litz	Fair	Moderate	Fair	Fair	Shale bedrock at a depth of 20 to 26 inches.
Mine dump: Md	(1)	(1)	(1)	Good	(1)
Monongahela: MgB, MgC	Poor	Moderate to high.	Fair	Fair	Seasonal high water table; seeps above pan.
Murrill: MuC, MuD, MvD, MvE	Fair	Moderate	Fair	Good	Solution channels in underlying limestone.
Nolo	Poor	High	Poor	Poor	High water table; sandstone bedrock at a depth of 20 to 36 inches; stony surface.
Philo: Ph	Poor	Moderate	Good	Fair	Subject to flooding; seasonal high water table.

See footnotes at end of table.

interpretations—Continued

Soil features affecting—Continued					
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions
	Reservoir area	Embankment			
Cherty limestone bedrock at a depth below 4 feet.	Pervious, cherty substratum.	Pervious material; cherty.	Well drained	Moderately rapid permeability; low to moderate water storage capacity.	Stony in some areas; a few cherty limestone outcrops.
Seasonal high water table; hazard of soil slippage.	Low seepage loss	Fair stability; stony in some areas.	Moderately slow permeability in pan; seasonal high water table; seeps.	Seasonal high water table; moderately slow permeability in pan.	Erodible; seeps; stony in some areas.
Limestone bedrock at a depth below 3½ feet.	Limestone bedrock at a depth of 3½ feet; solution caverns.	Fair to poor stability; erodible.	Well drained	Moderate to high water storage capacity.	Limestone bedrock at a depth of 3½ feet; a few rock ledges.
Rock ledges	Solution caverns	Fair stability; erodible.	Well drained	High water storage capacity.	Rock ledges.
Shale and sandstone bedrock at a depth of 20 to 30 inches; stony surface.	Bedrock at a depth of 20 to 30 inches; pervious substratum.	Fair stability; stony surface.	Well drained	Moderate water storage capacity; bedrock at a depth of 20 to 30 inches; stony surface.	Bedrock at a depth of 20 to 30 inches; stony surface.
Subject to flooding	Subject to flooding; pervious substratum.	Subject to flooding; fair stability.	Well drained	Features generally favorable; high water storage capacity.	Not generally needed.
Stony	Sandy layers in substratum; stony.	Fair stability; stony surface.	Well drained	Stony surface	Stony surface.
Subject to flooding; seasonal high water table.	Subject to flooding; pervious substratum.	Subject to flooding; fair stability.	Seasonal high water table; subject to flooding.	Subject to flooding; seasonal high water table.	Seasonal high water table; subject to flooding.
Shale bedrock at a depth of 20 to 26 inches.	Bedrock at a depth of 20 to 26 inches; pervious substratum.	Fair stability; limited quantity of material.	Well drained	Low water storage capacity; shallow to bedrock.	Shale bedrock at a depth of 20 to 26 inches.
(1)	(1)	(1)	(1)	(1)	(1).
Seasonal high water table.	Sand lenses may occur in substratum.	Fair stability	Slow permeability; seasonal high water table.	Slow permeability; seasonal high water table.	Seepage above pan.
Stony	Solution channels in substratum.	Fair stability; stony in some areas.	Well drained	High water storage capacity; stony in some areas.	Stony in some areas.
High water table; bedrock at a depth of 20 to 36 inches; instability; stony surface.	Stony surface; pervious substratum.	Instability; stony surface; limited quantity of material.	Slow permeability; high water table; stony.	Slow permeability; stony surface.	High water table; bedrock at a depth of 20 to 36 inches; stony surface.
Subject to flooding; seasonal high water table.	Subject to flooding; pervious substratum.	Subject to flooding; fair stability.	Seasonal high water table; subject to flooding.	Seasonal high water table; subject to flooding.	Seasonal high water table.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of—		Soil features affecting—
			Topsoil	Road fill	Highway location
Pickaway: PkB	Poor	High	Fair to good	Fair	Limestone bedrock at a depth below 36 inches; seasonal high water table; solution channels in bedrock.
Pope: Po	Fair	Low to moderate.	Good	Fair to good	Subject to flooding
Purdy: Pu	Unsuitable	High	Poor	Poor	High water table; instability.
Rock land, steep: RkF	(1)	(1)	(1)	(1)	(1)
Sees: Sc	Poor	High	Poor to fair	Poor	High water table; instability; limestone bedrock at a depth below 42 inches.
Steep eroded land, shale materials: Sp.	Fair to good	Moderate	Poor	Fair to good	Shale bedrock at the surface.
Stony rock land: Sr	(1)	(1)	(1)	(1)	(1)
Strip mine spoil: St	(1)	(1)	(1)	(1)	(1)
Summers: SuC, SyD	Good	Low	Fair to poor; stony.	Good	Sandstone bedrock at a depth of 20 to 30 inches; stony surface in many areas.
Teas: TIB, TIC, TIC3, TID, TID3, TIE, TIE3, TIF, TIF3. For Litz part, see Litz series.	Fair	Moderate	Fair	Fair	Shale bedrock at a depth of 20 to 26 inches.
Weikert: WeC, WeD, WeE, WeF, WkD, WkE, WkF. For Berks part of WkD, WkE, and WkF, see Berks series.	Good	Low	Poor	Fair to good; limited quantity of material.	Shale bedrock at a depth of 10 to 20 inches.
Westmoreland: WmB, WmC, WmD, WmD3, WmE, WmE3, WmF.	Fair	Moderate	Good	Fair	Shale and limestone bedrock at a depth of 24 to 40 inches; subject to soil slippage on steep slopes.

[1] Not rated, because the soil material is too variable for reliable evaluation.

interpretations—Continued

Soil features affecting—Continued					
Pipeline construction and maintenance	Farm ponds		Agricultural drainage	Irrigation	Terraces or diversions
	Reservoir area	Embankment			
Limestone bedrock at a depth below 36 inches; seasonal high water table.	Solution channels in limestone.	Fair stability	Seasonal high water table; moderately slow permeability in fragipan.	Seasonal high water table; moderately slow permeability.	Limestone bedrock at a depth below 36 inches; seasonal high water table.
Subject to flooding and stream erosion.	Pervious substratum; subject to flooding.	Pervious material; subject to flooding.	Well drained	Moderate water storage capacity; subject to flooding.	Subject to flooding.
High water table; instability.	Low seepage loss	Instability; erodible	Slow to very slow permeability; high water table.	Slow to very slow permeability; high water table.	High water table.
(1)	(1)	(1)	(1)	(1)	(1).
High water table; instability; limestone bedrock at a depth below 42 inches.	Solution channels in underlying limestone.	Instability	Moderately slow permeability; high water table; lack of outlets.	Moderately slow permeability; high water table.	High water table.
Shale bedrock at the surface; erodible.	Bedrock at the surface; pervious substratum.	Limited quantity of material.	Well drained	Low water storage capacity.	Shale bedrock at the surface; steep slopes.
(1)	(1)	(1)	(1)	(1)	(1).
(1)	(1)	(1)	(1)	(1)	(1).
Sandstone bedrock at a depth of 20 to 30 inches.	Sandstone bedrock at a depth of 20 to 30 inches; pervious substratum.	Pervious material; stony surface in many areas.	Well drained	Low water storage capacity; stony in many areas.	Sandstone bedrock at a depth of 20 to 30 inches; stony in many areas.
Shale bedrock at a depth of 20 to 26 inches.	Shale bedrock at a depth of 20 to 26 inches; pervious substratum.	Fair stability	Well drained	Low water storage capacity; shale bedrock at a depth of 20 to 26 inches.	Shale bedrock at a depth of 20 to 26 inches.
Shale bedrock at a depth of 10 to 20 inches.	Shallow to pervious substratum.	Fair stability; limited quantity of material.	Well drained	Very low water storage capacity.	Shale bedrock at a depth of 10 to 20 inches.
Shale and limestone bedrock at a depth of 24 to 40 inches; subject to soil slippage on steep slopes.	Shale and limestone bedrock at a depth of 24 to 40 inches; pervious substratum.	Fair stability	Well drained	Moderate water storage capacity.	Shale and limestone bedrock at a depth of 24 to 40 inches; subject to soil slippage on steep slopes.

TABLE 7.—*Engineering*

[Tests were performed by West Virginia University, in cooperation with the West Virginia State Road Commission and the Bureau

Soil name and location	Parent material	W. Va. Report No. S–65	Depth from surface	Moisture-density data [1]		Fragments larger than 3 inches discarded in field sampling
				Maximum dry density	Optimum moisture	
			In.	*lb./cu. ft.*	*Pct.*	*Pct.*
Dekalb very stony loam:						
5 miles N. of Trout on W. Va. Route 10; 500 yards E. of road (Modal.)	Sandstone and shale of Pottsville Series.	13–12–1	3–11	86	28	----------
		13–12–2	11–25	96	16	10
		13–12–3	30–42	112	14	5
Dekalb channery loam:						
5 miles E. of Auto on W. Va. Route 11; 100 yards N. of road. (Finer textured subsoil than modal.)	Sandstone and shale of the Chemung Formation.	13– 6–1	6–16	107	18	----------
		13– 6–2	21–30	117	14	10
Dekalb fine sandy loam:						
2 miles E. of Auto on W. Va. Route 11; roadbank in woods. (Fewer coarse fragments than modal.)	Sandstone of the Pocono Formation.	13– 7–1	13–23	116	13	----------
		13– 7–2	23–31	114	14	----------
Frankstown silt loam:						
5 miles W. of Lewisburg on W. Va. Route 60; 1 mile N. of U.S. Highway 60 (Modal.)	Silty strata in Greenbrier limestone.	13– 8–1	0–8	102	17	----------
		13– 8–2	16–25	104	21	----------
		13– 8–3	28–47	104	20	----------
0.9 mile S. of Frankford on U.S. Highway 219; W. side of road. (High siltstone content in B/C horizon.)	Silty strata in Greenbrier limestone.	13– 1–1	15–28	89	30	----------
		13– 1–2	31–65	88	30	----------
1.8 miles S. of Frankford on U.S. Highway 219; W. side of road. (Heavy subsoil.)	Silty strata in Greenbrier limestone.	13– 4–1	13–27	95	25	----------
		13– 4–2	31–60	90	29	----------
Frederick cherty silt loam:						
1 mile S. of Fairlea on W.Va. Route 37; 200 ft. N. of highway. (Modal.)	Greenbrier limestone.	13– 9–1	0–7	99	19	----------
		13– 9–2	28–42	88	30	----------
		13– 9–3	42–55	92	21	----------
S. edge of Fairlea; 200 yards E. of U.S. Highway 219. (Cherty lower subsoil.)	Greenbrier limestone.	13– 3–1	18–25	99	22	----------
		13– 3–2	39–61	93	26	10
		13– 3–3	61–78	92	24	5
Frederick very rocky silt loam:						
1 mile N. of Lewisburg on U.S. Highway 219; W. side of road. (Very rocky phase.)	Greenbrier limestone.	13– 2–1	18–29	100	22	----------
		13– 2–2	43–70	100	20	----------
Pickaway silt loam:						
5 miles W. of Lewisburg along U.S. Highway 60. (Modal.)	Silty strata of Greenbrier limestone.	13–11–1	0–8	97	22	----------
		13–11–2	25–38	103	20	----------
		13–11–3	38–61	98	16	----------
2 miles W. of Lewisburg on W. Va. Route 35. (Fine-textured substratum.)	Silty strata of Greenbrier limestone.	13–10–1	24–35	100	21	----------
		13–10–2	35–53	99	23	----------
1 mile N. of Lewisburg on W. Va. Route 32. (Silty Bx and Cx.)	Silty strata of Greenbrier limestone.	13–15–1	20–28	108	17	----------
		13–15–2	28–38	106	18	----------
Teas silt loam:						
1 mile S. of Meadow Bluff on Smoot Road; W. Va. Route 25. (Modal.)	Red shale, siltstone, and sandstone from Mauch Chunk Formation.	13–13–1	2–7	98	21	----------
		13–13–2	7–15	105	19	----------
		13–13–3	15–24	111	17	----------
3.1 miles S. of Smoot on W. Va. Route 27; 100 yards S. of road. (Low shale content.)	Red shale, siltstone, and sandstone from Mauch Chunk Formation.	13–14–1	10–19	106	18	----------
		13–14–2	19–27	108	18	----------
1 mile E. of Lewisburg on U.S. Highway 60; 50 yards S. of highway at picnic site. (Heavy subsoil.)	Red shale, siltstone, and sandstone from Mauch Chunk Formation.	13– 5–1	10–18	109	18	----------
		13– 5–2	18–26	114	15	----------

[1] Based on AASHO Designation: T 99, Methods A and C. (*2*).

[2] Analysis according to AASHO Designation: T 88. Results by this procedure frequently differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for use in naming textural classes for soil.

test data

of Public Roads, in accordance with standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [2]									Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than—							
¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO [3]	Unified [4]
									Pct.			
[5] 87	82	77	67	51	46	33	20	13	51	10	A–5(3)	MH
64	53	52	45	26	23	13	6	3	38	9	A–2–4(0)	GM
73	63	58	45	30	26	18	7	1	([6])	([6])	A–2–4(0)	GM
[5] 91	89	84	75	61	57	50	37	28	32	10	A–4(5)	ML–CL
[5] 82	79	74	61	45	40	33	25	21	24	5	A–4(2)	SM–SC
		100	96	39	27	13	5	2	19	([6])	A–4(1)	SM
		100	94	28	22	8	4	2	19	([6])	A–2–4(0)	SM
	100	98	96	85	78	57	24	12	34	8	A–4(8)	ML
			100	99	92	71	41	26	39	15	A–6(10)	CL
			100	98	90	70	30	24	36	14	A–6(10)	CL
				99	94	81	56	35	66	38	A–7–6(20)	CH
			100	95	91	82	58	36	70	37	A–7–5(20)	MH–CH
			100	93	90	75	50	29	95	31	A–7–5(20)	MH
		100	99	87	85	70	48	23	65	29	A–7–5(20)	MH
85	77	75	69	53	48	36	14	3	35	11	A–6(4)	ML–CL
			100	94	90	79	54	44	55	26	A–7–6(17)	MH–CH
		100	99	97	92	75	50	44	56	28	A–7–6(18)	MH–CH
	100	99	92	74	68	53	27	12	45	23	A–7–6(14)	CL
86	83	80	72	58	54	44	28	16	57	26	A–7–5(13)	MH–CH
80	78	76	70	59	56	49	34	24	64	28	A–7–5(14)	MH
		100	98	83	78	64	38	20	46	22	A–7–6(14)	CL
			100	91	87	76	52	32	59	28	A–7–5(19)	MH–CH
		100	96	81	75	58	24	10	37	13	A–6(9)	ML–CL
			100	95	88	69	37	24	39	16	A–6(10)	CL
	100	98	97	87	83	64	34	24	49	21	A–7–6(14)	ML
		100	99	97	92	74	38	28	44	22	A–7–6(14)	CL
			100	96	89	75	43	29	51	27	A–7–6(17)	CH
		100	98	91	84	60	27	15	29	10	A–6(8)	CL
		100	98	85	78	54	22	12	32	13	A–6(9)	CL
	100	[7] 98	90	72	66	50	24	12	43	21	A–7–6(12)	CL
	100	97	94	84	78	62	33	14	33	11	A–6(8)	ML–CL
	100	93	89	69	60	37	22	16	30	10	A–4(7)	CL
	100	96	91	71	63	47	26	17	31	12	A–6(8)	CL
	100	98	96	77	66	47	29	19	35	14	A–6(10)	CL
	100	90	82	61	57	40	27	21	38	16	A–6(8)	CL
100	91	86	72	52	47	35	21	16	39	20	A–6(7)	CL

[3] Based on AASHO Designation M 145–49.

[4] Based on MIL–STD–619B (*22*). SCS and the Bureau of Public Roads have agreed that any soil having a plasticity index within 2 points of A-line is to be given a borderline classification. ML–CL is an example of a borderline classification.

[5] 100 percent passed the 2-inch sieve.

[6] Nonplastic.

[7] Fragments of soft shale larger than 2 millimeters in diameter often slake down or are crushed in laboratory procedure, and a higher percentage of material passes No. 10 and larger sieves.

Figure 6.—**Excavation in Frederick very rocky soil. The underlying limestone bedrock occurs in an irregular pattern.**

Pipeline construction and maintenance is influenced by such soil features as depth to bedrock, soil slippage, erodibility, and depth to the water table. Corrosivity to uncoated steel is influenced by low pH values, the depth to the water table, and the organic-matter content.

Farm pond reservoir areas are affected mainly by seepage loss of water (fig. 7). Among the soil features that influence such seepage are texture, slope, presence of stones, depth to bedrock, and permeability of substrata. Shear strength and the hazard of flooding are also important.

Figure 7.—**Typical farm pond on Frederick soil. Soil material was treated with sodium tripolyphosphate to insure dispersion of the soil material to prevent excessive leaking.**

Farm pond embankments serve as dams. The soil features of both subsoil and substratum are important to the use of soils for constructing embankments. Stability of the soil material, compaction characteristics, erodibility, and presence of stones are important.

Factors affecting agricultural drainage are shown for those soils where drainage is needed. Generally, moderately well drained soils, such as those of the Monongahela series, need only spot drainage to be suitable for row crops. Poorly drained soils, such as those of the Atkins series, need more extensive drainage to be suitable for crops.

Irrigation is a suitable practice on deep, well-drained, nearly level soils that have moderate permeability and high water-storage capacity. Soil features that affect irrigation are shown for each soil. Availability of water is not considered.

Terraces or divisions are needed on some soils in the county. On long slopes they help control runoff, and at the base of slopes they are useful in diverting water away from more nearly level areas. The degree of slope, the depth to bedrock, and the availability of suitable outlets should be considered in planning these practices.

There are no reliable sources of sand and gravel in the county. Small deposits occur in soils of the Pope series and in areas of Alluvial land. Extensive deposits of limestone suitable for crushing for roadbuilding material and other construction uses occur in soils of the Frederick series.

Engineering test data

Fifteen soil samples were tested for engineering purposes, according to standard procedures. The results of these tests are given in table 7. The samples represent soils of the Dekalb, Frankstown, Frederick, Pickaway, and Teas series. Of these, the Dekalb, Frederick, and Teas soils are extensive in this county.

The engineering classifications given in table 6 are based on the data obtained by mechanical analyses and on the liquid limit and plasticity index. Table 7 also gives moisture-density, or compaction, data for the soils tested. If soil material is compacted at successively higher moisture content and the compactive effort remains constant, the dry density of the compacted material increases as the moisture content increases, until the optimum moisture content is reached. After that, the dry density decreases as the moisture content increases. The highest dry density obtained is the maximum dry density, and the corresponding moisture content is the optimum moisture. Moisture-density data are important in earthwork because, as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density at approximately optimum moisture content.

Liquid limit and plasticity index indicate the effect of water on the consistence of soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from plastic to liquid. The plastic limit is the moisture content at which the material changes from a semisolid to a plastic. The liquid limit is the moisture content at which the material changes from plastic to liquid. The plasticity index is the nu-

mercial difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil is plastic.

Recreational and Nonfarm Uses of the Soils

Table 8 lists the limitations of the soils of Greenbrier County for several major components of recreational and nonfarm uses. For each of these uses, the soils are rated in terms of the limitations to be expected for the specified use. The major limiting factors are listed if the limitation is moderate or severe. The degrees of limitations are defined as follows:

None to slight. The soils have few, if any, limitations.
Moderate. The soils have one or more properties that limit their use. Correcting these conditions will increase the installation and maintenance costs.
Severe. The soils have one or more properties that seriously limit their use. The cost of correcting such conditions is generally prohibitive.

The information given in table 8 is for the dominant soil in the mapping unit. In any given area, other soils included in mapping may affect local application of a specific practice. Detailed field investigation is needed to determine the in-place condition of the soil at the site of the proposed construction.

The recreational and nonfarm uses rated in table 8 and soil properties affecting them are discussed in the following paragraphs.

BUILDING LOCATIONS AND HOMESITES.—Buildings considered are three stories or less and have basements. Sewage disposal is not considered. The slope, depth to the water table, soil slippage, the hazard of flooding, and the depth to bedrock are soil properties that affect building locations and homesites. If basements are not planned, the depth to bedrock is of less importance.

LAWNS.—Soil properties should be such that, with the necessary additions of lime and fertilizer, lawns can be easily established and maintained. Soil depth, texture, slope, droughtiness, depth to water table, and stoniness are properties that affect establishment and maintenance of lawns.

EXTENSIVE PLAY AREAS.—These are fairly large areas used for hiking, picnicking, and other kinds of recreation. They are essentially undisturbed so far as land surfaces are concerned. Slope, texture, high water table, and hazard of flooding affect the use of extensive play areas. Limitations are less serious for these uses than for more intensive use, such as for athletic fields.

ATHLETIC FIELDS.—These are generally small, nearly level areas used for football, baseball, and other athletic field events. Considerable grading and land shaping is generally required because nearly level areas are needed. A clayey, gravelly, or stony surface makes an unsuitable playing area. The depth to bedrock, depth to water table, hazard of flooding, and soil slope are other properties that affect suitability for athletic fields.

STREETS AND PARKING LOTS.—The soil requirements and limitations of soils for streets and parking lots are similar to those for highways. Table 5, in the section "Use of the Soils in Engineering," shows depth to the seasonal high water table, depth to bedrock, and the shrink-swell potential for each soil in the county. Table 6 gives the suitability of each soil for road fill, the limitations that affect highway location, and susceptibility to frost action. The slope and the hazard of flooding are other factors that affect the location of streets and parking lots.

ACCESS ROADS.—These roads carry light to medium traffic to recreational areas and buildings and to homesites. Such soil features as slope, soil depth, depth to the water table, stoniness, soil slippage, and the hazard of flooding were considered in making the ratings. Slope and depth to bedrock are generally somewhat less serious limitations for access roads than for streets and parking lots. Soil requirements and limitations are similar to those given for highways in tables 4 and 5.

CAMPSITES.—Tent and trailer sites should be large enough for level pads, picnic tables, fireplaces, and parking space, and large enough to afford privacy. Limitations are generally less serious for tent sites than for trailer sites. The slope, depth to bedrock, natural soil drainage, and soil texture are properties considered in rating soils for campsites.

IMPOUNDMENTS AND SEWAGE LAGOONS.—The following factors should be considered: Impoundments generally are more than one-half acre in size. They may be used for swimming, fishing, ice skating, and other related forms of recreation. Sewage lagoons are shallow ponds built to dispose of sewage through oxidation. They may be practical in some areas where septic tanks and sewage systems are not feasible. The soil restrictions and limitations for these uses are about the same as for farm ponds as given in table 6. Slope, soil depth, permeability, and hazard of flooding are important properties to consider. Soils that are sandy, are underlain by sand and gravel, or are shallow to bedrock have severe limitations.

SEWAGE DISPOSAL FIELDS.—Septic tank filter fields work with difficulty in soils that are shallow to bedrock, are slowly permeable, have slopes of more than 10 percent, have a high water table, or are subject to flooding. A soil that has slight limitations is generally well suited for use as filter fields. A rating of moderate means that the soil is less well suited and a larger filter field is commonly needed. A rating of severe means that the soil may be unsuitable for disposal fields and should be thoroughly investigated.

Formation and Classification of the Soils

This section discusses the factors of soil formation, the processes of horizon differentiation, and the classification of the soils. The section contains two tables. Table 9 shows the relationship of topographic position and parent material to drainage and depth of soils. Table 10 shows the classification of the soils by higher categories.

407-696—72——7

TABLE 8.—*Estimated degree and kind of soil*

[Soil limitations are not given for Mine dump; Rock land, steep; Steep eroded land, shale materials;

Soil series and map symbols	Building locations and homesites	Lawns	Extensive play areas	Athletic fields
Albrights: AbB	Moderate: seasonal high water table.	Slight	Slight	Moderate: slope; seasonal high water table.
Alluvial land: Ad	Severe: frequent flooding.	Severe: frequent flooding.	Moderate to severe: frequent flooding; wet areas.	Moderate to severe: flooding; deposition.
Andover: AnB	Severe: high water table; stones.	Severe: stones; high water table.	Severe: high water table.	Severe: high water table.
Atkins: At, Ay	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.
Calvin:				
CgD	Moderate: slope; bedrock at depth of 20 to 30 inches.	Moderate to severe: slope; stones.	Moderate: slope; stones.	Severe: slope
CgE, CgF	Severe: slope; bedrock at depth of 20 to 30 inches.	Severe: slope	Severe: slope; stones.	Severe: slope
Chavies: Ch	Moderate: infrequent flooding.	Slight	Slight	Moderate: infrequent flooding.
Clarksburg: ClB	Moderate: seasonal high water table; seeps.	Slight	Slight	Severe: slope; seasonal high water table.
Clymer:				
CmB	Moderate: slope	Slight	Slight	Moderate: slope
CmC	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope
Cookport: CpB	Moderate: seasonal high water table.	Slight	Slight	Moderate: slope; seasonal high water table.
Dekalb:				
DbB, DcB	Severe: slope; bedrock at depth of 24 to 42 inches.	Moderate: droughtiness; slope.	Moderate: slope	Severe: slope; bedrock at depth of 24 to 42 inches.
DbC, DcC	Severe: slope; bedrock at depth of 24 to 42 inches.	Moderate to severe: slope; droughtiness.	Severe: slope	Severe: slope
DcD	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope	Severe: slope	Severe: slope
DeC	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; stones	Severe: slope; stones	Severe: slope; stones
DgC	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; stones	Severe: slope; stones	Severe: slope; stones
DlE, DlF	Severe: slope; bedrock at depth of 20 to 42 inches.	Severe: slope; stones	Severe: slope; stones	Severe: slope; stones

limitations for recreational and nonfarm uses

and Strip mine spoil, because the soil material is too variable for reliable evaluation]

Streets and parking lots	Access roads	Campsites (intensive use)		Impoundments and sewage lagoons	Sewage disposal fields
		Tents	Trailers		
Moderate: seasonal high water table.	Moderate: seeps; soil slippage; seasonal high water table.	Moderate: seeps; seasonal high water table.	Moderate: seeps; seasonal high water table.	Moderate to severe: slope.	Severe: moderately slow permeability in fragipan.
Severe: frequent flooding.	Moderate to severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding; pervious substrata.	Severe: frequent flooding.
Severe: high water table; stones.	Severe: high water table; stones.	Severe: high water table; stones.	Severe: high water table; stones.	Moderate to severe: stones; slope.	Severe: high water table; stones.
Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.
Severe: slope	Moderate: slope; bedrock at depth of 20 to 30 inches.	Severe: slope; bedrock at depth of 20 to 30 inches.	Severe: slope; bedrock at depth of 20 to 30 inches.	Severe: slope	Severe: slope; bedrock at depth of 20 to 30 inches.
Severe: slope	Severe: slope; bedrock at depth of 20 to 30 inches.	Severe: slope; bedrock at depth of 20 to 30 inches.	Severe: slope; bedrock at depth of 20 to 30 inches.	Severe: slope	Severe: slope.
Slight	Slight	Moderate to severe: infrequent flooding.	Moderate to severe: infrequent flooding.	Severe: pervious substrata.	Moderate: infrequent flooding.
Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Moderate to severe: slope.	Severe: seasonal high water table; slow permeability.
Moderate: slope	Moderate: slope	Slight	Moderate: slope	Severe: pervious substrata; slope.	Moderate: slope.
Severe: slope; bedrock at depth below 3½ feet.	Moderate: slope; bedrock at depth below 3½ feet.	Moderate: slope	Severe: slope; bedrock at depth below 3½ feet.	Severe: pervious substrata; slope.	Severe: slope.
Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Severe: seasonal high water table; slope.	Severe: seasonal high water table; slope.	Severe: pervious substrata; bedrock at depth of about 3 to 4 feet.	Severe: seasonal high water table.
Moderate to severe: slope; bedrock at depth of 24 to 42 inches.	Moderate: slope	Moderate: slope	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: pervious substrata; bedrock at depth of 24 to 42 inches.	Severe: bedrock at depth of 24 to 42 inches; slope.
Severe: slope; bedrock at depth of 24 to 42 inches.	Moderate to severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: pervious substrata; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.
Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: pervious substrata; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.
Severe: slope; bedrock at depth of 24 to 42 inches; stones.	Severe: slope; stones; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: pervious substrata; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.
Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; stones; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.	Severe: pervious substrata; bedrock at depth of 24 to 42 inches.	Severe: slope; bedrock at depth of 24 to 42 inches.
Severe: slope; bedrock at depth of 20 to 42 inches.	Severe: slope; stones; bedrock at depth of 20 to 42 inches.	Severe: slope; bedrock at depth of 20 to 42 inches.	Severe: slope; bedrock at depth of 20 to 42 inches.	Severe: pervious substrata; bedrock at depth of 20 to 42 inches.	Severe: slope; bedrock at depth of 20 to 42 inches.

TABLE 8.—*Estimated degree and kind of soil*

Soil series and map symbols	Building locations and homesites	Lawns	Extensive play areas	Athletic fields
Dekalb—Continued				
DnC	Moderate to severe: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Severe: slope
DoB, DpC	Moderate to severe: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Severe: slope
DsC, DsE, DsF	Severe: slope; bedrock at depth of 20 to 42 inches.	Severe: slope; stones	Severe: slope; stones	Severe: slope; stones
Elliber:				
EbD, ElD	Moderate to severe: slope.	Severe: chert fragments; stones; slope.	Moderate to severe: slope; stones.	Severe: slope; stones; chert fragments.
EbF	Severe: slope	Severe: chert fragments; stones; slope.	Severe: slope	Severe: slope; stones; chert fragments.
Ernest:				
ErB	Moderate: seasonal high water table.	Slight	Slight	Moderate: slope; seasonal high water table.
ErC	Moderate: seasonal high water table; soil slippage.	Moderate: slope; seeps.	Moderate: slope; seeps.	Severe: slope; seasonal high water table.
Frankstown:				
FaB	Slight	Slight	Slight	Moderate to severe: slope; limestone bedrock at depth below 3½ feet.
FaC, FbC	Moderate: slope; limestone bedrock at depth below 3½ feet.	Moderate: slope	Moderate: slope	Severe: slope
FaD	Moderate to severe: slope; limestone bedrock at depth below 3½ feet.	Severe: slope	Severe: slope	Severe: slope
FeC	Moderate to severe: limestone outcrops; slope.	Severe: limestone outcrops; slope.	Moderate: slope; limestone outcrops.	Severe: limestone outcrops; slope.
FeD	Severe: limestone outcrops; slope.	Severe: limestone outcrops; slope.	Severe: slope	Severe: limestone outcrops; slope.
Frederick:				
FhB, FkB	Moderate: slope; limestone outcrops.	Slight	Slight	Moderate to severe: slope; limestone outcrops.
FhC, FkC	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope
FhD	Moderate: slope	Severe: slope	Moderate to severe: slope.	Severe: slope
FhE	Severe: slope	Severe: slope	Severe: slope	Severe: slope
FrC, FrD	Severe: bedrock outcrops; slope.	Severe: bedrock outcrops; slope.	Moderate: slope; bedrock outcrops.	Severe: bedrock outcrops; slope.
FrE, FrE3, FrF	Severe: bedrock outcrops; slope.	Severe: bedrock outcrops; slope.	Severe: slope	Severe: bedrock outcrops; slope.

limitations for recreational and nonfarm uses—Continued

Streets and parking lots	Access roads	Campsites (intensive use)		Impoundments and sewage lagoons	Sewage disposal fields
		Tents	Trailers		
Moderate to severe: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Severe: seasonal high water table; slope.	Severe: seasonal high water table; slope.	Severe: slope	Severe: slope; seasonal high water table.
Moderate to severe: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Severe: seasonal high water table; slope.	Severe: seasonal high water table; slope.	Severe: slope	Severe: slope; seasonal high water table.
Severe: slope; bedrock at depth of 20 to 42 inches; stones.	Severe: slope; stones; bedrock at depth of 20 to 42 inches.	Severe: slope; bedrock at depth of 20 to 42 inches.	Severe: slope; bedrock at depth of 20 to 42 inches.	Severe: pervious substrata; bedrock at depth of 20 to 42 inches.	Severe: slope; bedrock at depth of 20 to 42 inches.
Moderate to severe: slope.	Moderate: slope	Severe: slope; stones.	Severe: slope; stones.	Severe: pervious substrata.	Severe: slope.
Severe: slope	Severe: slope	Severe: slope; stones.	Severe: slope; stones.	Severe: pervious substrata.	Severe: slope.
Moderate: seasonal high water table; slope; seeps.	Moderate: seasonal high water table; seeps; soil slippage.	Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Slight to moderate: slope.	Severe: seasonal high water table; moderately slow permeability in pan.
Moderate to severe: seasonal high water table; slope; seeps.	Moderate: seasonal high water table; seeps; soil slippage.	Moderate: slope; seasonal high water table.	Severe: slope; seasonal high water table.	Severe: slope	Severe: seasonal high water table; moderately slow permeability in pan.
Slight to moderate: slope; limestone bedrock at depth below 3½ feet.	Slight	Slight to moderate: slope; limestone bedrock at depth below 3½ feet.	Moderate: slope; limestone bedrock at depth below 3½ feet.	Severe: low shear strength; cavernous limestone bedrock at depth below 3½ feet.	Moderate: slope.
Moderate to severe: slope; limestone bedrock at depth below 3½ feet.	Moderate: slope	Moderate: slope; limestone bedrock at depth below 3½ feet.	Severe: slope; limestone bedrock at depth below 3½ feet.	Severe: low shear strength; cavernous limestone bedrock at depth below 3½ feet; slope.	Severe: slope.
Severe: slope; limestone bedrock at depth below 3½ feet.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: limestone outcrops; slope.	Severe: limestone outcrops; slope.	Severe: limestone outcrops; slope.	Severe: limestone outcrops; slope.	Severe: slope	Severe: limestone outcrops; slope.
Severe: limestone outcrops; slope.	Severe: limestone outcrops; slope.	Severe: slope	Severe: slope	Severe: slope	Severe: limestone outcrops; slope.
Moderate: slope; limestone outcrops.	Slight	Slight	Moderate: slope; limestone outcrops.	Severe: low shear strength; cavernous limestone at depth below 62 inches.	Moderate: slope; limestone outcrops.
Severe: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe; low shear strength, cavernous limestone at depth below 62 inches; slope.	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope Severe: bedrock outcrops; slope.	Severe: slope Severe: bedrock outcrops; slope.	Severe: slope Severe: bedrock outcrops; slope.	Severe: slope Severe: bedrock outcrops; slope.	Severe: slope Severe: slope; bedrock outcrops.	Severe: slope. Severe: bedrock outcrops; slope.
Severe: bedrock outcrops; slope.	Severe: bedrock outcrops; slope.	Severe: bedrock outcrops; slope.	Severe: bedrock outcrops; slope.	Severe: slope; bedrock outcrops.	Severe: bedrock outcrops; slope.

TABLE 8.—*Estimated degree and kind of soil*

Soil series and map symbols	Building locations and homesites	Lawns	Extensive play areas	Athletic fields
Huntington: Hu	Severe: flooding or ponding.	Slight: ponding of short duration.	Slight	Slight to moderate: ponding of short duration.
Laidig:				
LaB	Slight	Slight to moderate: stone fragments.	Slight	Moderate: slope; stone fragments.
LaC	Moderate: slope; hazard of soil slippage.	Moderate: stone fragments; slope.	Moderate: slope	Severe: slope; stone fragments.
LbC, LbD	Moderate: slope; stones; soil slippage.	Moderate to severe: stones; slope.	Moderate to severe: slope; stones.	Severe: slope; stones.
LeC, LeD	Severe: stones; slope	Severe: stones	Severe: many surface stones.	Severe: many surface stones.
Lindside: Ln	Severe: local ponding	Slight to moderate: local ponding.	Moderate: seasonal high water table; ponding.	Moderate: seasonal high water table; ponding.
Monongahela:				
MgB	Moderate: seasonal high water table; seeps.	Slight	Slight to moderate: seasonal high water table.	Moderate: seasonal high water table; slope.
MgC	Moderate: seasonal high water table; seeps; slope.	Slight to moderate: slope.	Moderate: seasonal high water table; slope.	Severe: slope; seasonal high water table.
Murrill:				
MuC	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope
MuD	Moderate: slope	Severe: slope	Severe: slope	Severe: slope
MvD	Moderate to severe: slope; stones.	Severe: slope; stones.	Moderate: slope; stones.	Severe: slope
MvE	Severe: slope; stones.	Severe: slope; stones.	Severe: slope	Severe: slope
Philo: Ph	Severe: flooding; seasonal high water table.	Slight to moderate: flooding.	Moderate: flooding; seasonal high water table.	Moderate: seasonal high water table; flooding.
Pickaway: PkB	Moderate: seasonal high water table.	Slight	Slight	Moderate: slope; seasonal high water table.
Pope: Po	Severe: flooding	Moderate: flooding; surface droughtiness.	Moderate: flooding	Moderate: flooding
Purdy: Pu	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Sees: Sc	Severe: seasonal high water table.	Moderate to severe: seasonal high water table.	Moderate to severe: seasonal high water table.	Severe: seasonal high water table.

limitations for recreational and nonfarm uses—Continued

Streets and parking lots	Access roads	Campsites (intensive use)		Impoundments and sewage lagoons	Sewage disposal fields
		Tents	Trailers		
Moderate: ponding of short duration.	Moderate: ponding of short duration.	Moderate: ponding of short duration.	Moderate: ponding of short duration.	Severe: pervious substrata of cavernous limestone.	Severe: flooding or ponding.
Moderate: slope----	Slight----------	Slight: slope-------	Moderate: slope----	Moderate: slope; sandy layers in substrata.	Slight.
Severe: slope------	Moderate: slope----	Moderate: slope----	Severe: slope------	Severe: slope------	Moderate: slope.
Severe: slope; stones.	Moderate to severe: slope; stones.	Moderate to severe: slope.	Severe: slope; stones.	Severe: slope------	Moderate to severe: slope; stones.
Severe: many surface stones.	Severe: many surface stones.	Severe: slope; stones.	Severe: many surface stones.	Severe: slope; stones.	Severe: stones; slope.
Moderate to severe: seasonal high water table; ponding.	Moderate: seasonal high water table; ponding.	Moderate to severe: local ponding.	Severe: seasonal high water table; ponding.	Severe: pervious substrata.	Severe: seasonal high water table; ponding.
Moderate: seasonal high water table; slope.	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table; slope.	Moderate to severe: sandy layer in substrata.	Severe: seasonal high water table slow permeability in pan.
Severe: seasonal high water table; slope.	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table; slope.	Severe: slope------	Severe: slope; seasonal high water table.
Severe: slope------	Moderate: slope----	Moderate: slope----	Severe: slope------	Severe: slope------	Moderate: slope.
Severe: slope------	Severe: slope------	Severe: slope------	Severe: slope------	Severe: slope------	Severe: slope.
Severe: slope------	Moderate to severe: slope; stones.	Moderate to severe: slope; stones.	Severe: slope------	Severe: slope------	Severe: slope.
Severe: slope------	Severe: slope------	Severe: slope; stones.	Severe: slope------	Severe: slope------	Severe: slope.
Severe: seasonal high water table; flooding.	Moderate: seasonal high water table.	Severe: flooding----	Severe: flooding----	Moderate to severe: flooding; sandy layers.	Severe: seasonal high water table; flooding.
Moderate: slope; seasonal high water table.	Moderate: seasonal high water table; slope.	Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Severe: pervious substrata; cavernous limestone at depth below 36 inches.	Severe: seasonal high water table; moderately slow permeability.
Severe: flooding----	Moderate to severe: flooding.	Severe: flooding----	Severe: flooding----	Severe: flooding; pervious substrata.	Severe: flooding.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Slight----------	Severe: high water table; slow to very slow permeability.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate to severe: cavernous limestone at depth below 42 inches.	Severe: seasonal high water table; moderately slow permeability.

TABLE 8.—*Estimated degree and kind of soil*

Soil series and map symbols	Building locations and homesites	Lawns	Extensive play areas	Athletic fields
Stony rock land: Sr	Severe: bedrock outcrops; stoniness.	Severe: bedrock outcrops; stoniness.	Severe: bedrock outcrops; stoniness.	Severe: bedrock outcrops; stoniness.
Summers:				
SuC	Moderate to severe: bedrock at depth of 20 to 30 inches; slope.	Moderate: slope; bedrock at depth of 20 to 30 inches.	Moderate: slope	Severe: slope; bedrock at depth of 20 to 30 inches.
SyD	Moderate to severe: bedrock at depth of 20 to 30 inches; slope.	Severe: slope; bedrock at depth of 20 to 30 inches; stones.	Moderate to severe: slope; stones.	Severe: slope; bedrock at depth of 20 to 30 inches.
Teas:				
TIB	Moderate: slope; bedrock at depth of 20 to 26 inches.	Moderate: slope; bedrock at depth of 20 to 26 inches.	Moderate: slope	Severe: slope; bedrock at depth of 20 to 26 inches.
TIC, TIC3	Moderate: slope; bedrock at depth of 20 to 26 inches.	Moderate: slope; bedrock at depth of 20 to 26 inches.	Moderate: slope	Severe: slope
TID, TID3	Moderate: slope; bedrock at depth of 20 to 26 inches.	Severe: slope; bedrock at depth of 20 to 26 inches.	Severe: slope	Severe: slope
TIE, TIE3, TIF, TIF3	Severe: slope; bedrock at depth of 20 to 26 inches.	Severe: slope; bedrock at depth of 20 to 26 inches.	Severe: slope	Severe: slope
Weikert:				
WeC	Moderate: slope; bedrock at depth of 10 to 20 inches.	Severe: slope; droughtiness; bedrock at depth of 10 to 20 inches.	Moderate: slope; droughtiness.	Severe: slope
WeD	Moderate to severe: slope; bedrock at depth of 10 to 20 inches.	Severe: slope	Severe: slope	Severe: slope
WeE, WeF	Severe: slope	Severe: slope	Severe: slope	Severe: slope
WkD	Moderate to severe: slope.	Severe: slope	Severe: slope	Severe: slope
WkE, WkF	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Westmoreland:				
WmB	Moderate: slope; bedrock at depth of 24 to 40 inches.	Moderate: slope	Slight	Moderate to severe: slope; bedrock at depth of 24 to 40 inches.
WmC	Moderate: slope; bedrock at depth of 24 to 40 inches.	Moderate to severe: slope.	Moderate: slope	Severe: slope; bedrock at depth of 24 to 40 inches.
WmD, WmD3	Severe: slope; soil slippage.	Severe: slope; erodibility.	Severe: slope	Severe: slope
WmE, WmE3, WmF	Severe: slope; soil slippage.	Severe: slope; erodibility.	Severe: slope	Severe: slope

limitations for recreational and nonfarm uses—Continued

Streets and parking lots	Access roads	Campsites (intensive use)		Impoundments and sewage lagoons	Sewage disposal fields
		Tents	Trailers		
Severe: bedrock outcrops; stoniness.	Severe: bedrock outcrops; stoniness.	Severe: bedrock outcrops; stoniness.	Severe: bedrock outcrops; stoniness.	Severe: bedrock outcrops; stoniness.	Severe: bedrock outcrops; stoniness.
Severe: bedrock at depth of 20 to 30 inches.	Moderate: slope; bedrock at depth of 20 to 30 inches.	Moderate: slope	Moderate to severe: slope; bedrock at depth of 20 to 30 inches.	Severe: bedrock at depth of 20 to 30 inches; pervious substrata.	Severe: bedrock at depth of 20 to 30 inches.
Severe: bedrock at depth of 20 to 30 inches; slope.	Severe: slope; bedrock at depth of 20 to 30 inches; stones.	Moderate to severe: slope.	Severe: slope; bedrock at depth of 20 to 30 inches.	Severe: bedrock at depth of 20 to 30 inches; pervious substrata.	Severe: bedrock at depth of 20 to 30 inches.
Moderate: slope; bedrock at depth of 20 to 26 inches.	Moderate: slope; bedrock at depth of 20 to 26 inches.	Slight	Moderate: slope; bedrock at depth of 20 to 26 inches.	Severe: bedrock at depth of 20 to 26 inches; pervious substrata.	Severe: bedrock at depth of 20 to 26 inches.
Severe: slope; bedrock at depth of 20 to 26 inches.	Moderate: slope; bedrock at depth of 20 to 26 inches.	Moderate: slope; bedrock at depth of 20 to 26 inches.	Severe: slope; bedrock at depth of 20 to 26 inches.	Severe: bedrock at depth of 20 to 26 inches; pervious substrata.	Severe: slope; bedrock at depth of 20 to 26 inches.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; bedrock at depth of 20 to 26 inches.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; bedrock at depth of 20 to 26 inches.
Severe: slope; bedrock at depth of 10 to 20 inches.	Moderate to severe: bedrock at depth of 10 to 20 inches; slope.	Moderate to severe: slope.	Severe: slope; bedrock at depth of 10 to 20 inches.	Severe: slope; bedrock at depth of 10 to 20 inches.	Severe: slope; bedrock at depth of 10 to 20 inches.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; bedrock at depth of 10 to 20 inches.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; bedrock at depth of 10 to 20 inches.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope; soil slippage; bedrock at depth of 24 to 40 inches.	Moderate: slope; soil slippage; bedrock at depth of 24 to 40 inches.	Slight	Moderate: slope; bedrock at depth of 24 to 40 inches.	Severe: slope; pervious bedrock at depth of 24 to 40 inches.	Severe: bedrock at depth of 24 to 40 inches; slope.
Severe: slope; soil slippage; bedrock at depth of 24 to 40 inches.	Moderate to severe: slope; soil slippage; bedrock at depth of 24 to 40 inches.	Severe: slope; bedrock at depth of 24 to 40 inches.	Moderate: slope; bedrock at depth of 24 to 40 inches.	Severe: slope; pervious bedrock at depth of 24 to 40 inches.	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

TABLE 9.—*Relationship of topographic position and parent material to drainage and depth of soils*

[Dashed lines indicate that there is no series of this drainage class in the county]

Topographic position and parent material	Well-drained soils			Moderately well drained, deep soils	Somewhat poorly drained, deep soils	Poorly drained, deep soils
	Shallow	Moderately deep	Deep			
Uplands: Residuum derived from—						
Acid, gray sandstone	----------	Dekalb, Summers.	Clymer	Cookport	Nolo [1]	Nolo.[1]
Acid, gray shale, siltstone, and sandstone.	Weikert	Gilpin, Berks	----------	----------	----------	----------
Acid, reddish siltstone and sandstone	----------	Calvin, Teas [2]	----------	----------	----------	----------
Gray siltstone and shale	----------	Litz [2]	----------	----------	----------	----------
Interbedded limestone, shale, and sandstone.	----------	Westmoreland	Westmoreland	----------	----------	----------
Cherty limestone	----------	----------	Frederick, Elliber.	----------	----------	----------
Silty limestone	----------	----------	Frankstown	Pickaway	Sees [3]	Sees.[3]
Colluvial slopes: Colluvium derived from—						
Acid, gray sandstone	----------	----------	Laidig, Murrill	Buchanan	Andover	Andover.
Acid, gray shale, siltstone, and sandstone.	----------	----------	----------	Ernest	----------	----------
Reddish and gray siltstone and sandstone.	----------	----------	----------	Albrights [2]	----------	----------
Interbedded limestone, shale, and sandstone.	----------	----------	----------	Clarksburg	----------	----------
Terraces: Material derived from—						
Acid shale, siltstone, and sandstone	----------	----------	----------	Monongahela	----------	Purdy.
Flood plains: Alluvium derived from—						
Acid sandstone, siltstone, and shale	----------	----------	Chavies, Pope	Philo	Philo	Atkins.
Limestone and calcareous shale and siltstone.	----------	----------	Huntington	Lindside	Lindside	----------

[1] Some soils in the Nolo series are only moderately deep.
[2] The parent material of these soils contains some calcareous strata.
[3] These soils are affected by colluvium derived from limestone in the surrounding uplands.

Factors of Soil Formation

The factors that determine the kind of soil that forms at any given point are the climate under which the soil material accumulated and weathered, the plant and animal life on and in the soil, the composition of the parent material, the topography or lay of the land, and time. The relative importance of each factor differs from place to place, and each modifies the effect of the other four. In some cases one factor may dominate the formation of a soil.

Climate and vegetation are the active factors of soil formation. They alter the accumulated soil material and bring about the development of genetically related horizons. Topography, mainly by its influence on temperature and runoff, modifies the effect of climate and vegetation. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed to change the parent material into a soil. Usually, a long time is required for the development of distinct horizons.

Climate

Greenbrier County has a humid-continental climate, characterized by strong seasonal temperature changes. In the southern and eastern parts of the county, the average annual air temperature is 50°F., the annual precipitation about 39 inches, and the rainfall during the growing season about 18 inches. In this part of the county the growing season extends from May through September, and the soil is frozen only for short periods each year. In the northwestern part of the county, which is high and mountainous, the annual precipitation ranges from 50 to 55 inches and the rainfall during the growing season is nearly 25 inches. In this part of the county the growing season extends from the last week in May through September.

In this kind of climate, the soils tend to be strongly weathered, leached, moderately fertile, and acid.

Plant and animal life

Vegetation, bacteria, fungi, earthworms, cicadas, and burrowing animals are important in the formation of soil. The vegetation generally governs the organic-matter content and the color of the surface layer, and it affects the amount of nutrients in the soil. Earthworms, cicadas, and larger burrowing animals help to keep the soil open and porous. Bacteria and fungi, through decomposition of vegetation, bring about many beneficial changes, such as release and leaching of elements, aggregation of par-

TABLE 10.—*Soil series classified by higher categories*

Soil series	Family	Subgroup	Order	Great soil group, 1938 classification
Albrights	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols	Red-Yellow Podzolic soils intergrading to Gray-Brown Podzolic soils.
Andover	Fine-loamy, mixed, mesic	Typic Fragiaquults	Ultisols	Low-Humic Gley soils.
Atkins	Fine-loamy, mixed, acid, mesic	Fluventic Haplaquepts	Inceptisols	Low-Humic Gley soils.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides intergrading to Lithosols.
Buchanan	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols	Red-Yellow Podzolic soils.
Calvin	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides intergrading to Lithosols.
Chavies	Coarse-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Alluvial soils.
Clarksburg	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils.
Clymer	Fine-loamy, mixed, mesic (siliceous).	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading to Red-Yellow Podzolic soils.
Cookport	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols	Red-Yellow Podzolic soils intergrading to Gray-Brown Podzolic soils.
Dekalb	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Elliber	Loamy-skeletal, siliceous, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Ernest	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols	Gray-Brown Podzolic soils intergrading to Red-Yellow Podzolic soils.
Frankstown	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Frederick	Clayey, kaolinitic, mesic	Typic Paleudults (Hapludults).	Ultisols	Red-Yellow Podzolic soils.
Gilpin	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading to Red-Yellow Podzolic soils.
Huntington	Fine-silty, mixed, mesic	Fluventic Hapludolls	Mollisols	Alluvial soils.
Laidig	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils.
Lindside	Fine-silty, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols	Alluvial soils.
Litz	Loamy-skeletal, mixed, mesic	Ruptic Ultic Dystrochrepts.	Inceptisols	Red-Yellow Podzolic soils intergrading to Lithosols.
Monongahela	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils.
Murrill	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading to Red-Yellow Podzolic soils.
Nolo [1]	Fine-loamy, mixed, mesic	Typic Fragiaquults	Ultisols	Low-Humic Gley soils.
Philo	Coarse-loamy, mixed, mesic	Fluvaquentic Dystrochrepts	Inceptisols	Alluvial soils.
Pickaway	Fine-silty, mixed, mesic	Aquic Fragiudalfs	Alfisols	Red-Yellow Podzolic soils.
Pope	Coarse-loamy, mixed, mesic	Fluventic Dystrochrepts	Inceptisols	Alluvial soils.
Purdy	Clayey, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils
Sees	Fine, mixed, mesic	Aquollic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Brunizems.
Summers	Loamy-skeletal, mixed, mesic	Typic Haplumbrepts	Inceptisols	Sols Bruns Acides.
Teas	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides intergrading to Lithosols.
Weikert	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols	Lithosols intergrading to Sols Bruns Acides.
Westmoreland	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.

[1] These soils are shallower to bedrock than those in the defined range of the Nolo series and are considered taxadjuncts to the series.

ticles, and aeration of the soil, as well as improvement of soil-moisture relationships.

In Greenbrier County, the native hardwood forests have had a major effect on the formation of soils.

Parent material

In Greenbrier County, the soils formed most extensively in residuum on uplands but they also formed in colluvium, in the material that makes up the stream terraces, and in recent alluvium along the streams. The residuum has weathered from a variety of rocks (*14*).

Residuum weathered from the strongly folded, acid, gray siltstone, shale, and thin-bedded sandstone is the dominant parent material in the eastern third of the county. The soils that formed in this material are shallow to moderately deep, medium textured, and high in content of rock fragments. Among these are the extensive soils of the Berks and Weikert series.

Residuum weathered from younger massive limestone that contains considerable chert is the parent material of soils in the rolling valley areas in the central part of the county. The soils that formed in this material are medium textured to fine textured and are drained by solution channels in the limestone, rather than by surface streams. Among these are soils of the Frankstown and Frederick series.

Residuum weathered from interbedded red and gray siltstone, shale, and sandstone is the parent material of soils on most of the strongly dissected plateau in the west-central part of the county. Some of these rocks are calcareous. The soils that formed in this parent material are moderately deep and medium textured. The most extensive of these are soils of the Teas, Litz, and Calvin series.

Residuum from younger, massive, level-bedded sandstone and shale that contains extensive seams of coal is the parent material of soils in the rugged northwestern part of the county. Soils that formed in this material are medium textured to moderately coarse textured, acid, and for the most part, very stony. Soils of the Dekalb and Gilpin series occupy most of this area.

Colluvium is the parent material that commonly occurs as narrow strips on toe slopes below the uplands that are underlain by acid sandstone and shale. This material is medium textured to moderately coarse textured, and in many places there are stones on the surface. It commonly receives seepage of ground water from higher slopes. Soils of the Ernest and Laidig series occur extensively in these areas.

The parent material that makes up the stream terraces is of relatively minor extent. It is medium textured and acid and, in many places, is gravelly in the lower part. This material occurs along the Greenbrier River, Anthony Creek, and other major streams. Soils of the Monongahela series occur in most of these areas.

Recent alluvium is the parent material that occurs along most of the sizable streams. This material is medium textured to coarse textured, mostly acid, and in many areas is gravelly. Soils of the Pope, Philo, and Atkins series and Alluvial land occur in these areas. Small areas of medium-textured, recent alluvium derived from the limestone of upland areas occur in the limestone valley areas. Soil of the Huntington and Lindside series formed in these valley areas.

Topography

The shape of the land and the slope and position of the soils in relation to the water table have strongly affected the formation of soils in Greenbrier County. Length, steepness, and configuration of the slope affect the characteristics of soils from place to place. Local differences are largely the result of differences in topography and parent material. In some soils wetness, strong leaching, or enrichment may be caused by topographic position. For example, soils on colluvial toe slopes receive seepage from the slopes above. Table 9 shows the relationship of topographic position and parent material to drainage and depth of the soils of this county.

On steep and very steep slopes, where runoff is excessive and where the movement of soil material by creep is appreciable, the soils have a weakly developed profile and commonly contain a considerable amount of rock fragments. In sloping areas where runoff is moderate to rapid, they are generally well drained and have a bright-colored, unmottled subsoil. In gently sloping areas where runoff is slower, they are often wet for short periods, and consequently, have a mottled subsoil. In level areas and in depressions where the water table is at or near the surface for long periods, the soils show the effect of wetness to a marked degree. They have a black or dark-gray surface layer and a strongly mottled, grayish subsoil.

Time

Time is necessary for the formation of soils from parent material. Usually a long time, when measured in years, is required.

The soils of Greenbrier County range from young soils on stream bottoms to old soils on gently sloping uplands. The soils on stream bottoms are considered young because they are subject to flooding and in some places receive new sediments with each flooding. They have only weak structure and slight differences in color from one horizon to another. Among these are soils of the Pope series. Steep and very steep soils are also considered young because the soil material is removed by geologic erosion before there is time for distinct horizons to form. This soil material is removed by soil creep and washing, or by solifluction. Among these are soils of the Dekalb series. The soils in smooth upland areas are considered old, or mature, because they have been in place long enough for the development of distinct genetic horizons. They remain in place a long time because they have relatively stable parent material, and the removal of their soil material is slow. Among these are soils of the Frederick series.

Processes of Horizon Differentiation

Among the several processes involved in the formation of horizons are accumulation of organic matter, leaching of soluble salts, formation and translocation of clay minerals, and reduction and transfer of iron. These processes take place continuously throughout the profile, generally at the same time. They are measured in thousands of years.

The accumulation of organic matter takes place with the decomposition of plant residue. This process darkens the surface layer and helps to form the A1 horizon. Once lost, organic matter is replaced only over a long period of time. In this county organic matter makes up 1 to 1½ percent of the surface layer in tilled areas and 5 to 6 percent in wooded areas. A thin A1 horizon is common where there is a permanent cover of trees.

The leaching of some of the lime and other soluble salts is believed to take place before the translocation of clay minerals. Among the many factors that affect leaching are the dominant kind of vegetation, the kind of salts originally present, the depth to which the soil solution percolates, and the texture and structure in the soil profile.

The most important process of horizon differentiation in Greenbrier County is the formation and translocation of silicate clay minerals. The amount of clay minerals throughout the profile is governed by the amount inherited from the parent material, but it varies from one horizon to another. Clay minerals generally move downward from the A horizon by the process of eluviation and accumulate in the B horizon by the process of illuviation. The clay generally occurs as clay films on the ped faces and in the pores and root channels of the B horizon. In some soils a light-colored A2 horizon that has platy structure has formed as a result of the considerable eluviation of clay minerals to the B horizon. Soils of the

Frederick series are examples of soils in which translocation of clay minerals has taken place.

The reduction and transfer of iron are associated mainly with the wetter, more poorly drained soils. This process is called gleying. Moderately well drained to somewhat poorly drained soils that have strong-brown and reddish-brown mottles are an indication of the segregation of iron. Poorly drained to very poorly drained soils, such as those of the Atkins and Purdy series have a grayish subsoil and underlying material, which is an indication of reduction and transfer of iron.

Classification of the Soils

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*4*) and later revised (*17*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965 and supplemented in March 1967 and September 1968 (*20*). This system is under continual study, and readers interested in the development of the system should refer to the latest literature available.

The current system of classification defines classes in terms of observable or measurable properties of soils (*16*). It has six categories. Beginning with the most inclusive, the categories are the order, the suborder, the great group, the subgroup, the family, and the series. The placement of some soil series, particularly in families, may change as more precise information becomes available.

Table 10 shows the classification of the soil series in Greenbrier County according to the current system and the great soil group according to the 1938 system. Following are brief descriptions of the six categories.

ORDER.—Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The Inceptisols, Mollisols, Alfisols, and Ultisols are represented in Greenbrier County.

Inceptisols occur mostly on young, but not recent, land surfaces. This order is represented in this county by soils of the Atkins, Berks, Calvin, Dekalb, Elliber, Lindside, Litz, Philo, Pope, Summers, Teas, and Weikert series.

Mollisols have a thick, dark-colored surface layer, moderate to strong structure, and base saturation of more than 50 percent. This order is represented by soils of the Huntington series.

Alfisols contain accumulated aluminum and iron, have argillic or natric horizons, and have a base saturation of more than 35 percent. This order is represented by soils of the Albrights, Chavies, Clarksburg, Pickaway, Sees, and Westmoreland series.

Ultisols are soils that are highly developed but still contain weatherable materials. This order is represented by soils of the Andover, Buchanan, Clymer, Cookport, Ernest, Frankstown, Frederick, Gilpin, Laidig, Monongahela, Murrill, Nolo, and Purdy series.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that indicate genetic similarity. The suborders have a narrower climatic range than the orders. The criteria for suborders reflect either the presence or absence of waterlogging or soil differences resulting from climate or vegetation.

GREAT GROUP.—Each suborder is divided into great groups on the basis of uniformity in kind and sequence of genetic horizons. The great group in the current classification is not shown in table 10, because the name of the great group is the same as the last word in the name of the subgroup.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) concept of the group, and other groups, called intergrades, that have properties of one great group but also one or more properties of another great group.

FAMILIES.—Families are established within subgroups, primarily on the basis of properties important to plant growth. Some of these properties are texture, mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

Laboratory Data

This section gives laboratory data for soils of the Calvin and Teas series. The sample of the Calvin soil was taken in a wooded area about 3 miles southwest of Smoot, and that of the Teas soil in a wooded area about 1 mile east of Lewisburg along U.S. Highway 60. The soils from which the samples were taken are considered representative of their respective series. Their profiles are described in detail in the section "Descriptions of the Soils."

Data for a Frederick cherty silt loam sampled in Greenbrier County, as well as for other soils that occur in this county, are given in the soil survey for Monroe County (*21*).

Tables 11 and 12 give the laboratory data for selected Calvin and Teas soils. These data are helpful in determining the characteristics and classification of the soils and in understanding their genesis. They are also useful in making interpretations for use and management, as well as in verifying field methods and determinations. The laboratory samples were analyzed at the Soil Survey Laboratories at Beltsville, Maryland, and at Lincoln, Nebraska.

In table 11, organic carbon was determined by wet combustion (*12*), and total nitrogen by the Kjeldahl method (*3*). Extractable iron was determined by a method that involves reducing and dissolving the iron by means of sodium hydrosulfite and titration with potassium dichromate (*7*). Calcium was determined by oxalate precipitation and potassium permanganate titration. Magnesium was determined as magnesium ammonium phosphate. Sodium and potassium were determined by the flame photometer. Bases were extracted with ammonium acetate at a pH value of 7. Extractable acidity was determined by extraction with a barium chloride and triethanolamine solution and back titration with a standard acid. Cation exchange capacity by sum of cations was determined by adding extractable bases and extractable acidity. Cation exchange capacity by ammonium acetate was determined by direct distillation (*12*). Base saturation by sum of cations was calculated

TABLE 11.—*Laboratory*

[Analyses made by Soil Survey

Soil type, sample number, and horizon	Depth from surface	Reaction, soil-water (1:1)	Organic carbon	Nitrogen	C/N ratio	Extractable iron
Calvin silt loam: S58 W. Va. 13–3 (1–4)	*In.*	*pH*	*Pct.*	*Pct.*		*Pct*
A1	0–2	5. 1	5. 48	0. 247	22	1. 6
A2	2–7	4. 9	1. 13	. 071	16	1. 8
B2	7–13	4. 7	. 33	. 045	7	2. 2
B3	13–23	4. 7	. 14	. 040	4	2. 8
Teas silt loam: S58 W. Va. 13–4 (1–3)						
A2	1–8	5. 1	. 92	. 074	12	1. 9
B2	8–14	5. 0	. 39	. 058	7	2. 8
B3	14–22	4. 9	. 22	. 047	5	1. 6

[1] Trace detected but below the level recorded.

TABLE 12.—*Particle-size distribution*

[Unless otherwise indicated, analyses made by Soil

Soil type, sample number, and horizon	Depth from surface	Textural class	Size class and diameter of particles [1]		
			Very coarse sand (2–1 mm.)	Coarse sand (1–0.5 mm.)	Medium sand (0.5–0.25 mm.)
Calvin silt loam:					
S58 W. Va. 13–3 (1–4):	*In.*		*Pct.*	*Pct.*	*Pct.*
A1	0–2	Silt loam	0. 6	1. 5	1. 1
A2	2–7	Silt loam	. 2	1. 0	. 9
B2	7–13	Silt loam	. 1	. 8	. 7
B3	13–23	Silt loam	(2)	. 5	. 8
Teas silt loam:					
S58 W. Va. 13–4 (1–3):					
A2	1–8	Silt loam	1. 8	1. 5	. 6
B2	8–14	Silty clay loam	2. 8	2. 8	1. 1
B3	14–22	Silty clay loam	1. 0	1. 2	. 7

[1] All sand fractions contain many concretions, except those of fine sand and very fine sand in the uppermost layer of Teas soils. In these two sand fractions, concretions are very common.

data for selected soils

Laboratories at Lincoln, Nebraska]

Extractable bases (meq./100 gm. of soil)				Sum of bases	Extractable acidity	Cation exchange capacity (meq./100 gm. of soil)		Base saturation		Ca/Mg ratio
Ca	Mg	Na	K			Sum of cations	Ammonium acetate	Sum of cations	Ammonium acetate	
				Meq./100 gm. of soil	*Meq./100 gm. of soil*			*Pct.*	*Pct.*	
6. 5	1. 6	(1)	0. 6	8. 7	14. 7	23. 4	16. 2	37	54	4. 1
1. 0	. 6	(1)	. 3	1. 9	9. 5	11. 4	8. 4	17	23	1. 7
. 7	1. 0	(1)	. 2	1. 9	9. 7	11. 6	8. 7	16	22	. 7
. 7	1. 4	(1)	. 2	2. 3	10. 0	12. 3	9. 7	19	24	. 5
1. 4	1. 4	(1)	. 3	3. 1	9. 0	12. 1	9. 5	26	33	1. 0
1. 1	2. 0	(1)	. 3	3. 4	10. 0	13. 4	10. 6	25	32	. 6
2. 6	3. 6	(1)	. 3	6. 5	8. 0	14. 5	11. 7	45	56	. 7

and water retention for selected soils

Survey Laboratories at Lincoln, Nebraska]

Size class and diameter of particles [1]—Continued							Water retention at 15 bars	Bulk density [2]
Fine sand (0.25–0.10 mm.)	Very fine sand (0.10–0.05 mm.)	Silt (0.05–0.002 mm.)	Clay (less than 0.002 mm.)	0.2–0.02 mm.	0.02–0.002 mm.	More than 2.0 mm.		
Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*		*Pct.*	*Gm/cc.*
6. 0	14. 4	60. 4	16. 0	41. 7	37. 5	(3)	9. 8	
4. 8	12. 8	62. 1	18. 2	39. 2	39. 3	(3)	6. 5	1. 41
3. 2	7. 6	64. 4	23. 2	30. 7	43. 5	(3)	8. 5	1. 72
2. 6	6. 4	69. 5	20. 2	35. 7	41. 9	(3)	8. 4	1. 85
1. 4	4. 7	68. 6	21. 4	25. 1	49. 1	(3)	7. 0	1. 38
1. 6	2. 2	60. 8	28. 7	15. 1	48. 8	(3)	8. 8	1. 67
1. 5	2. 8	57. 5	35. 3	10. 2	51. 0	(3)	10. 5	1. 87

[2] Analyses made by Soil Survey Laboratories at Beltsville, Maryland.
[3] Trace.

by dividing the sum of bases by the sum of cations for cation exchange capacity. Base saturation by ammonium acetate was calculated by dividing the sum of bases by the ammonium acetate cation exchange capacity. The ratio of calcium to magnesium was calculated by dividing the extractable calcium by the extractable magnesium.

In table 12, particle-size distribution was determined by the pipette method (*8*, *9*). Water retention at 15 bars was measured by means of a pressure membrane apparatus on fragmented samples (*19*). Bulk density was determined by the plastic-coated clod method. Clod volume was determined by water displacement.

General Nature of the County

Greenbrier County was established in 1778, when West Virginia was still part of the State of Virginia. Lewisburg, the first permanent settlement, is the county seat. Livestock raising became important in the central part of the county not long after permanent settlements had been established. Lumbering became important with the building of a railroad in 1872. Coal mining was begun at the western edge of the county about 1907 and had become an important industry by 1922.

In 1960 the population was 34,446 in the county, 2,259 at Lewisburg, and 2,676 at White Sulphur Springs. At present there are several small mining communities in the western part of Greenbrier County. The central part is largely rural, and farmsteads are dispersed throughout the area. The northern and eastern parts are mostly wooded and sparsely populated. There are livestock markets at Alderson, Ronceverte, and Caldwell, and large sawmills at Rainelle and Ronceverte.

Among the industries are the production of coal (955,245 tons in 1965), transported to market largely by rail, and the extensive quarrying of limestone for use in road surfacing, as railroad ballast, and on farms.

Greenbrier County has a good network of roads. There are 131 miles of primary roads and 787 miles of improved secondary roads. U.S. Highway 60 and Interstate Highway 64 cross the county in an east-west direction, and U.S. Highway 119 crosses the county in a north-south direction. The main line of one railroad serves Alderson, Ronceverte, and White Sulphur Springs, and other railroads haul lumber and coal. There is a modern airport just north of Lewisburg.

Physiography, Relief, and Drainage

The eastern part of Greenbrier County is in the Southern Appalachian Ridge and Valleys, and the western part is in the Eastern Allegheny Plateau and Mountains.

The Ridge and Valley area, which is generally east of the Greenbrier River, consists of a series of parallel mountain ridges and the narrow valleys between them. The steep sides of rounded hills rise sharply to the main mountaintops, as for example, Kates Mountain. The bedrock consists of strongly folded shale, siltstone, and sandstone. The main mountaintops are generally underlain by massive, resistant sandstone and the side slopes by interbedded shale and siltstone. Folding has resulted in narrow outcropping of limestone along Beaver Creek and on Cole Mountain. In the valleys along the main streams, the flood plains are generally narrow, but there are fairly broad areas on the bottoms and on terraces along the lower part of the Greenbrier River and Howard Creek, downstream from White Sulphur Springs.

The Greenbrier Valley, which is also in the Ridge and Valley area, lies generally between the Greenbrier River to the east and the Allegheny Plateau and Mountains to the west. It is underlain by limestone and is commonly referred to as "the limestone valley" (fig. 8). This valley is generally rolling, but there are small areas of rounded, moderately steep hills. The flood plains are generally narrow, and the valley walls are steep.

The Eastern Allegheny Plateau and Mountains extend northeasterly and southwesterly from Rainelle in the western part of Greenbrier County. The northern part is a rugged, mountainous area underlain by level-bedded sandstone and shale. The valleys are narrow and steep sided. The ridges, which are underlain by massive sandstone, are mostly level, but in several fairly broad areas they are gently sloping. South of Rainelle, the Allegheny Plateau becomes less rugged and generally has rounded, moderately steep slopes. The area is underlain by level-bedded, red and gray siltstone and shale and thin-bedded sandstone. These rocks weather rather easily, and numerous streams have cut far back into the hills. The flood plains along the small streams are generally narrow, but they are quite broad and wet along the Meadow River, upstream from Rainelle. The Meadow River flows over massive sandstone downstream from Rupert, and a rather broad, level hanging valley has formed in this area.

The elevations in the Ridge and Valley area are mostly 2,500 to 2,800 feet on the mountaintops. They range from about 1,700 feet along the main drainageways near Caldwell to about 1,800 feet near Neola. The elevations in the northern part of the Allegheny Plateau and Mountains range from about 3,000 feet to 4,400 feet on the ridges. The valleys are as much as 1,000 to 2,000 feet lower than the ridges. South of Rainelle, the higher elevations range from 2,000 to 3,000 feet, and the lower elevations along the main streams range from about 1,700 to 2,400 feet.

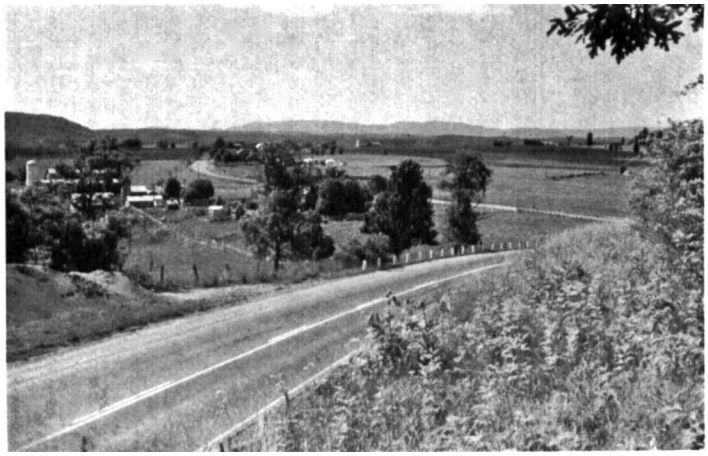

Figure 8.—**Typical farming area in the limestone valley. In the foreground are soils of the Frederick and Frankstown series. In the background in woodland on Brushy Ridge are soils of the Dekalb series.**

The Ridge and Valley area is drained mainly by the Greenbrier River, Anthony Creek, and Howard Creek. The Greenbrier Valley is drained mostly through underground solution channels in the limestone (fig. 9), but there are some small streams, such as Culberson Creek. The Greenbrier River, which crosses the northern and southern ends of the valley, has cut through the limestone and is entrenched in resistant sandstone. Areas in the Allegheny Mountains are drained mainly by tributaries of the Cherry River to the north and Big Clear Creek and Little Clear Creek to the south. The less rugged areas of the Plateau south of Rainelle are drained by numerous small streams and by the Meadow River.

Climate [5]

The northwestern part of Greenbrier County has some of the highest ridges in the State. These ridges have considerable effect on the climate. Because of the prevailing westerly winds at this latitude, considerable moisture falls on the windward side of the Allegheny Mountains, which are in this part of the county, but the leeward side is relatively dry. Relatively sharp differences in climate occur within short distances, and there are marked variations in mesoclimate between the valley bottoms and the ridgetops.

Temperature and precipitation data based on records at McRoss and Rainelle are given in table 13, and data based on records at White Sulphur Springs are given in table 14. The probabilities of low temperatures in spring and fall are given in table 15. The data from McRoss and Rainelle are representative of the northwestern part of the county, and those from White Sulphur Springs are representative of the rest of the county. The marked variations in mesoclimate between valley bottoms and ridgetops should be considered when applying the data in the tables to different elevations.

In the northwestern part of the county, the annual precipitation is about 51 inches, which includes up to 80 inches of snow, and the freeze-free season is about 132 days, according to data recorded at McRoss. At the higher elevations in this part of the county, the annual precipitation is 55 inches or more. Forests of northern hardwoods cover about 90 percent of the area; these trees are especially well suited to the short cool season and the abundant rainfall. Pasture and forage crops are well suited. Most of the farms are small and of the general type.

In the central and eastern parts of the county, the precipitation is only about 38 inches, which includes about 20 inches of snow. The average length of the freeze-free season is 149 days, according to data recorded at White Sulphur Springs. Dairying and the raising of beef cattle and sheep are extensive, especially in and around the limestone valley area. The length of the growing season and the amount of rainfall are generally adequate for bluegrass pasture and for small grain and corn. Toward the southwestern margin of the county, the precipitation is slightly higher and the growing season is slightly shorter.

The winter weather is moderately rigorous, but it is somewhat more prolonged and severe at elevations of more than 3,000 feet. Cold waves occur two or three times in an average year, but they seldom last longer than a few days. The snowstorms are usually followed by a period of thawing, and there is no large-scale melting in spring of the accumulated snowpack. The total snowfall varies greatly from winter to winter. South-facing slopes lose their snow cover in the frequent sunny periods between storms.

Thunderstorms occur on 40 to 50 days in an average year, but they are more frequent at the higher elevations and in June and July. Tornadoes and hailstorms are rare. The remnants of hurricanes sometimes cause damage because of the heavy rains accompanying them. More frequently, there are flash floods caused by widespread heavy rain or severe thunderstorms. Light winds prevail in the lulls between storms; they are most frequent late in summer and in fall, especially in the valleys.

Dry spells in the central and southern parts of the county sometimes limit water supplies for dairy herds and other livestock and curtail the growth of fall or late-summer pasture.

[5] By Robert O. Weedfall, State climatologist, Environmental Science Services Administration, U.S. Department of Commerce.

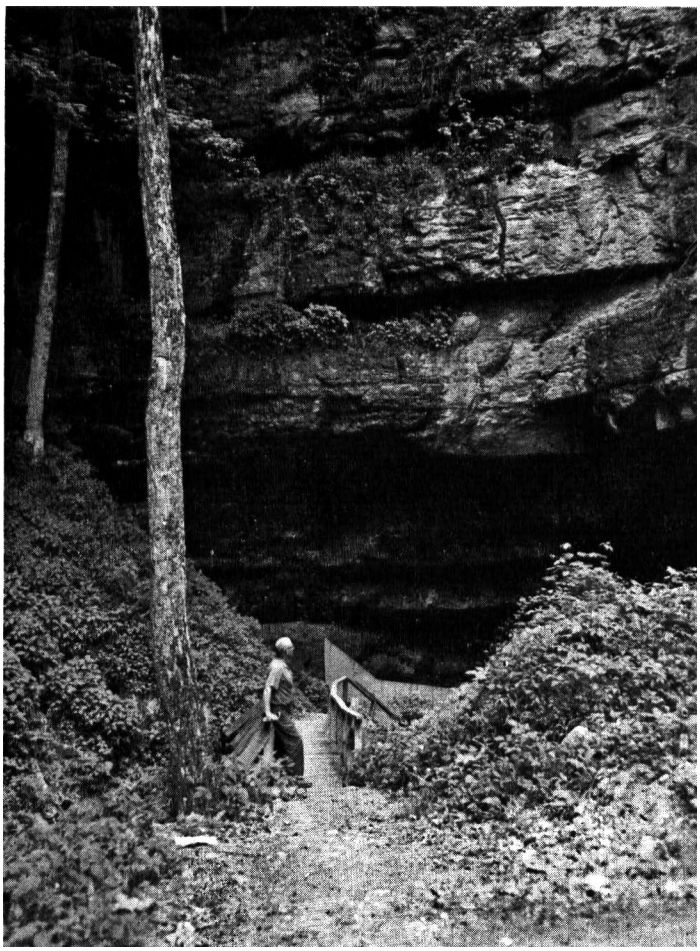

Figure 9.—**Organ Cave in the south-central part of Greenbrier County in an area of Frederick soils. Many solution caverns run for miles underground in these limestone areas.**

TABLE 13.—*Temperature and precipitation data, McRoss and Rainelle*

[All data, except those on precipitation probabilities and average total, are from McRoss, elevation 2,445 feet; based on records for the period 1956–65. The data on precipitation probabilities and average total include data from Rainelle, elevation 2,424 feet, based on records for the period 1931–60]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have 4 days with—		Average total	One year in 10 will have—		Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°F.	°F.	°F.	°F.	In.	In.	In.	No.	In.
January	39.8	17.9	56	−5	4.39	2.4	6.6	18	4.2
February	43.7	21.1	62	−6	4.24	2.5	6.2	13	7.4
March	50.5	26.4	70	10	5.14	3.0	7.3	8	9.3
April	64.3	36.5	82	22	4.16	2.6	5.7	[1]	1.3
May	73.9	45.7	84	30	4.66	2.3	6.8	----	----
June	77.6	52.8	85	41	4.96	2.7	8.0	----	----
July	79.8	56.8	85	46	5.19	3.0	8.2	----	----
August	80.1	56.1	88	46	4.74	2.2	8.8	----	----
September	75.5	50.2	85	36	3.35	1.4	6.4	----	----
October	65.7	38.2	80	20	2.75	.8	5.4	[1]	1.0
November	54.7	29.6	72	15	3.37	1.6	5.6	3	1.9
December	42.7	20.3	62	−1	3.89	2.2	5.9	12	4.5
Year	62.4	37.6	[2] 89	[3] −12	50.84	40.8	58.8	54	----

[1] Less than half a day.
[2] Average annual highest temperature.
[3] Average annual lowest temperature.

TABLE 14.—*Temperature and precipitation data, White Sulphur Springs*

[All data from White Sulphur Springs, elevation 1,914 feet. Data on temperature probabilities and snow cover and depth are based on records for the period 1956–65; other data are based on records for the period 1931–60]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have 4 days with—		Average total	One year in 10 will have—		Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°F.	°F.	°F.	°F.	In.	In.	In.	No.	In.
January	44.5	23.1	59	2	3.09	1.3	5.4	9	3.0
February	46.9	23.1	65	1	2.83	1.3	4.4	8	4.2
March	54.6	28.7	73	12	4.00	2.0	6.2	4	6.8
April	67.4	37.9	85	24	3.06	1.4	4.8	----	----
May	77.1	46.9	88	31	3.51	1.8	5.2	----	----
June	83.5	55.6	91	42	3.62	1.5	6.2	----	----
July	85.9	59.2	92	47	4.28	1.8	7.4	----	----
August	84.2	58.3	92	46	3.84	1.7	6.2	----	----
September	78.1	51.6	88	37	2.79	.8	5.2	----	----
October	68.6	39.9	80	23	2.25	.7	4.6	----	----
November	55.3	29.5	72	16	2.59	1.2	4.4	[1]	2.0
December	45.0	22.8	65	4	2.68	1.3	4.4	6	3.2
Year	65.9	39.7	[2] 95	[3] −2	38.54	32.4	45.6	27	----

[1] Less than half a day.
[2] Average annual highest temperature.
[3] Average annual lowest temperature.

TABLE 15.—*Probabilities of low temperatures in spring and fall*

[Elevations are 2,424 feet at Rainelle and 1,914 feet at White Sulphur Springs. Data based on records for the period 1926–55 (*6*)]

Probability	Dates for given probability and temperature		
	32° F. or lower	24° F. or lower	16° F. or lower
Rainelle:			
Spring—			
1 year in 10 later than	June 3	May 5	Apr. 11
1 year in 4 later than	May 28	Apr. 29	Mar. 31
1 year in 2 later than	May 20	Apr. 22	Mar. 17
3 years in 4 later than	May 12	Apr. 15	Mar. 7
9 years in 10 later than	May 5	Apr. 10	Feb. 24
Fall—			
1 year in 10 earlier than	Sept. 16	Oct. 4	Oct. 28
1 year in 4 earlier than	Sept. 22	Oct. 11	Nov. 4
1 year in 2 earlier than	Sept. 29	Oct. 19	Nov. 12
3 years in 4 earlier than	Oct. 7	Oct. 27	Nov. 20
9 years in 10 earlier than	Oct. 13	Nov. 3	Nov. 27
White Sulphur Springs:			
Spring—			
1 year in 10 later than	May 27	Apr. 30	Mar. 30
1 year in 4 later than	May 18	Apr. 22	Mar. 22
1 year in 2 later than	May 8	Apr. 12	Mar. 12
3 years in 4 later than	Apr. 28	Apr. 3	Mar. 3
9 years in 10 later than	Apr. 19	Mar. 25	Feb. 22
Fall—			
1 year in 10 earlier than	Sept. 21	Oct. 10	Nov. 1
1 year in 4 earlier than	Sept. 27	Oct. 16	Nov. 9
1 year in 2 earlier than	Oct. 4	Oct. 24	Nov. 18
3 years in 4 earlier than	Oct. 10	Oct. 31	Nov. 27
1 year in 10 earlier than	Oct. 16	Nov. 7	Dec. 4

Evaporation from ponds and reservoirs generally is about 22 inches in the period May through October, and 31 inches for the entire year. In the northwestern part of the county, evaporation is about 15 percent less.

Water Supply

Greenbrier County, except for areas underlain by limestone, is well supplied with surface streams. Most of these streams are small. They are generally adequate for local needs, but they would not be adequate for extensive industrial use. The Greenbrier River, which flows through the east-central part of the county, is large enough for some industrial use.

Surface streams are not numerous in the limestone valley areas in the center of the county, but there are strongly flowing springs. The water supplies for both municipal and domestic use are largely furnished by wells. The depth to water in the limestone is extremely variable from place to place, and supplying water to livestock is a problem in many areas.

The soils that are underlain by limestone generally are not well suited to impoundments, but those underlain by shale and sandstone, if not too steep, are generally suited to small impoundments.

Farming

Farming is important to the economy of Greenbrier County. According to the 1964 Census of Agriculture, there are 228,969 acres in farms. There are 1,237 farms, and an average farm is about 185 acres in size. Land use in the county is stable, but there has been a trend in the last decade toward allowing steep, eroded pasture to revert to woodland. This trend is most prevalent on the shale uplands in the western part of the county.

In 1964, the acreage of cropland, woodland, and pasture was reported as follows:

	Acres
Cropland:	
Harvested	29,646
Used only for pasture	8,525
Not harvested or pastured	2,697
Woodland:	
Pastured	42,220
Not pastured	51,189
Pasture:	
Neither cropland nor woodland	88,593

Following is the acreage of principal crops grown in the county:

	Acres
Corn for all purposes	4,439
Small grain, threshed or combined:	
Wheat	740
Oats	967
Barley	380
Hay crops:	
Alfalfa and alfalfa mixtures	4,060
Clover, timothy, and clover-grass mixtures	14,938
Small grain cut for hay	1,153

Literature Cited

(1) ALLAN, PHILIP E., GARLAND, LLOYD E., and DUGAN, R. FRANKLIN.
1963. RATING NORTHEASTERN SOILS FOR THEIR SUITABILITY FOR WILDLIFE HABITAT. Transactions of the Twenty-Eighth N. Amer. Wildlife and Natural Resources Conference, pp. 247–261, illus. Wildlife Management Institute, Washington, D.C.

(2) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1961. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 v., illus.

(3) ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.
1955. OFFICIAL METHODS OF ANALYSIS. Ed. 8, 1008 pp., illus.

(4) BALDWIN, M., KELLOGG, C. E., and THORP, J.
1938. SOIL CLASSIFICATION. U.S. Dept. Agr. Ybk. 1938: 979–1001.

(5) FERGUSON, ROLAND H.
1964. THE TIMBER RESOURCES OF WEST VIRGINIA. U.S. Forest Serv. Res. Bull. NE–2, 123 pp., illus.

(6) HAVENS, A. V., and MCGUIRE, J. K.
1961, THE CLIMATE OF THE NORTHEAST. SPRING AND FALL LOW-TEMPERATURE PROBABILITIES. N.J. Agr. Expt. Sta. Bul. 801, 32 pp. New Brunswick, N.J.

(7) KILMER, V. J.
1960. THE ESTIMATION OF FREE IRON OXIDES IN SOILS. Soil Sci. Soc. Amer. Proc., v. 24, pp. 420–421.

(8) ——— and ALEXANDER, L. T.
1949. METHODS OF MAKING MECHANICAL ANALYSES OF SOILS. Soil Sci. 68: 15–24.

(9) ——— and MULLINS, J. F.
1954. IMPROVED STIRRING AND PIPETTING APPARATUS FOR MECHANICAL ANALYSIS OF SOILS. Soil Sci. 77: 437–441, illus.

(10) MCCARTHY, E. F.
1933. YELLOW POPLAR CHARACTERISTICS, GROWTH, AND MANAGEMENT. U.S. Dept. Agr. Tech. Bul. 356, 58 pp.

(11) NELSON, T. C., CLUTTER, J. L., and CHAIKEN, L. E.
1961. YIELD OF VIRGINIA PINE. U.S. Forest Serv., Paper No. 124, 11 pp.
(12) PEECH, M., ALEXANDER, L. T., DEAN, L. A., and REED, J. F.
1947. METHODS OF SOIL ANALYSIS FOR SOIL-FERTILITY INVESTIGATIONS. U.S. Dept. Agr. Cir. 757, 25 pp.
(13) PORTLAND CEMENT ASSOCIATION.
1962. PCA SOIL PRIMER. 52 pp., illus. Chicago.
(14) PRICE, PAUL H., and HECK, E. T.
1939. GREENBRIER COUNTY, WEST VIRGINIA GEOLOGICAL SURVEY. COUNTY REPORT. 846 pp., illus.
(15) SCHNUR, G. LUTHER.
1937. YIELD, STAND, AND VOLUME TABLES FOR EVEN-AGED UPLAND OAK FOREST. U.S. Dept. Agr. Tech. Bul. 560, 87 pp., illus.
(16) SIMONSON, ROY W.
1962. SOIL CLASSIFICATION IN THE UNITED STATES. Science 137: 1027–1034, illus.
(17) THORP, JAMES, and SMITH, GUY D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, and GREAT SOIL GROUPS. Soil Sci. 67: 117–126.
(18) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. U.S. Dept. Agr. Handbook 18, 503 pp., illus.
(19) ———
1951. DIAGNOSIS AND IMPROVEMENT OF SALINE AND ALKALI SOILS. U.S. Dept. Agr. Handbook 60, 160 pp., illus.
(20) ———
1960. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 265 pp., illus. [Supplements issued in March 1967 and September 1968]
(21) ———
1965. SOIL SURVEY OF MONROE COUNTY, WEST VIRGINIA. Soil Conserv. Serv., 114 pp., illus.
(22) UNITED STATES DEPARTMENT OF DEFENSE.
1968. UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS AND FOUNDATIONS. MIL–STD–619B, 30 pp., illus.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

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

Aspect (forestry). The direction toward which a slope faces.

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold dilute hydrochloric acid.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

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.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or parallel to the terrace grade.

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

Erosion. The wearing away of the land surface by wind, running water, and other geological agents.

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 content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard 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.

Gleyed soil. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the lower horizons, as a result of waterlogging with poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

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

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused by (1) accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Karst topography. Relief marked by sinks interspersed with abrupt ridges and protuberant rocks and by caverns and underground streams.

Leached layer. A layer from which the soluble materials have been dissolved and washed away by percolating water.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of 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.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Natural drainage. Drainage that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A horizon and upper part of the B horizon and have mottling in the lower part of the B horizon and in the C horizon.

Somewhat poorly drained soils are wet for significant periods but not all the time. They commonly have mottling at a depth below 6 to 16 inches, in the lower part of the A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods; they are light gray and generally mottled from the surface downward, but some have few or no mottles.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the lower parts of the profile.

Parent material (soil). The disintegrated and partly weathered rock from which a soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

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

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. 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		

Residuum. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residuum is not soil but is frequently the material in which a soil has formed.

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands to serve as vegetative barriers to wind and water erosion.

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. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

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.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

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.

Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The USDA Target Center can convert USDA information and documents into alternative formats, including Braille, large print, video description, diskette, and audiotape. For more information, visit the TARGET Center's Web site (http://www.targetcenter.dm.usda.gov/) or call (202) 720-2600 (Voice/TTY).

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).